REPORT TO
NSW OFFICE OF ENVIRONMENT AND HERITAGE, AND VICTORIAN DEPARTMENT OF ENVIRONMENT, LAND, WATER AND PLANNING
26 SEPTEMBER 2017

RESIDENTIAL HOUSING INDUSTRY CAPABILITIES

ANALYSIS OF CAPABILITY TO SUPPORT NSW AND VICTORIAN GOVERNMENT ENERGY EFFICIENCY POLICIES AND PROGRAMS
FINAL REPORT
DISCLAIMER:

This report is the result of a research project commissioned by the NSW Office of Environment and Heritage (OEH) and the Victorian Department of Environment Land Water and Planning (DELWP) and delivered by ACIL Allen Consulting, based on their experience in the industry and information provided by stakeholders.

The views and the recommendations expressed in this report are those of the authors and are not endorsed by OEH or DELWP. The report is provided for your information only and should not be relied upon as indicating any future action by both agencies on the recommendations made.
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<td>ABSA</td>
<td>Australian Building Sustainability Association</td>
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<tr>
<td>ACIL Allen</td>
<td>ACIL Allen Consulting</td>
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<tr>
<td>AIA</td>
<td>Australian Institute of Architects</td>
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<td>AIB</td>
<td>Australian Institute of Building</td>
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<td>AIRAH</td>
<td>Australian Institute of Refrigeration Air Conditioning and Heating</td>
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<td>AISC</td>
<td>Australian Industry and Skills Committee</td>
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<tr>
<td>ANZSCO</td>
<td>Australian and New Zealand Standard Classification of Occupations</td>
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<td>ASC</td>
<td>Australian Solar Council</td>
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<td>AWA</td>
<td>Australian Window Association</td>
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<td>BASIX</td>
<td>Building Sustainability Index</td>
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<td>BDAA</td>
<td>Building Designers Association of Australia</td>
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<td>BDAV</td>
<td>Building Designers Association of Victoria</td>
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<td>CEC</td>
<td>Clean Energy Council</td>
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<td>COAG</td>
<td>Council of Australian Governments</td>
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<td>CPD</td>
<td>Continuing professional development</td>
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<td>DELWP</td>
<td>Victorian Department of Environment, Land, Water and Planning</td>
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<td>EEAP</td>
<td>Energy Efficiency Action Plan</td>
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<td>ETU</td>
<td>Electrical Trades Union</td>
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<tr>
<td>GBCA</td>
<td>Green Building Council of Australia</td>
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<tr>
<td>HIA</td>
<td>Housing Industry Association</td>
</tr>
<tr>
<td>HVAC</td>
<td>Heating, ventilation and air conditioning</td>
</tr>
<tr>
<td>ICANZ</td>
<td>Insulation Council Of Australia and New Zealand</td>
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IRC  Industry Reference Committee
ISC  Industry Skills Council
MBAV  Master Builders Association of Victoria
NABERS  National Australian Built Environmental Rating Scheme
NatHERS  Nationwide House Energy Rating Scheme
NCC  National Construction Code
NCVER  National Centre for Vocational Education Research
NECA  National Electrical and Communications Association
OEH  NSW Office of Environment and Heritage
OH&S  Occupational health and safety
PV  Photovoltaic
REI  Real Estate Institute of Australia
RTO  Registered training organisation
SEIA  Solar Energy Industries Association
SME  Small and medium sized enterprises
SSO  Skills Service Organisations
VBA  Victoria Building Authority
VEET  Victorian Energy Efficiency Target
VET  Vocational education and training
The NSW and Victorian Governments are both implementing policies and programs that will likely drive demand for energy efficiency and energy management skills. Both NSW and Victoria are seeking to accelerate the state’s energy productivity and have a long-term objective of achieving net-zero emissions by 2050. One way to achieve this goal is through improving the energy performance of the housing stock.

These policy drivers, coupled with the emergence of new technologies, mean that both jurisdictions will need to gain an understanding of the industry’s existing skills base, any gaps that may impede program success, and actions to address these gaps.

This report, commissioned by the NSW Office of Environment and Heritage (OEH) and the Victorian Department of Environment, Land, Water and Planning (DELWP), provides an understanding of:

— the key actors in the residential housing supply chain and their influence on a dwelling energy performance
— the skills required to support uptake of energy efficiency and energy management in the residential built environment
— the extent to which these skills currently exist among key actors in the residential housing supply chain
— motivations and day-to-day conditions of the actors in the residential housing supply chain to upskill their knowledge
— pathways through which individuals can access new skills and knowledge
— any gaps that may impede the success of residential energy efficiency programs in NSW and Victoria
— actions to address these gaps.

The residential housing industry supply chain

Figure ES 1 presents the key actors that have a role (or could have a role) in influencing energy efficiency decisions in the residential built environment supply chain—building design, construction, sales/lease, building occupation and renovation/retrofits. It also presents the extent of their likely involvement in influencing energy efficiency decisions at the various stages of a building’s lifecycle—involved in all or most projects, involved in only some projects, could potentially be involved but currently is not, or no role to play.
The motivations for actors in the housing supply chain to implement energy efficiency may be:

- **Financial.** Generally, industry actors will implement and promote energy efficiency where they have the financial incentive to do so. Depending on the industry actor, this could be in the form of:
  - a competitive advantage leading to more business opportunities and increased profit
  - (in the past) availability of ready demand stimulated by government rebates
  - the ability to command higher wages through having obtained a recognised skill or qualification valued by the market.

However, at present, the commercial motivations to implement energy efficiency in the residential housing industry are not widespread and energy efficiency remains largely a niche market.

- **Regulatory.** Government regulation is one of the most powerful influencers on industry standards and practices. Regulation may be intended to set a floor for standards and practices, with the expectation that parts of the market will strive to exceed minimum requirements. However, in practice, regulation frequently becomes the ceiling deemed to represent acceptable standards. In a cost-competitive
environment, industry actors will typically seek to achieve the required level with minimal commitment and minimal possible cost.

— Values. A niche cohort in the residential housing supply chain is strongly motivated by environmental and sustainability values. These individuals are driven by personal rather than commercial motivations. The demand for their services comes largely from the niche group of similarly motivated customers, who can be categorised as the early adopters forming the initial 5-10 per cent of the market.

Skills and capabilities needed to deliver energy efficiency outcomes

Overall, stakeholders noted that energy efficiency skills are in many cases not substantially different from those required for the design and construction of good, high quality dwellings. The selection and appropriate installation of energy efficient building products and appliances was noted as the main area where new skills and knowledge are specifically required.

Product manufacturers and suppliers were generally seen to have sufficient skills and knowledge to meet the demand for energy efficient products when this arises. Suppliers and manufacturers play a role in informing key actors in the residential housing supply chain of latest available technologies; however, key actors with a role in equipment selection need skills relating to calling for and interpreting product specifications.

Energy management and skills required for new technologies such as smart appliances were noted by few stakeholders, but were not highlighted during most consultations. Of existing trades and professions, electricians are most likely to require new skills and knowledge. However, it is also likely that new occupations and business models will emerge and become mainstreamed as residential energy management technologies mature and energy data becomes increasingly available.

The motivations and day-to-day conditions for most actors in the residential housing supply chain to upskill in energy efficiency are not strong. Lack of demand from consumers reduces the motivation to invest time and money in upskilling—this was noted as a particular constraint in the current climate of strong building activity when most builders and tradespeople are fully employed.

Government policies and regulations were noted as an important incentive across the supply chain; however, a lack of long-term commitment from government to its policies and regulations was noted as a significant obstacle to the willingness to upskill.

Skills and training gaps in the residential housing supply chain

Overall, the knowledge base on energy efficiency in the residential housing supply chain is not yet well-established. Where training on energy efficiency is available, uptake has been limited to a small proportion of the industry. Other actors have no defined skills development available to them.

Table ES 1 summarises the priority actors most likely to have an impact on a dwelling’s energy performance by lifecycle stage, and the key gaps currently preventing energy efficiency outcomes from being realised.

<table>
<thead>
<tr>
<th>Lifecycle stage</th>
<th>Key actor(s)</th>
<th>Key gaps(s)</th>
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<tr>
<td>Building design</td>
<td>Architects and building designers</td>
<td>Key gaps: translating existing knowledge of building design to efficient outcomes; keeping up to date with new products and technologies Emerging gap: embedding new energy management technologies in building design</td>
</tr>
<tr>
<td>Construction</td>
<td>Builders, supporting trades</td>
<td>Key gap: translating building design to energy efficient outcomes</td>
</tr>
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</table>
### Lifecycle stage | Key actor(s) | Key gaps(s)
--- | --- | ---
Sale or lease | Real estate agents | Key gaps: currently not involved, but in context of a residential energy rating scheme could play a role; promotion needed to encourage uptake of existing training
| Property inspectors | Key gap: currently not involved, but in context of a residential energy rating scheme could play a role; may require upskilling but extent of current knowledge unknown
Building occupation | Tradespeople | Key gap: skills to recommend more efficient alternatives at point of equipment breakdown
|  | Emerging gap: knowledge of energy management principles and technologies (electricians)
Renovations and retrofits | Architects and building designers | Key gap: translating existing knowledge of building design to efficient outcomes
| Builders, supporting trades | Key gap: skills to recommend more efficient alternatives

**Recommendations for addressing skills and training gaps**

To address the skills and training gaps, so as to facilitate successful residential energy efficiency programs, it is recommended that the NSW and Victorian Governments focus its actions around four key objectives.

**Objective 1: strengthen the commercial incentive to engage in energy efficiency training.** The majority of the residential housing market supply chain will only participate in energy efficiency training if the skills gained provide a clear business advantage. A core objective for government action is therefore to support uptake of training through strengthening the commercial incentive to gain new skills and knowledge and reducing the cost, including the opportunity cost, of participating in training.

**Objective 2: build a consistent base of knowledge throughout the supply chain.** The residential housing market supply chain is highly fragmented, with professionals and tradespeople often working in silos with little overlap. In this context of fragmentation and specialisation, government is uniquely placed to create the framework needed to ensure that actors in the residential housing supply chain share a common base knowledge about energy efficiency.

**Objective 3: offer training tailored to the needs of the audience.** The commercial incentives, influence over energy efficiency outcomes, access to training and base level of energy efficiency skills and knowledge differ between actors in the residential housing supply chain. Therefore, the need to build a consistent knowledge base throughout the supply chain must be balanced with the need to ensure that the training offering is tailored to the context and incentives of the key actor(s) at which the training is aimed.

**Objective 4: build on the existing base when developing new initiatives.** A range of energy efficiency training programs are already available to actors in the residential housing supply chain from a range of industry and VET sector training providers. Government action should seek to build on, rather than supplant or duplicate, these existing initiatives, and should be focussed on providing a greater degree of harmonisation to what is a fairly fragmented training landscape.

The remainder of the section discusses the strategies NSW and Victoria could adopt when seeking to address skills and training gaps in the residential housing market supply chain.

**Objective 1: strengthen the commercial incentive to engage in energy efficiency training**

1. **Pursue nationally consistent policies, with a long-term commitment to the development of energy efficiency skills**

   Upskilling in energy efficiency is one competing priority among many, and industry associations, companies and individuals are likely to be reluctant to make substantial investments in initiatives they believe to be of only short duration or which do not have broad applicability. Consequently, training
initiatives need to be aligned with existing and planned government policies, programs and regulations which are likely to drive up the demand for energy efficiency in the residential housing sector.

In the past, changing government priorities and differences between jurisdictions have been key challenges for embedding energy efficiency in the residential housing supply chain on a sustained basis. Providing market participants with investment certainty is essential; training and upskilling initiatives should therefore be planned on a 5-10 year time horizon, sending a clear signal of government commitment which has in the past been lacking.

2. **Reduce the opportunity cost of participating in training**

Through providing funding to industry partners to develop and deliver training courses, government plays a role in shaping the upskilling opportunities available to actors in the residential housing supply chain. Further, in the context of its own schemes where it sets a mandated minimum standard for participation, governments should consider the opportunity cost of its training and accreditation requirements.

To reduce the opportunity cost of accessing training, government should adopt the following principles when collaborating with industry partners and setting training requirements for its own schemes:

a) offer flexible training modes to suit diverse needs
b) balance rigour with the need for flexibility when setting training and accreditation requirements for government schemes

**Objective 2: build a consistent base of knowledge throughout the supply chain**

3. **Provide harmonised and consistent base knowledge of energy efficiency to all actors in the residential housing supply chain**

The residential housing market supply chain is highly fragmented with industry actors often working in silos. Providing all industry actors with the same basic level of energy efficiency knowledge and skills through a harmonised training scheme would help develop a shared systems view of each actor’s role in delivery energy efficiency outcomes.

While industry would take the leading role in developing and delivering the training, government can support the scheme through:

a) providing policy certainty
b) providing initial seed funding
c) coordinating industry participants who may not normally collaborate
d) providing a stamp of approval enhancing the credibility of the scheme.

4. **Embed energy efficiency in basic training for all actors in the residential housing supply chain**

While developing training content is primarily a function of industry and the training and education sector, government can encourage the incorporation of energy efficiency in curricula through providing clear direction on its policy priorities. This will enable industry to work on training packages to be able to roll these out in a timely manner when the demand for training occurs.

**Objective 3: tailor training to the needs of the audience**

5. **Encourage uptake of existing training where this is already on offer**

A range of key actors already have access to training on energy efficiency, relevant to their specific role. Government should, in collaboration with industry, continue to encourage uptake of these courses. A key role for government in promoting the uptake of training is through communicating the impact of its policies on the commercial incentives of actors in the residential housing supply chain. Further, government can support industry in addressing specific skills gaps through providing seed-funding for new courses and initiatives.

6. **Develop training for industry actors where this is currently not available**

A number of key actors in the residential housing supply chain currently have little or no access to energy efficiency training. For these actors, government can support the development and uptake of training through:
– communicating the relevance and benefits of energy efficiency (specific to the industry actor), strengthening the incentives to take up training
– providing seed-funding for specific areas where skills gaps exist and commercial incentives to take up training are likely to be stronger
– working with industry bodies with similar aims to improve professional standards in the industry, particularly in areas where government policy in the near term is likely to strengthen the incentives to participate in energy efficiency
– for licensed or regulated trades and professions not currently required to undertake CPD, considering the introduction of mandated upskilling requirements.

**Objective 4: building on the existing base when developing new initiatives**

7. **Work with existing schemes**

   A number of energy efficiency training schemes already exist and any new initiatives should seek to build on and enhance, rather than supplant, existing training.

8. **Continue to work with industry partners in developing and delivering training**

   Through its coordinating role, government can facilitate consistent training for different actors at different parts of the supply chain. In addition, government leadership provides a quality stamp trusted by industry participants and sends a signal of longer-term policy commitment.

   In turn, industry involvement helps ensure that training is seen to be relevant and current for the trades and professions. Additionally, industry associations play an important role in identifying training needs and promoting the offering to their members.
Government and industry initiatives in relation to energy efficiency and more recently with energy management in the residential built environment have created demand for new skills within existing occupations as well as the creation of new occupations.¹

The NSW and Victorian Governments are both implementing policies and programs that will likely drive demand for energy efficiency and energy management skills. Both NSW and Victoria are seeking to accelerate the state’s energy productivity and have a long-term objective of achieving net-zero emissions by 2050. One way to achieve this goal is through improving the energy performance of the housing stock.

These policy drivers, coupled with the emergence of new technologies, mean that both jurisdictions will need to gain an understanding of the industry’s existing skills base, identify any gaps that may impede program success and develop actions to address these gaps.

This report, commissioned by the NSW Office of Environment and Heritage (OEH) and the Victorian Department of Environment, Land, Water and Planning (DELWP), provides an understanding of:

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— motivations and day-to-day conditions of the actors in the residential housing supply chain to upskill their knowledge
— pathways through which individuals can access new skills and knowledge
— any gaps that may impede the success of residential energy efficiency programs in NSW and Victoria
— actions to address these gaps.

The premise for this project explicitly assumes that the demand for energy efficiency will increase in the near future as the result of government action. It is not within the scope of this report to:

— examine in detail the commercial motivations for actors in the residential housing supply chain to undertake energy efficiency activities
— make recommendations on how to increase the demand for energy efficiency training
— identify behaviours home owners could or should exhibit to signal demand for energy efficiency
— assess the impact of government policy on the demand for energy efficiency skills

¹ Request for Quotation, p. 12
— identify policy and regulatory gaps that governments should address to promote the uptake of energy efficiency.

1.1 Approach, methodology and limitations

ACIL Allen Consulting (ACIL Allen) has delivered the project through a series of clearly defined tasks which systematically build towards providing OEH and DELWP with an understanding of the current capabilities of the residential housing industry to support government energy efficiency policies and programs, identify gaps in current capabilities, and recommend actions to address these.

Throughout the report, energy efficiency is defined as a reduction in the amount of energy required to reach a desired outcome, such as heating a home to a comfortable standard.

In contrast, energy management can be understood as the products or services to monitor, control or analyse energy usage in the home. This can include automated home energy management through smart appliances and devices, as well as data analysis and visualisation of energy usage data.

Broadly speaking, energy efficiency relates to the fixed components of a dwelling that make up its baseline energy use, while energy management relates to behaviours that can contribute to reduced energy usage.

The project was undertaken as follows:

1. **Desktop review** of the residential housing market supply chain, and available literature on skills needs. Based on this research, ACIL Allen identified key emerging trends from the literature. The desktop review also informed the development of the stakeholder consultation plan and a semi-structured discussion guide.

2. **Stakeholder consultation** to identify:
   a) industry skills needs
   b) motivations for upskilling
   c) challenges in accessing new skills and knowledge
   d) education and training sector perspectives on the demand for energy efficiency skills training.

Details of consultations undertaken are presented in Appendix A.

3. **Identification of relevant accreditation schemes and training programs** (both formally in the vocational education and training (VET) sector and industry-led courses) as well as analysis of the uptake for these in the residential housing industry supply chain.

4. **Gap analysis** of accreditation and training programs, and identification of the respective roles of government and industry in addressing those gaps. This analysis draws on the desktop review of previous literature, information sourced through the stakeholder consultations, and analysis of existing accreditation and training schemes, including quantitative data on the scale of uptake.

A key limitation of the analysis in this report is the nature and extent of stakeholder consultation. While a broad range of stakeholders have been consulted, not all actors in the residential housing supply chain have been covered. In addition, for most actors, only one industry representative was consulted, meaning that the full diversity of views across the sector may not be represented in the report findings.

The range of stakeholders consulted also means that energy efficiency is covered more comprehensively than energy management. While the questions posed to stakeholders covered both topics, the conversations largely (but not exclusively) centred on energy efficiency rather than energy management. This may mean that:

— to comprehensively cover energy management, the inclusion of other stakeholders (such as specialist energy management companies) would have been necessary

— energy management in the residential housing industry in not yet at the forefront for most industry actors.

Finally, the project timelines did not allow for the development and dissemination of a survey, which would have provided more quantitative and specific information on some of the questions of interest.
1.2 Structure of this report

The rest of this report is structured as follows:

— chapter 2 describes the context for this report, including:
  – the systems for formal vocational education and training and industry-led skills development
  – past policies supporting energy efficiency skills development
  – the current policy context in NSW and Victoria

— chapter 3 provides an overview of the key actors in the residential housing sector

— chapter 4:
  – outlines the energy efficiency and energy management skills needed in the residential housing supply chain
  – analyses the extent to which these skills currently exist
  – outlines the challenges in accessing new knowledge and skills

— chapter 5 outlines the current energy efficiency education and training pathways available for key actors in the residential housing supply chain

— chapter 6 presents the key findings of this study and provides recommendations on how to address identified skills and training gaps.
This chapter provides background information as context for the more detailed discussion and analysis in the subsequent chapters.

An overview of education and career pathways for trades and professions is provided in section 2.1. The framework for vocational education and training in Australia, the role of industry in the development of training products, and the most recent industry trends driving the development of VET courses are provided in section 2.2. The roles of continuing professional development (CPD) and industry-led accreditation are summarised in sections 2.3 and 2.4, respectively.

An overview of the historical and current policy context for energy efficiency training, in New South Wales and Victoria, are provided in sections 2.5 and 2.6, respectively.

2.1 Education and training in career pathways

Education and training is now understood by providers and governments alike to be a lifelong experience. Understanding the career points at which certain qualifications or training are pursued is an important factor in considering the broad trends in participation in education and training.

Work on vocational entry and pathways shows that qualification pathways in professions and vocations that are licensed or regulated in some way remain largely static. These pathways are more responsive to industry standards and regulatory requirements than they are to demand from prospective students. Someone looking to enter the construction industry or architecture, for example, will find that their education pathway is mapped for them, and built on a clear progression of certified skills and knowledge.

Each career pathway, whether professional or vocational, has its own entry points and markers of progression within that industry.

Professional career pathways commence with a higher qualification. At a minimum this is an advanced diploma, and most commonly a bachelor degree. Relevant examples include building designers and architects.

From these entry points, ongoing professional development and training becomes the norm for maintaining and extending skills and knowledge, and is often a condition of a license to operate. The acquisition of additional, formal qualifications may be a requirement for career advancement and professional registration requirements for complex projects.

Vocational career pathways are those that begin with an apprenticeship or traineeship; relevant examples include builders, plumbers, electricians, and heating, ventilation and air conditioning (HVAC) installers.

Additional formal qualifications are less common in vocational career pathways. Training and development is more likely to be focused on acquiring skills and knowledge of new tools, techniques and processes on an incremental or as-needs basis. Post-apprenticeship qualifications (for example Certificate IV) are available, and may be required to obtain licensing or registration for certain roles, such as becoming a project builder. However, continuing training and development is usually not required to maintain a trade licence or registration.

2.2 Australia’s vocational education and training system

The VET sector in Australia delivers qualifications ranging from Certificate I through to Advanced Diplomas to provide students with the technical skills and knowledge needed across all sectors of the economy. These skills and knowledge are identified in National Training Packages that are designed to reflect the competencies required to safely and effectively operate in various occupations and industries.

The system in place to develop and deliver National Training Packages is intended to reflect contemporary and future industry demand for skills, to ensure that VET students are ‘job ready’ when they enter the labour market. The training package development framework has been recently revised and consists of three key entities:

1. The Australian Industry and Skills Committee (AISC), which provides advice to the Council of Australian Governments (COAG) to ensure that the directions taken by Ministers are informed by an industry-based perspective focused on the quality and relevance of training in VET. It includes a nominee from each jurisdiction, a representative from the Commonwealth VET Advisory Board and a peak industry body representative.

2. Industry Reference Committees (IRCs) are the industry engagement mechanism at the centre of training package development. They provide advice to the AISC about the skills needs of their industry or sector, based on their experience and expertise.

3. Skills Service Organisations (SSOs) are funded by the Australian Government for an initial three-year period from 2016. They provide technical, operational and secretariat services to enable IRCs to undertake their industry engagement and training package development and review activities.

Figure 2.1 provides an overview of the system for training package development.

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3 NSW’s nominee is Mr Bill Galvin OAM and Victoria’s nominee is Mr Neil Coulson.
2.2.1 Developing and updating a National Training Package

Training packages are reviewed and development work is commissioned based on a national schedule. The schedule is developed by the AISC’s assessment of relative priorities across IRC work plans, taking account of risk, regulatory need, strategic industry and government priorities, economic impact, current levels of VET activity, and available budget.

The stages of work that contribute to a National Training Package are:

— **business case**: a formal exercise of industry engagement is undertaken by the SSO, under the supervision of the IRC, to assess the need to review and refine a training package, and to put forward the business case for the consideration of the AISC

— **training package development**: once a training package has been approved by the AISC, the necessary industry engagement, technical writing and validation of changes to training packages is undertaken by the SSO in accordance with the activity order issued by the Australian Department of Education

— **case for endorsement**: the revised training package is presented for formal consideration and endorsement by the Council of Australian Governments’ (COAG’s) Industry and Skills Council, and subsequent arrangements for updating the register of National Training Packages and teaching out superseded courses.

2.2.2 Identifying industry demand for new skills for incorporation in training packages

Industry demand for training is influenced by a number of drivers, such as licensing and accreditation requirements, and maintaining currency of skills and knowledge in the face of new and changing technologies. IRCs and their supporting skills service organisation actively scan their environments to understand future industry demand for skills and identify skills gaps. The results of this analysis are published regularly and used to inform the review and development of training packages.

The most recently published scans, outlined in Table 2.1, indicate that the main drivers of industry demand for training and skills development in energy efficiency, and in sustainability more broadly, are:

— consumer demand, for example, the consumer demand for sustainable house ratings

— rapidly changing technologies, for example, new and emerging technologies such as automation, building information modelling, artificial intelligence, connected devices and appliances, and virtual reality

— evolving standards, for example, sustainability regulations such as National Australian Built Environmental Rating Scheme (NABERS), GreenStar, Leadership in Energy and Environmental Design.

Table 2.1 provides an overview of skills demand for energy efficiency and sustainability more broadly. Specific skills needs relating to energy efficiency in the residential housing supply chain are discussed in Chapter 4.

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4 [https://www.aisc.net.au/content/national-schedule](https://www.aisc.net.au/content/national-schedule)
### TABLE 2.1 EMERGING SKILLS DEMAND BY INDUSTRY REFERENCE COMMITTEE

<table>
<thead>
<tr>
<th>Industry Reference Committee</th>
<th>Emerging skills demand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sustainability industry</strong></td>
<td><strong>Generic workforce skills</strong></td>
</tr>
</tbody>
</table>
| MSS Sustainability Training Package | “Environmental and sustainability” is considered to be the second-most important generic skill, after “managerial/leadership”.
| *IRC skills forecast and proposed schedule of work 2017-2021* | **Auditing and certification** |
|  | The growth of corporate social responsibility, international and national agreements and goals associated with carbon reduction are leading to a demand to be able to produce evidence of reductions in carbon footprints and emissions.
|  | There is currently a gap in content in the training package associated with carbon auditing. An associated action was identified to review the training package to ensure it has adequate content associated with the skills and capabilities associated with carbon auditing.
|  | **Corporate responsibility** |
|  | Review training package content to ensure the adequacy of training products associated with emerging skills necessary to support customer / client / corporate social responsibility.
|  | Industry consultations identified that customer/client relations, corporate social responsibility was the top ranked skill for the sector’s workforce within the next 3-5 years. |

<table>
<thead>
<tr>
<th>Construction, plumbing and services</th>
<th><strong>Industry-identified trends that will impact the sector:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPO Construction Training Package</td>
<td>– building information modelling (BIM)</td>
</tr>
<tr>
<td></td>
<td>– sustainability</td>
</tr>
<tr>
<td></td>
<td>– technological disruption.</td>
</tr>
<tr>
<td><em>IRC skills forecast and proposed schedule of work 2017</em></td>
<td><strong>Factors driving future skill needs</strong></td>
</tr>
<tr>
<td></td>
<td>– sustainability regulations, such as NABERS, GreenStar, Leadership in Energy and Environmental Design</td>
</tr>
<tr>
<td></td>
<td>– energy efficiency minimum standards</td>
</tr>
<tr>
<td></td>
<td>– energy use technologies (batteries and solar storage, water re-use technologies)</td>
</tr>
<tr>
<td></td>
<td>– new and emerging technologies such as automation, building information modelling, artificial intelligence, connected devices and appliances, and virtual reality</td>
</tr>
<tr>
<td></td>
<td>– sustainability and renewable energies, such as biogas plants, waste-to-energy projects, solar energy</td>
</tr>
<tr>
<td></td>
<td>– energy saving and water saving equipment.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Property Services</th>
<th><strong>Industry-identified trends that will impact the sector:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPP Property Services Training Package</td>
<td>– building information modelling</td>
</tr>
<tr>
<td></td>
<td>– sustainability</td>
</tr>
<tr>
<td></td>
<td>– technological disruption.</td>
</tr>
<tr>
<td><em>IRC skills forecast and proposed schedule of work 2017</em></td>
<td><strong>Factors impacting future skill needs:</strong></td>
</tr>
<tr>
<td></td>
<td>– recycling and reproducing waste in alternative forms</td>
</tr>
<tr>
<td></td>
<td>– consumer demand for sustainable house ratings</td>
</tr>
<tr>
<td></td>
<td>– consumer demand for environmentally sustainable practices and products</td>
</tr>
<tr>
<td></td>
<td>– sustainable use of microfiber (cleaning) and cleaning chemicals</td>
</tr>
<tr>
<td></td>
<td>– energy saving and water saving products.</td>
</tr>
</tbody>
</table>

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5 The acronyms are used by convention and refer to training package codes, rather than specific abbreviations.
### Industry Reference Committee

<table>
<thead>
<tr>
<th>Industry Reference Committee</th>
<th>Emerging skills demand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrotechnology</strong></td>
<td></td>
</tr>
<tr>
<td>EUU Electrotechnology Training Package</td>
<td>Industry challenges and opportunities</td>
</tr>
<tr>
<td><strong>Electrotechnology IRC skills forecast 2017</strong></td>
<td>Self-generation and battery storage are having an effect on the market with customers generating, storing and trading their own electricity. Storage solutions for renewable electricity continue to diversify, improve and reduce in cost, further bolstering growth in solar panel uptake across Australia.</td>
</tr>
<tr>
<td><strong>Sustainable environments</strong></td>
<td>A number of energy efficiency initiatives are being introduced by the Australian and State Governments to encourage the uptake of technologies such as solar photovoltaic (PV), battery storage and electric vehicles. These initiatives will create an unprecedented demand for electrotechnology workers with skills in energy efficiency technologies. The Australian Government also plans to phase down the importation of hydrofluorocarbons (HFCs) used as an alternative to chloroflourocarbons (CFCs) in refrigeration and other processes, commencing January 2018. As a result, other synthetic and natural refrigerants will be used in new refrigeration and air-conditioning equipment which are either more flammable, more toxic or operate at higher pressures, creating entirely new skills demands.</td>
</tr>
<tr>
<td><strong>Skills shortages and priority skills:</strong></td>
<td>Skills shortages and priority skills:</td>
</tr>
<tr>
<td>- renewables energy specialists and renewable energy storage</td>
<td>- renewables energy specialists and renewable energy storage</td>
</tr>
<tr>
<td>- generic skills in environmental and sustainability</td>
<td>- generic skills in environmental and sustainability</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Business Services</strong></th>
<th>Adaptability to change, especially digital change</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSB Business Services Training Package</td>
<td>The rapid pace of changes in digital technologies and structural change in the Australian economy is meaning that workers in business services will need the skills to adapt to changes. The ability to respond well to change and embrace new roles and technologies will be required.</td>
</tr>
<tr>
<td><strong>Industry Brief-Business Services, PwC’s Skills for Australia 2016</strong></td>
<td>Business analytics</td>
</tr>
<tr>
<td></td>
<td>Growing use and importance of data in business decision making is leading to employer demand for workers who can use and analyse data as a part of their roles. An ability to comprehend and work with increasing amounts of data will be required.</td>
</tr>
<tr>
<td></td>
<td>Proposed changes (2016 work plan)</td>
</tr>
<tr>
<td></td>
<td>Introduction of new units of competency in some qualifications, including sustainable procurement.</td>
</tr>
</tbody>
</table>

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**2.3 Continuing professional development**

CPD is offered by many professional associations. Participation can be mandatory, strongly encouraged as a preferred method of demonstrating members’ specific knowledge and skill set, or entirely voluntary. In many cases, it is a part of an accreditation scheme which licenses members to perform certain actions (such as certification) or undertake certain types of work eligible for government schemes and rebates (such as solar installation). Other forms of CPD are designed to enable their members to claim adherence to recognised standards in process, design or production. Details of CPD obligations and availability for the actors in the residential housing market supply chain are provided in section 3.2 and Chapter 5.

CPD activities may be informal or formal. Informal activities typically provide members with information regarding new products, policy developments, updates on licensing or regulatory requirements. These types of activities provide general information on the operating environment in which those members work; the information may be available elsewhere but is presented in a contextualised format.

Formal activities typically focus on developing the technical skills and knowledge of the members, ensuring that members can operate safely and effectively with new products, tools, processes or techniques. Attaching points to this type of activity encourages members to remain up to date and continue meeting licensing or other registration requirements. Formal CPD may also allow members

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10. [https://www.skillsforaustralia.com/industries/business-services/]
to pursue a specialisation within their industry that supports a unique offering to the members’ clientele.

2.4 Industry accreditation in Australia

Accreditation can be defined as an external review of quality with four principal components:
— it is based on written and published standards
— reviews are conducted by professional peers
— the accreditation process is administered by an independent body
— the aim of accreditation is to encourage organisational development.

Accreditation can help customers identify suitably qualified service providers (either companies or individuals). This is particularly relevant where there is an information asymmetry between the customer and service provider about skills levels or the quality of service provided.

Other circumstances in which accreditation can contribute to improved outcomes include the presence of:
— gaps in the skill sets of critical individuals
— gaps in the resources or processes of companies
— misaligned incentives between managers and contractors.

Accreditation can be associated with either an individual or a company. The roles and purpose of these different accreditation types is outlined in Table 2.2.

<table>
<thead>
<tr>
<th>Type of accreditation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accreditation of individuals</td>
<td>Skills are generally held by individuals. Therefore, accreditation of individuals is appropriate where the aim is to build skills and help customers hire suitably skilled individuals. Accreditation can be linked to a role (e.g. lighting design) or a trade/profession (e.g. electrician).</td>
</tr>
<tr>
<td>Accreditation of companies</td>
<td>Companies, rather than individuals, are generally responsible for maintaining processes, resources and finances. For example, if a skilled HVAC expert works for a company that has insufficient resources, they may be unable to deliver an effective service. Therefore, accreditation of companies is relevant for processes, resources and finances.</td>
</tr>
</tbody>
</table>

Source: Sustainability Victoria 2011

Additional dimensions associated with accreditation include:
— **Degree of obligation**: Accreditation and standards can vary from desirable to obligatory, depending on how critical they are.
— **Degree of coverage**: If there is only a subset of individuals in a role, trade or profession who get involved in retrofits (e.g. civil engineers), then accreditation may only be necessary for those individuals who wish to undertake retrofits. However, if all practitioners in a field need to have basic energy efficiency skills (e.g. architects), then accreditation could be obligatory to practice in a field (e.g. registration of architects).
— **Level of accreditation**: If the skills that are necessary for a role vary significantly between contexts, multiple levels of accreditation may be necessary. For example, basic lighting design skills may be sufficient to design a lighting system for a small, two-storey commercial building, but more extensive skills would be appropriate for a fifty-storey building.

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The first major national policy development in response to changes in demand for energy efficiency skills, relating to training, was the Green Skills Agreement (2010-12).\textsuperscript{12} It committed the Commonwealth, state and territory governments to working with training organisations and business to ensure skills for sustainability were an integral part of VET and relevant to the needs of industry. The agreement contained a number of actions including:

- incorporation of new sustainability skills training into training packages
- professional development of VET educators in the delivery of sustainability training
- research into emerging demand for sustainability skills.

One of the objectives of the agreement was to involve industry in the development of responsive training products that supported generic skills for sustainability, as well as specific professional and vocational skills for existing and new ‘green’ jobs.

Actions arising from the agreement involved the VET sector, industry and Commonwealth, state and territory governments.

These actions included:

- Industry Skills Councils (ISCs) revising and rewriting training packages
- state and territory TAFEs piloting a scheme for upskilling VET instructors and teachers in green skills
- a review of training packages for sustainability skills, involving ISCs and industry consultation
- a strategy to reskill vulnerable workers.

The focus at this stage of the policy cycle was on ‘sustainability skills’ broadly defined and preparation for new ‘green’ jobs. This meant that program actions covered all industry sectors and training packages. They included key industry actors in the residential construction industry and energy efficiency training, based on a review of training packages and/or state-led initiatives.

The first initiatives in NSW to support energy efficiency training in NSW were the Green Skills Strategy 2008-2010 and the Energy Efficiency Strategy 2009-2013. These supported the development of sustainability skills in the workforce and the transition to a lower carbon and more sustainable economy.

Initiated by the Board of Vocational Education and Training, the Green Skills Strategy delivered accredited training for sustainability skills, with a focus on resource intensive industries.\textsuperscript{13} In addition, the Energy Efficiency Training Program (EETP) was a $20 million component of the Energy Efficiency Strategy, managed jointly by OEH and the NSW Department of Education and Communities. The program:

- provided subsidies for RTOs to deliver accredited courses in energy efficiency skills
- developed courses to update the energy efficiency knowledge of educators and trainers in the VET sector
- supported industry partnerships to develop and deliver energy efficiency training
- developed technology and sector-specific training courses by OEH to build the energy efficiency skills of business and government
- supported projects that developed energy efficiency education for universities.\textsuperscript{14}

In 2010, the Victorian Government announced its response with a $5 million \textit{Building a Green Future} fund to support sustainability-related skills for building practitioners and the implementation of the six-star residential building standards. Additionally, $2.1 million was committed to establish the Plumbing Industry Climate Action Centre, a partnership with industry, unions and government to offer training in state of the art green plumbing techniques. An additional investment of $5 million was made to

\textsuperscript{13} NSW Board of Vocational Education and Training 2009, \textit{Skills for Sustainability, second edition}
support green skills training through the development of new curricula and approaches to workforce development.\textsuperscript{15}

The curricula were developed by government departments as state-owned courses, and included Vocational Graduate Certificates in:

- Building Energy Analysis (non-residential)
- Energy Efficiency for Facility Managers

These courses were developed by Sustainability Victoria and were offered until 2013. After this date, the curricula were either absorbed into, or superseded by, nationally developed training packages. As a result, the courses are no longer offered by RTOs in Victoria.

An evaluation of the Green Skills Agreement found that this ‘supply push’ from state training authorities, ISCs, RTOs had led to a situation where:

> It would appear that in some areas skills for sustainability has matured to beyond a pre-commercial or supported commercial product. At a minimum, skills for sustainability content is now a commercial niche, and could even be characterised as mainstream in some industry sub-sectors.

\textit{Evaluation of the National VET Sector Sustainability Policy and Action Plan and the Green Skills Agreement Implementation Plan, May 2013, p. vii.}

The evaluation also noted that changed policy priorities arising from changes in government at the state and territory level meant that some actions were not pursued to the fullest extent.\textsuperscript{16}

The experience of the NSW and Victorian Government strategies indicates that supply-side initiatives must be met with demand—whether from consumers or industry—and must be delivered in a timely manner. Reflections from personnel involved in program development and delivery indicates that uptake was lower than expected or more difficult to achieve due to low demand or lengthy training package development processes.

Since these initiatives, the policy language has changed substantially as sustainability skills are now more clearly recognised as comprising discrete skills according to industry and profession. Accordingly, the policy vocabulary has expanded to refer to sustainability skills as a generic term with increased use of specific terms such as energy efficiency.

From 2013, changes of government at the national, state and territory levels presaged a change in policy direction for energy efficiency skills. The Australian Government introduced a Direct Action Plan, with the Emissions Reduction Fund as the centre piece, and did not continue initiatives under the Green Skills Agreement.

NSW launched the Energy Efficiency Action Plan (EEAP) in 2013 after a change in government. The objectives of the EEAP are to reduce consumers’ energy costs and further reduce pressure on future energy prices. Of the 30 actions, four were specifically designed to increase the energy efficiency skills and knowledge of different actors across the residential and business sectors:

- Action 9 aimed to provide training for appliance retailer staff and web-based information on the benefits of higher star ratings, to help households make informed decisions.
- Action 16 aimed to encourage quality energy efficiency projects by publishing lists of eligible products, and training and licensing tradespeople to use the Energy Savings Scheme tools.
- Action 18 aimed to provide hands-on training for site managers to help them apply best practice maintenance plans.
- Action 19 aimed to provide training in energy efficiency basics and information resources to general business advisors.\textsuperscript{17}

As this brief overview of energy efficiency policies and programs indicates, this area has been characterised more by change than continuity. This has generated uncertainty for industry actors,
training providers and students as they endeavour to respond to policy settings and consumer demand.

Energy efficiency skills, as defined by this report, have been incorporated into VET by RTOs and industry using three main approaches:

1. embedded within existing skills and training with no change to their format, particularly where there is little change to processes or products
2. within newly developed units, where specific skills and knowledge are clearly identified
3. within sustainability guideline units, where a broad understanding of environmental sustainability is introduced within an industry context.

In certain professions, energy efficiency skills and knowledge are now a core part of initial training. For example, architecture degrees include core units in sustainable design and processes to meet the degree accreditation requirements of their professional associations and licensing bodies. This is not evident in VET, where energy efficiency relevant trades such as plumbing and electrotechnology include units addressing efficiency and resource management only as elective units.

To varying degrees, energy efficiency skills and knowledge have also been incorporated into CPD units, with industry associations responding to changing regulatory requirements and to consumer demand for energy efficient design, products and processes. Availability of energy efficiency training, and gaps in coverage for the key actors in the residential housing supply chain, are discussed in Chapter 5.

2.6 Current policy context in NSW and Victoria

This section discusses the current policies being considered and/or being implemented by the NSW and Victorian Governments that are expected to have the effect of increasing the demand for energy efficiency skills and capabilities in the residential housing sector supply chain.

2.6.1 Introduction of voluntary residential energy rating and disclosure

COAG supports a national collaborative approach to residential energy rating and disclosure.18

For the past two years, the NSW Government has, under the Energy Efficiency Action Plan (EEAP), investigated the introduction of a voluntary rating system for residential buildings at the point of sale or lease. The implementation of such scheme is contemplated under the Draft Plan to Save NSW Energy and Money. Should it prove to be efficient and effective, it is envisaged that it will transition to a mandatory requirement in 2020.19

As part of the investigation, the OEH is developing the scoping and operating options for the rating system. Ratings are envisaged to be delivered by accredited and trained assessors, who will need to have technical skills in relation to building construction and energy efficiency, as well as soft skills and work health and safety awareness as they enter people's properties.

In parallel, the Victorian Government is rolling out the Residential Efficiency Scorecard (RES), Australia's first energy efficiency rating tool for existing homes. This scorecard assesses the performance of the key features of the homes (including heating and cooling systems, hot water, construction materials and renewable energy sources) and provides recommendations on how to improve the rating and energy features of the home. Assessments are delivered by trained and accredited assessors.20

The overall objective of these two schemes will be to drive demand for residential upgrades to improve energy efficiency.

2.6.2 Other government policies contributing to demand for energy efficiency skills

The NSW Energy Efficiency Scheme (ESS) continues to provide a financial incentive for broad-based uptake of energy efficiency in NSW.

In addition to the ESS, a range of actions are being considered in the residential sector, including measures to improve the energy performance of tenanted homes, increase the stringency of BASIX targets, and expand the Home Energy Action program aimed at low income households. Further, it is anticipated that the NSW Government will continue to be active in providing energy efficiency training to the business sector. Taken together as a suite, these are likely to increase the demand for energy efficiency and, by extension, drive up the demand for skills across the supply chain.

The Victorian Energy Efficiency Target (VEET) continues to provide a financial incentive for broad-based uptake of energy efficiency in Victoria. Since 2013, the Victorian Government’s policy has broadened to include demand-side policy for energy efficiency, and has positioned the delivery of these programs within Business Victoria and Sustainability Victoria. In addition, the Victorian Future Industries and the Boosting Business Productivity program managed by Sustainability Victoria provide support for both the uptake of energy efficiency and skills development among industry. These are described in more detail below.

The Victorian Future Industries policy focuses on six sectors of strategic importance to the Victorian economy in the medium to long term. One of the sectors recognised is New Energy Technologies and is supported by the New Energy Jobs Fund which provides $20 million that will support Victorian-based projects that create long-term jobs, increase the uptake of renewable energy generation, reduce greenhouse gas emissions and drive innovation in new energy technologies. Three funding rounds are planned; applications have recently closed for Round Two.

As part of Boosting Business Productivity, a program managed by Sustainability Victoria, Energy Efficiency Capability grants are available to support a number of industry associations, business networks and RTOs to develop energy efficiency knowledge and skills in small and medium sized enterprises (SMEs) and service providers. The first round of Energy Efficiency Capability grants program closed on 15 March 2017.

As an example of the outcomes expected from the funding, Melbourne Polytechnic will develop, trial and implement a new formal qualification for electricians in energy efficiency. The new Certificate IV in Energy Management and Control aims to upskill graduates so they can provide more energy efficient services to businesses. The qualification will be developed in partnership with Energy Skills Australia and piloted in January 2018.

At a national level, the National Australian Built Environment Rating System (NABERS) program is currently developing a new rating tool for apartment buildings on behalf of the Federal and State Governments. The tool will assess the energy performance of central services and is expected to drive sustainability upgrades, resulting in greenhouse gas reductions and bill savings. Potential upgrades to common areas include lighting, HVAC systems, pool pumps, hot water systems, sensors and building management systems.

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This chapter provides an overview of the actors in the residential housing sector supply chain (in section 3.1). It then discusses their roles and responsibilities of each of these actors, and provides an overview of typical entry paths into the respective trade or profession as well as the general conditions for training and upskilling (in section 3.2).

### 3.1 Actors in the residential housing sector supply chain

Figure 3.1 presents the key actors that have a role (or could have a role) in influencing energy efficiency decisions in the residential built environment supply chain—building design, construction, sales/lease, building occupation and renovation/retrofits. It also presents the extent of their likely involvement in influencing energy efficiency decisions at the various stages of a building’s lifecycle—involved in all or most projects, involved in only some projects, could potentially be involved but currently is not, or no role to play.

Further details on each of these actors is provided in the following section.

The motivations for actors in the housing supply chain to implement energy efficiency may be:

— **Financial.** Generally, industry actors will implement and promote energy efficiency where they have the financial incentive to do so. Depending on the industry actor, this could be in the form of:
  - a competitive advantage leading to more business opportunities and increased profit
  - (in the past) availability of ready demand stimulated by government rebates
  - the ability to command higher wages through having obtained a recognised skill or qualification valued by the market.

However, at present, the commercial motivations to implement energy efficiency in the residential housing industry are not widespread and energy efficiency remains largely a niche market.

— **Regulatory.** Government regulation is one of the most powerful influencers on industry standards and practices. Regulation may be intended to set a floor for standards and practices, with the expectation that parts of the market will strive to exceed minimum requirements. However, in practice, regulation frequently becomes the ceiling deemed to represent acceptable standards. In a cost-competitive environment, industry actors will typically seek to achieve the required level with minimal commitment and minimal possible cost.

— **Values.** A niche cohort in the residential housing supply chain is strongly motivated by environmental and sustainability values. These individuals are driven by personal rather than commercial motivations. The demand for their services comes largely from the niche group of similarly motivated customers, who can be categorised as the early adopters forming the initial 5-10 per cent of the market.
In addition to the actors listed in Figure 2.1, two additional groups were noted during stakeholder consultation as key influencers on a dwelling’s energy efficiency.

Developers can have an impact on the potential for energy efficiency through decisions made about lot division and orientation, reducing baseline requirement for heating and cooling, resulting in cost savings for residents. However, lot division and orientation is largely driven by commercial motivations. In addition, developers usually arrange for licensed contractors to do the building work (unless they are licensed builders in their own right). Therefore, developers’ skills and capabilities are not discussed further in this report, except to the extent that they may influence other actors in the supply chain.

It was also noted during stakeholder consultations that the home owner is a key influencer. Given the focus of this project is on the skills and capabilities of the residential housing market supply chain, home owners are not included in Figure 2.1 as a specific actor; however, discussion of the home owners’ role in driving uptake of energy efficiency is included throughout the report where relevant.

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3.2 Roles and responsibilities of the supply chain

This section provides an overview of the role that each industry actor plays in the residential housing market supply chain and a qualitative assessment of the degree of influence the key actor plays over achieving energy efficiency outcomes. Broadly speaking, actions that directly affect the energy efficiency performance of a dwelling, such as drawing up designs and plans or installing equipment, are classified as ‘primary influence’. In contrast, indirect actions such as providing information and advice are classified as ‘supporting influence’.

In addition, this section outlines typical entry paths to the trade or profession, including an overview of the extent to which energy efficiency training is included in these entry paths, and provides an overview of existing opportunities and/or mandatory requirements for upskilling. Further details on the extent to which energy efficiency training is included in the training and education pathways for each of these actors is provided in chapter 5.

3.2.1 Architects and building designers

Box 3.1 summarises the influence of architects and building designers on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

Box 3.1 Architects and building designers’ influence on energy performance

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>Design and drawing up of plans and project documentation, Specification of building products and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Selection of building products and equipment (if undertaking contract management)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Building occupation</td>
<td>Communicating the value of energy efficiency to inhabitants, Providing advice on appropriate operation and maintenance of products and equipment</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Retrofits and renovations (larger projects)</td>
<td>Design and drawing up of plans and project documentation, Specification of building products and equipment, Selection of building products and equipment (if undertaking contract management)</td>
<td>Primary influence, Supporting influence</td>
</tr>
</tbody>
</table>

Incorporation of energy efficiency in basic training

For architects, the National Standard of Competency for Architects establishes the standard for architectural education and assessment of professional competency prior to registration as an Architect in Australia. Sustainable environment is one of the five knowledge domains, covering architects’ responsibility to minimise the impact on natural resources and design for longevity.

For building designers, the basic qualifications have included principles of energy efficient and sustainable design since 2009. Registration is mandatory in Victoria, but not in NSW.

Source: ACIL Allen, Architects Accreditation Council of Australia, Stakeholder Consultations

The core role of an architect is to design new buildings or alterations to existing buildings. Key tasks include consulting clients on the type, style and size of planned construction; drawing up plans, designs and project documentation; ensuring the designs meet minimum compliance requirements; and providing information on designs, materials and estimated building times.25

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Building designers undertake tasks similar to those of an architect. Key responsibilities include drawing up designs and plans based on client requirements; ensuring the designs meet minimum compliance requirements; providing assistance with planning application and contract administration, including site visits to monitor progress; and ensuring that works are delivered to plan. The Building Designers Association of Australia (BDAA) estimates that 75-80 per cent of residential work is designed by building designers. In addition to designing the building, architects and building designers can manage the entire design and construction process on behalf of clients. Key tasks in contract management include writing the specification for works required, obtaining quotes from builders and other service providers, monitoring the budget, and inspecting throughout the construction period. However, this role is distinct from the role of a builder, who has overall responsibility for the quality of the construction.

Pathways to the profession and continuing professional development—architects

A person offering services as an architect must be registered with the architects' board in the relevant state or territory. Applicants must have a recognised academic qualification in architecture, recent practical experience of 3,300 hours (approximately two years) and have passed an examination by the Architects Accreditation Council of Australia, which includes a written and oral exam.

The National Standard of Competency for Architects establishes the standard for architectural education and assessment of professional competency prior to registration as an Architect in Australia. Sustainable environment is one of the five knowledge domains, covering architects' responsibility to minimise the impact on natural resources and design for longevity.

In addition to formal entry requirements to the profession, architects have a well-established CPD regime.

In NSW, architects are required to undertake a minimum of 20 hours CPD per year to maintain their registration, of which at least 10 hours should be formal training. Formal CPD includes accredited courses relating to any aspect of the practice of architecture, as well as short courses offered by professional associations where these have stated learning outcomes and are formally assessed through a test, self-check questions or a written paper.

In Victoria, there is no formal requirement for architects to undertake CPD; however, it is the preferred mechanism to prove competence as an architect in matters brought to the Victorian Building Appeals Board.

The Australian Institute of Architects (AIA) is the key industry body providing formal and informal CPD to architects in Australia. Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.

Pathways to the profession and continuing professional development—building designers

Building designers in NSW are not required to be registered; however, in an effort to raise standards in the profession, the Building Designers Association (BDA) has introduced independent voluntary accreditation which it encourages practitioners to undertake. The accreditation can be for low rise, low rise (residential only), medium rise and unrestricted (all building types). Different entry pathways apply, depending on the applicant’s qualifications and previous experience.

In Victoria, building designers are required to be registered with the Victoria Building Authority (VBA). Registration in the class Building Design (Architectural) requires a relevant formal qualification (satisfied by the Victorian qualification, the Advanced Diploma of Building Design), at least one year of

26 Building Designers Association Victoria 2017, Services provided by building designers.
supervised practical experience and a portfolio of at least three building designs. The basic qualifications have included principles of energy efficient and sustainable design since 2009.

The Building Designers Association of Victoria (BDAV) runs a CPD program for its members, proactively tailoring its offering to drivers such as cases brought in front of the VBA. Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.

3.2.2 Builders

Box 3.2 summarises the influence of builders on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

**BOX 3.2 BUILDERS’ INFLUENCE ON ENERGY PERFORMANCE**

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>Consulting with architects and designers to ensure that design intentions are met</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Consulting with architects and designers to ensure that design intentions are met</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Selection of building products and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td></td>
<td>Overseeing the construction process, including ensuring that relevant legislations and regulations are followed</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Retrofits and renovations (all project sizes)</td>
<td>Consulting with architects and designers to ensure that design intentions are met (complex renovations)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Specification and selection of building products and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td></td>
<td>Overseeing the construction process, including ensuring that relevant legislations and regulations are followed</td>
<td>Primary influence</td>
</tr>
</tbody>
</table>

**Incorporation of energy efficiency in basic training**

Builders typically have a relevant trade qualification, substantial work experience and a Certificate IV in Building and Construction. Energy efficiency is not included in the requirements for becoming a builder; however, individuals may have a grounding in energy efficiency through their base trade qualification.

**SOURCE: ACIL ALLEN, STAKEHOLDER CONSULTATIONS**

**Builders** work play a key role for all dwelling types (designed homes, volume homes off-plans and multi-unit apartment buildings) in both the construction and renovation stages. They may work for construction and development companies or consultancies, or work as self-employed building contractors.

Builders act as the project manager of the building works, coordinating the various tasks, suppliers and subcontractors. They are responsible for the overall time, cost and quality of the construction project. Key tasks include:

— planning construction methods and procedures
— coordinating the supply of labour and materials
— supervising construction sites, and directing site managers and subcontractors to ensure standards of building performance, quality, cost schedules and safety are maintained
— studying building contract documents, and negotiating with building owners and subcontractors;

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32 The term builder here refers to a specific job role, rather than a business model as a residential, commercial apartment or volume home builder.

— controlling payment to subcontractors by valuation of completed works
— ensuring that building regulations, standards and bylaws are enforced during construction
— consulting with architects, engineers and other technical works to ensure that design intentions are met.34

Pathways to the profession and continuing professional development
Builders must have a licence or registration. Requirements differ between the states and territories, but typically require a technical qualification combined with proven experience, skills and knowledge.35 In NSW, the licencing authority is NSW Fair Trading, while in Victoria, registrations are managed by the VBA. Typical entry pathways include a Certificate IV in Building and Construction coupled with a relevant trade qualification, or a four-year university degree in a relevant discipline.

CPD is provided by a number of industry bodies, including Australian Institute of Building (AIB), Housing Industry Association (HIA) and Master Builders Australia.

Energy efficiency is not included in the requirements for becoming a builder; however, individuals may have a grounding in energy efficiency through their base trade qualification.

Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.

3.2.3 Building certifiers and surveyors, property inspectors
Box 3.3 summarises the influence of building certifiers and surveyors on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>Assess that plans comply with legislations and regulations</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Carry out inspections during construction works</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Retrofits and renovations</td>
<td>Assess that plans comply with legislations and regulations</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Carry out inspections during construction works</td>
<td>Supporting influence</td>
</tr>
</tbody>
</table>

Certifiers and surveyors provide sign-off for building plans once these comply with the relevant legislations and regulations. In theory, their role could extend to ensuring compliance during construction or renovation. However, in practice compliance inspections do not usually extend to energy efficiency performance as built, resulting in actual building performance bel owed the standard as designed.

Incorporation of energy efficiency in basic training
Energy efficiency is not part of the basic training or registration requirements for becoming a building certifier or surveyor.

Box 3.4 summarises the influence of property inspectors on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

34 Ibid
Property inspectors

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale or lease</td>
<td>Provide advice on the building’s condition prior to sale</td>
<td>Supporting influence</td>
</tr>
</tbody>
</table>

Currently, property inspections focus on structural faults and hazards and energy efficiency performance is not reported on. However, should residential ratings lead prospective buyers to place higher priority on energy efficiency, it is possible that the scope of inspections will expand to also include energy efficiency.

Incorporation of energy efficiency in basic training

There are no specific requirements for becoming a property inspector. Energy efficiency will be covered to varying degrees, depending on the individual’s professional background.

SOURCE: ACIL ALLEN, STAKEHOLDER CONSULTATIONS

Building certifiers (NSW) or surveyors (Victoria) are responsible for confirming that the development meets the relevant legislative requirements. Certifiers are usually commissioned by the builder, and their role comprises three broad functions:

— assessing building plans to ensure they comply with relevant legislations and regulations
— carrying out inspections set out in legislation or regulations during construction works
— issuing an occupancy permit once building works have been completed.

Property inspectors prepare reports on the building’s condition and are usually commissioned by a prospective buyer before the exchange of contracts. The report covers any significant building defects or problems, such as rising damp, movement in the walls (cracking), safety hazards or a faulty roof. In addition, the report will provide information on whether the faults can be repaired and the likely cost.

Pathways to the profession and continuing professional development

In NSW, building certifiers must be accredited by the Building Professional’s Board. In Victoria, surveyors must be registered with the VBA. Prospective candidates must have relevant qualifications, with the specific requirements varying between the two states and depending on the category of licence or registration. However, broadly speaking, certifiers and surveyors must have a recognised qualification such as a degree, graduate diploma, advanced diploma or diploma, in combination with relevant work experience.

In NSW, CPD is a requirement for maintaining accreditation. It is not mandatory in Victoria, but it is strongly encouraged. The Australian Institute of Building Surveyors and the Association of Accredited Certifiers are among industry bodies providing CPD courses to the profession.

Energy efficiency is not part of the basic training or registration requirements for becoming a building certifier or surveyor. Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.
There are no formal entry requirements for becoming a property inspector; however, the person undertaking the inspection should be a suitably qualified person, such as a licensed builder, a surveyor or an architect. Energy efficiency will be covered to varying degrees, depending on the individual’s professional background.

3.2.4 Energy advisors

Box 3.5 summarises the influence of energy advisors on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

<table>
<thead>
<tr>
<th>Energy advisors</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building occupation</td>
<td>Assess building energy performance, advising on low cost options to reduce consumption</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Retrofits and</td>
<td>Assess and rate building energy performance, advising on upgrades to reduce consumption</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>renovations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Incorporation of energy efficiency in basic training

Energy advisors currently operating in the market are often also energy/thermal assessors and are likely to come from similarly diverse backgrounds.

The home energy advisor calculates household energy usage and identifies options for reducing consumption, ranging from no and low cost alternatives that can be implemented immediately to more substantive retrofit measures.

The role as a specific profession, alternatively known as an energy/sustainability assessor or auditor, may currently be regarded as largely dormant in the private sector. For example, BDAV reported that there is currently only one accredited home sustainability assessor in Victoria, from around 90 at the beginning of the decade.

In the not-for-profit sector, a range of service providers offer energy efficiency advice to low income and vulnerable households. In the past, initiatives such as the NSW Home Power Savings Program (HPSP) have supported home energy assessments among low income households.

Pathways to the profession and continuing professional development

The Certificate IV in Home Sustainability Assessment was developed specifically to allow entry into the profession; however, currently no providers offer this training in NSW or Victoria.

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42 Ibid.
43 This cohort was not included in the stakeholder consultation for this project, and therefore further comment on the likely professional backgrounds cannot be made.
45 Home sustainability assessors conduct assessments for homeowners who are seeking advice on how to improve the sustainability and comfort needs of households in Victoria. This may include advice on how to save costs associated with energy and water bills, how to live more sustainably by improving the comfort of the home, and reduce waste and options for a more sustainable garden environment. Source: BDAV, [https://www.bdav.org.au/home-sustainability-assessors](https://www.bdav.org.au/home-sustainability-assessors), accessed 24.07.2017.
46 For example, Kildonan Uniting Care supports household energy efficiency through energy visits, participated in the Australian Government’s Low Income Energy Efficiency Program (LIEEP) and is involved in the trial of the Victorian Residential Efficiency Scorecard. The Brotherhood of St Laurence also participated in LIEEP and is involved in the Scorecard trial.
The handful of energy advisors currently operating in the market are often also energy/thermal assessors and are likely to come from similarly diverse backgrounds. Not-for-profit organisations often provide in-house training to staff undertaking home energy visits.

### 3.2.5 Energy raters

Box 3.6 summarises the influence of energy raters on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

**BOX 3.6 ENERGY RATERS’ INFLUENCE ON ENERGY PERFORMANCE**

<table>
<thead>
<tr>
<th>Energy raters</th>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sale or lease</td>
<td>Provide a rating of a building’s energy performance</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Building occupation</td>
<td>Provide a rating of a building’s energy performance, potentially advising on how to reduce consumption</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Retrofits and renovations</td>
<td>Provide a rating of a building’s energy performance, potentially advising on how to reduce consumption</td>
<td>Supporting influence</td>
</tr>
</tbody>
</table>

**Incorporation of energy efficiency in basic training**

The specific skills required to deliver energy ratings will depend on policy design choices in relation to the rating tool, and this design choice is a key determinant on which professionals backgrounds are appropriate for filling this role.

**SOURCE: ACIL ALLEN, STAKEHOLDER CONSULTATIONS**

The energy rater is a new role in both NSW and Victoria. In contrast to thermal assessments (discussed in the next section), which focus on energy consumption as designed, energy raters prepare audits or ratings on existing dwellings focusing on performance as built.\(^{48}\) Therefore, while the same individual may undertake both thermal assessments and energy ratings, the two roles are distinct. In addition, depending on their skills and qualifications, energy raters may also provide energy efficiency advice, but whether they are required to do so will depending on policy and program design.

The tasks associated with a home energy rating or audit depend on policy and program design choices, but could be:

- using tools such as blower doors and infrared cameras to assess the thermal performance of existing dwellings
- knowledge of data entry and gathering to ensure consistency of ratings
- using rating tools to assess the energy performance of existing dwellings
- assessing household energy use, including reading and analysing energy bills
- advising residents on options to improve the building’s energy efficiency
- estimating the cost of energy efficiency improvements measures.\(^{49}\)

**Pathways to the profession and continuing professional development**

The specific skills required to deliver energy ratings will depend on policy design choices in relation to the rating tool, and this design choice is a key determinant on which professionals backgrounds are appropriate for filling this role. Potential actors in the residential housing supply chain that may deliver ratings are discussed in section 4.1.7.

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\(^{48}\) Sometimes a thermal assessment is referred to as an energy rating by industry; however, to avoid confusion, the convention defined above will be used throughout this report.

\(^{49}\) Construction & Property Services Industry Skills Council 2012, CPP41110 Certificate IV in Home Sustainability Assessment and stakeholder consultations.
3.2.6 Energy/thermal assessors

Box 3.7 summarises the influence of energy/thermal assessors on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

BOX 3.7 ENERGY ASSESSORS’ INFLUENCE ON ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>Energy/thermal assessors</th>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Building design</td>
<td>Assess and ensure that plans comply with legislations and regulations</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Retrofits and renovations</td>
<td>Assess and ensure that plans comply with legislations and regulations</td>
<td>Supporting influence</td>
</tr>
</tbody>
</table>

**Incorporation of energy efficiency in basic training**

Energy/thermal assessors come from various backgrounds and energy efficiency will be covered to varying degrees, depending on the individuals’ qualifications and training.

**Energy or thermal assessors** evaluate the compliance of a new home or major renovation with the minimum building energy efficiency requirements set out in the National Construction Code (NCC) and relevant state or territory regulations. In NSW, the Building Sustainability Index (BASIX) replaces the national energy efficiency standards, and includes additional requirements for sustainable practice such as water usage.50

NSW requires that the assessment is conducted by a person accredited by either the Australian Building Sustainability Association (ABSA) or Building Designers Association of Victoria (BDAV). 51 Around 150 assessors are accredited by the two organisations in NSW. While not a requirement in Victoria, the state nonetheless has around 300 accredited assessors.52

NSW and Victoria together account for approximately 80 per cent of all accredited assessors, with the remaining 20 per cent primarily in Queensland, South Australia, Tasmania and Western Australia.53 Throughout Australia, an estimated 70 per cent of new houses and apartments are rated using one of three software tools accredited by the Nationwide House Energy Rating Scheme (NatHERS).54 However, it is unclear what proportion of assessments are performed by accredited individuals.55

The assessment is based on the design and plans, rather than the performance of the dwelling as constructed. The typical tasks associated with a NatHERS or BASIX assessment are:

— finding the information needed to prepare a rating from the plans and designs
— entering data and information into the rating tool
— optimising the design and materials, in consultation with the client, when the dwelling does not initially achieve minimum regulatory compliance
— communicating to the client (designer or builder who has commissioned the assessment) the features of the dwelling that provide it with regulatory compliance, including required changes (if any) to building documentations and plans

50 The differences between NSW and the national requirements are noted, but not regarded to be material for the purposes of this report.
52 Stakeholder consultations.
53 Ibid.
55 Stakeholder consultations.
verifying and certifying building documentations and plans.\textsuperscript{56}

Pathways to the profession and continuing professional development

As of 1 January 2016, all accredited assessors in Australia are required to hold a Certificate IV in NatHERS Assessment. Two organisations are currently authorised to accredit NatHERS assessors—ABSA and BDAV.\textsuperscript{57} The two organisations also provide CPD for their members, which is a mandatory requirement for ABSA accredited assessors.

A random sample of around 20 per cent of NatHERS assessors currently accredited by ABSA in NSW and Victoria shows that most of the assessors have a background in architectural drafting/building design, or building and construction. A smaller number of assessors appear to specialise in energy consulting exclusively. Assessors typically listed degree or diploma level qualifications in architecture and engineering, with a minority listing their NatHERS accreditation as their only qualification.\textsuperscript{58}

BDAV indicated that around 20 per cent of its accredited NatHERS assessors have a background as a building designer or architect, and a further 10 per cent are draftspersons. Around 70 per cent of the accredited assessors come from other backgrounds, but based on available data it was not possible to provide a more detailed breakdown.

Despite the diversity in backgrounds, it was noted during stakeholder consultations that thermal performance assessors with a successful and sustainable business often have a background and/or core business in building design.

3.2.7 HVAC professionals and trades (designers, installers and service technicians)

Box 3.8 summarises the influence of HVAC professionals and trades on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

BOX 3.8 HVAC PROFESSIONALS AND TRADES’ INFLUENCE ON ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>Design and advice on HVAC systems and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Install HVAC systems and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Building operations</td>
<td>Maintain and service HVAC systems and equipment</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Advice on and install HVAC equipment in case of breakdown</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Retrofits and</td>
<td>Advice on and install HVAC systems and equipment</td>
<td>Primary influence</td>
</tr>
<tr>
<td>renovations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Incorporation of energy efficiency in basic training

HVAC designers come from various backgrounds, and energy efficiency will be covered to varying degrees, depending on the individuals’ qualifications and training. HVAC installers and service technicians typically have a VET qualification, which currently do not explicitly cover energy efficiency beyond basic environmentally sustainable practice.

SOURCE: ACIL ALLEN AND STAKEHOLDER CONSULTATIONS

HVAC professionals specialise in the design of HVAC systems, as well as the selection, installation and maintenance of HVAC equipment. In addition, other trades such as plumbers and electricians


\textsuperscript{57} ACIL Allen 2016.

\textsuperscript{58} Drawn from the Australian Building Sustainability Association (ABSA) list of accredited assessors [https://www.absa.net.au/find-a-hers-assessor], accessed 22.06.2017.
may be involved in the installation of HVAC equipment. The role of a HVAC professional typically includes:

- determining the required equipment capacity using an appropriate calculation method
- providing a detailed quotation including system specifications
- ensuring installation in accordance with all relevant legislation and Australian Standards
- commissioning the equipment.60

In addition, in accordance with best practice, HVAC technicians would remind customers when routine service of the equipment is recommended.61 However, this is rarely the case in practice.62

The design and selection of an appropriate system is more complex for large multi-unit apartment buildings with central systems than for small apartment blocks or single dwellings. As a result, HVAC designers work on multi-unit developments, while installers and service technicians works across all building types.

Pathways to the profession and continuing professional development

There is currently no dedicated university-level education for HVAC designers, and potential avenues into the industry include a degree or certificate in engineering or physical science, coupled with relevant work experience.63 While HVAC is often an elective topic covered in engineering programs, individuals working in the industry predominantly gain the required skills on the job rather than through formal education.64

A licence or registration is required in both NSW and Victoria to undertake installation or maintenance of HVAC equipment. A number of VET certificates and diplomas are on offer for installers and maintenance technicians.65

The Australian Institute of Refrigeration Air Conditioning and Heating (AIRAH) provides CPD for the industry, focussing mainly on the commercial sector.66 Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.

3.2.8 Product suppliers and manufacturers

Box 3.9 summarises the influence of product suppliers and manufacturers on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.
Box 3.9 PRODUCT SUPPLIERS AND MANUFACTURERS’ INFLUENCE ON ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>Advice on building products and technologies, including latest developments</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Advice on building products and technologies, including latest developments</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Supply building products and technologies</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Building operations</td>
<td>Advice on maintenance of building products and technologies</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Retrofits and renovations</td>
<td>Advice on energy products and technologies, including latest developments</td>
<td>Primary influence</td>
</tr>
<tr>
<td></td>
<td>Supply building products and technologies</td>
<td>Primary influence</td>
</tr>
</tbody>
</table>

Incorporation of energy efficiency in basic training

Individuals working for product suppliers and manufacturers come from various backgrounds, and energy efficiency will be covered to varying degrees, depending on the individuals’ qualifications and training.

Source: ACIL Allen, Stakeholder Consultations

Product suppliers and manufacturers are distinct from the other key actors in Figure 2.1 in that they represent a company, rather than an occupation, profession or a trade. They may be vertically integrated to differing degrees. Some companies may encompass the entire product lifecycle from design and manufacturing to sales/distribution and installation. Other companies may focus on sales and distribution of products sourced from manufacturers.

Product suppliers play a key role in nearly all stages of the housing market supply chain. This role is two-fold, including informing their customers (professionals and trades in the residential housing market supply chain) on the properties, use and appropriate installation of their products, and supplying the products as requested.

3.2.9 Tradespeople (electricians, glaziers, insulation installers and plumbers)

Box 3.10 summarises the influence of tradespeople (electricians, glaziers, insulation installers and plumbers) on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.
## Tradespeople’s Influence on Energy Performance

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building design</td>
<td>System design (electricians, plumbers)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Construction</td>
<td>Advice on selection of fixtures, equipment and systems (electricians, glaziers, plumbers)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Install fixtures, equipment and systems in accordance with plans (all)</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Building operations</td>
<td>Select and purchase fixed appliances and equipment on behalf of the home owners (electricians, plumbers)</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Retrofits and renovations</td>
<td>Select and purchase fixed appliances and equipment on behalf of the home owners (electricians, glaziers, plumbers)</td>
<td>Primary influence</td>
</tr>
<tr>
<td></td>
<td>Install fixtures, equipment and systems in accordance with plans (electricians, glaziers, plumbers)</td>
<td>Primary influence</td>
</tr>
</tbody>
</table>

### Incorporation of energy efficiency in basic training

Energy efficiency is included in basic training for plumbers, but not covered in basic qualifications for the other trades.

### Pathways to the profession and continuing professional development

In NSW, electricians, glaziers and plumbers all require a licence, while in Victoria electricians and plumbers are licenced trades. A relevant Certificate III combined with related work experience is a typical pathway to the trade.

Insulation installers do not currently require certification or registration in Australia. The Australian and New Zealand Standard Classification of Occupations (ANZSCO) states that insulation installers should hold a relevant Certificate II or III, or have at least one year of related experience. However, in practice, people installing insulation rarely hold a relevant qualification, with a reported 200

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67 Swinburne University of Technology 2005, Audit of Trades and Professional Training in Energy Efficiency.
69 Stakeholder consultations.
insulation installers (less than 10 per cent of the people undertaking installation) holding a relevant qualification.\footnote{Stakeholder consultations.}

Where a licence is required to be held, CPD is not mandatory to maintain that licence. Nonetheless, a number of industry bodies provide continuing training, including:

- the Australian Window Association (AWA)
- the Electrical Trades Union (ETU)
- the National Electrical and Communications Association (NECA)
- the Insulation Council of Australia and New Zealand (ICANZ)
- Master Plumbers.

Energy efficiency is included in basic training for plumbers, but not in covered basic qualifications for the other trades. Details of energy efficiency, energy management and sustainability-related training CPD are outlined in section 5.1.

### 3.2.10 Real estate professionals (real estate agents, property managers and strata managers)

Box 3.11 summarises the influence of real estate professionals on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.

#### BOX 3.11 REAL ESTATE PROFESSIONALS INFLUENCE ON ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lease or sale</td>
<td>Marketing the property to potential buyers or renters (real estate agents)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Building operations</td>
<td>Arrange for tradespeople to undertake repairs and replace broken-down equipment (property managers)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td></td>
<td>Arrange for repairs and general maintenance of common areas (strata managers)</td>
<td>Supporting influence</td>
</tr>
<tr>
<td>Retrofits and renovations</td>
<td>Forward-planning of capital works (strata managers)</td>
<td>Supporting influence</td>
</tr>
</tbody>
</table>

**Incorporation of energy efficiency in basic training**

Energy efficiency is not included in the basic training for real estate professionals.

**SOURCE:** ACIL ALLEN, STAKEHOLDER CONSULTATIONS

A number of professionals have responsibilities for the sale, lease and ongoing management of residential properties.\footnote{An additional role is filled by building managers. However, these play more of a caretaker than advisory role, and are unlikely to significantly influence energy efficiency outcomes.}

**Real estate agents** act on behalf of an owner to sell, lease or manage the property. The responsibilities of an agent include:

- marketing the property to potential buyers or renters
- assisting with negotiations to reach an agreed sale price or rent
- drawing up a tenancy agreement for rented properties
- acting on behalf of the landlord in the day-to-day management of the property, including collecting rent and arranging for repairs and maintenance.\footnote{Real Estate Institute of Australia (REI) 2017, A Career in Real Estate [https://reia.asn.au/training/a-career-in-real-estate/], accessed 23.07.2017.}
Property managers fulfil a similar role as real estate agents in relation to rental properties, including selecting tenants, collecting rent, arranging repairs, and negotiating leases and rent reviews. During building operations, property managers arrange for ongoing repairs and equipment replacement in case of breakdown, typically relying on the tradesperson to select and purchase the appliance or equipment.

Strata managers (also known as body corporate or owners’ corporation managers) control and administer the common area in a block of units or flats on behalf of the owners’ corporation. The functions of a strata manager include:

— managing, attending and preparing documentation for owners’ corporation meetings
— arranging for repairs and general maintenance of common areas
— collecting and managing strata levies and arranging required insurances
— advising the owners’ corporation of any changes to relevant legislation and regulations.

In addition, in large and medium-sized multi-unit developments, developers may appoint strata managers before construction commences. If strata managers have the appropriate skills, they may influence energy efficiency at the design stage through advising on selection of materials, plant and equipment, and lighting. However, this role is not currently a core function for strata managers.

Pathways to the profession and continuing professional development

Real estate agents, property managers and strata managers require a license or registration in both NSW and Victoria. Required qualifications are set out in the relevant regulations, but typically a Certificate IV in Property Services or similar is the minimum entry requirement for new entrants. Additionally, real estate agents, property managers and strata managers in NSW are required to undertake CPD to maintain their registration. In Victoria, the Real Estate Institute of Victoria requires its licensed and representative members to undertake CPD although this is not a legislative requirement.

Training for entry to the industry is provided by RTOs, the relevant state chapters of the Real Estate Institute of Australia (REI) and Strata Community Australia. They are also engaged to provide CPD to their members. Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.

3.2.11 Renewable energy installers

Box 3.12 summarises the influence of renewable energy installers on energy performance and provides an overview of the extent to which energy efficiency training is included in their training and education pathways.
BOX 3.12 RENEWABLE ENERGY INSTALLERS’ INFLUENCE ON ENERGY PERFORMANCE

<table>
<thead>
<tr>
<th>Life cycle stage</th>
<th>Influence on energy performance</th>
<th>Degree of influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>Design and install renewable energy systems</td>
<td>Primary influence</td>
</tr>
<tr>
<td>Retrofits and renovations</td>
<td>Design and install renewable energy systems</td>
<td>Primary influence</td>
</tr>
</tbody>
</table>

Incorporation of energy efficiency in basic training
Renewable energy installers must be licensed electricians. Energy efficiency and energy management are not covered in the basic trade qualifications.

SOURCE: ACIL ALLEN, STAKEHOLDER CONSULTATIONS

Renewable energy professionals design and install renewable energy systems, such as solar photovoltaic panels and battery storage, which is an emerging technology. Design and installation, particularly for small-scale residential projects, may be undertaken by one individual who:

— tailors the renewable energy system based on the customer’s budget, how much electricity is required to be offset, and the physical properties of the building

— follows appropriate techniques and safety standards when installing and maintaining the renewable energy system.80

Pathways to the profession and continuing professional development
In both NSW and Victoria, a solar photovoltaic (PV) installer must be a licenced electrician.81 The Clean Energy Council (CEC) provides accreditation for designers, installers and retailers. Only projects installed by a CEC-accredited installer are eligible for small-scale technology certificates under the Australian Government’s Renewable Energy Target.82 Effectively, this implies that all PV systems are installed by a CEC-accredited installer.

The CEC, the Australian Solar Council (ASC) and the Solar Energy Industries Association (SEIA) provide CPD for the industry. Details of energy efficiency, energy management and sustainability-related CPD are outlined in section 5.1.


This chapter outlines the skills needed to support energy efficiency in the residential housing industry supply chain in section 4.1. assesses the extent to which the required skills exist (in section 4.2) and outlines the motivations and challenges in accessing new skills and knowledge (in section 4.3).

Key findings of this chapter are:

1. Overall, stakeholders noted that energy efficiency skills are in many cases not substantially different from those required for the design and construction of good, high quality dwellings. The selection and appropriate installation of energy efficient building products and appliances was noted as the main area where new skills and knowledge are specifically required.

2. Product manufacturers and suppliers were generally seen to have sufficient skills and knowledge to meet the demand for energy efficient products when this arises. Suppliers and manufacturers play a role in informing key actors in the residential housing supply chain of latest available technologies; however, key actors with a role in equipment selection need skills relating to calling for and interpreting product specifications.

3. Energy management and skills required for new technologies such as smart appliances were noted by few stakeholders, but were not highlighted during most consultations. Of existing trades and professions, electricians are most likely to require new skills and knowledge. However, it is also likely that new occupations and business models will emerge and become mainstreamed as residential energy management technologies mature and energy data becomes increasingly available.

4. The motivations and day-to-day conditions for most actors in the residential housing supply chain to upskill in energy efficiency are not strong. Lack of demand from consumers reduces the motivation to invest time and money in upskilling—this was noted as a particular constraint in the current climate of strong building activity when most builders and tradespeople are fully employed.

5. Government policies and regulations were noted as an important incentive across the supply chain; however, a lack of long-term commitment from government to its policies and regulations was noted as a significant obstacle to the willingness to upskill.

Table 4.1 provides an overview of the findings in this chapter, summarising:

— the degree of influence each actor in the supply chain has on a dwelling’s energy efficiency performance
— the existing skill set relating to energy efficiency and energy management
— key knowledge and skills gaps preventing energy efficiency and energy management outcomes from being realised
— the general culture and specific motivations for upskilling in energy efficiency and energy management.
<table>
<thead>
<tr>
<th>Heading</th>
<th>Degree of influence</th>
<th>Existing skills set</th>
<th>Key knowledge and skills gaps</th>
<th>Motivations and culture for upskilling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architects and building designers</td>
<td>High—key influencer of energy efficient design</td>
<td>Understanding of building design principles: designing high efficiency buildings is not seen as requiring a substantially different skillset from that required to meet minimum requirements under the NCC</td>
<td>Communicating and translating energy efficiency to language consumers can relate to Clear specification of desired energy efficiency outcomes in building drawings and plans Up-to-date knowledge of energy efficiency products</td>
<td>Strong culture of upskilling and CPD A limited ability to influence outcomes during construction reduces motivation to upskill in energy efficiency</td>
</tr>
<tr>
<td>Builders</td>
<td>High—key influencer of energy efficient construction</td>
<td>Understanding of good building practices: building high efficiency buildings is not seen as requiring a substantially different skillset from that required to meet minimum requirements under the NCC</td>
<td>An understanding of the impact the substitution of products and materials can have on energy efficiency and thermal performance A greater understanding of the building system and how products, design choices and the tasks of each trade work together to achieve energy efficient outcomes Communicating and translating energy efficiency to language consumers can relate to</td>
<td>Relatively weak culture of upskilling and CPD During the current period of strong construction activity, very little motivation to take time off work to gain new skills Unlikely to engage in training unless contributes to more business opportunities or revenue, or required to do so</td>
</tr>
<tr>
<td>Building certifiers and surveyors</td>
<td>Potentially high, but not currently doing so—key influencer of compliance with building codes</td>
<td>Currently not trained in energy efficiency</td>
<td>Skills in energy efficiency and building thermal performance to verify that the dwelling is constructed to the standard as designed</td>
<td>CPD is mandatory (NSW) or strongly encouraged (Victoria) No motivation to upskill in energy efficiency as it is not currently part of core role</td>
</tr>
<tr>
<td>Energy or thermal assessors</td>
<td>Medium—verify that plans meet minimum standards</td>
<td>Knowledge of how to interpret plans and drawings Skills on advising how building elements affect thermal performance</td>
<td>As buildings grow more complex, a need for an increased understanding of the building system and greater advisory capacity may emerge</td>
<td>Often sole traders who may be time poor, reducing motivation and opportunity to upskill Requirement for accreditation where this exists is a strong driver for upskilling</td>
</tr>
<tr>
<td>Energy advisors and raters</td>
<td>Medium—will in the future play a role in communicating the performance of a dwelling through energy ratings</td>
<td>Unknown, dependent on previous professional background</td>
<td>Unknown, dependent on previous professional background</td>
<td>Largely a policy design question, likely to be determined by whether CPD is mandated by government as a condition for maintaining accreditation</td>
</tr>
<tr>
<td>Heading</td>
<td>Degree of influence</td>
<td>Existing skills set</td>
<td>Key knowledge and skills gaps</td>
<td>Motivations and culture for upskilling</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------</td>
<td>--------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Electricians</td>
<td>High—key influencer of correct installation of products and equipment, and of product choices during emergency replacements and renovations/retrofits</td>
<td>Compliance with existing minimum requirements</td>
<td>Skills in energy use and management&lt;br&gt;An understanding of new and emerging energy efficiency and energy management technologies&lt;br&gt;A greater understanding of the building system and how products, design choices and the tasks of each trade work together to achieve energy efficient outcomes&lt;br&gt;Communicating and translating energy efficiency to language consumers can relate to</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;During the current period of strong construction activity, very little motivation to take time off work to gain new skills&lt;br&gt;Unlikely to engage in training unless contributes to more business opportunities or revenue, or required to do so</td>
</tr>
<tr>
<td>HVAC professionals</td>
<td>High—key influencer of correct installation of products and equipment, and of product choices during emergency replacements and renovations/retrofits</td>
<td>Compliance with existing minimum requirements</td>
<td>Selecting appropriately-sized equipment&lt;br&gt;Proper installation of energy efficient equipment</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;During the current period of strong construction activity, very little motivation to take time off work to gain new skills&lt;br&gt;Unlikely to engage in training unless contributes to more business opportunities or revenue, or required to do so</td>
</tr>
<tr>
<td>Tradespeople (all)</td>
<td>High—key influencer of correct installation of products and equipment, and of product choices during emergency replacements and renovations/retrofits</td>
<td>Compliance with existing minimum requirements</td>
<td>Knowledge of energy efficiency options when recommending products&lt;br&gt;Skills in the proper installation of energy efficient equipment&lt;br&gt;A greater understanding of the building system and how products, design choices and the tasks of each trade work together to achieve energy efficient outcomes</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;During the current period of strong construction activity, very little motivation to take time off work to gain new skills&lt;br&gt;Unlikely to engage in training unless contributes to more business opportunities or revenue, or required to do so</td>
</tr>
<tr>
<td>Product suppliers and manufacturers</td>
<td>Medium—an influencer through advising on and supplying energy efficient building products</td>
<td>An understanding of the building system as well as building products to meet market demand</td>
<td>No skills gaps were seen to exist among product suppliers and manufacturers</td>
<td>Unknown, likely dependent on market demand for energy efficient building products</td>
</tr>
<tr>
<td>Property inspectors</td>
<td>Not currently active—could play a supporting role through property inspection reports</td>
<td>Unknown, dependent on previous professional background</td>
<td>Unknown, dependent on previous professional background</td>
<td>Unknown, dependent on previous professional background</td>
</tr>
<tr>
<td>Heading</td>
<td>Degree of influence</td>
<td>Existing skills set</td>
<td>Key knowledge and skills gaps</td>
<td>Motivations and culture for upskilling</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Property managers</td>
<td>Not currently active—could play a supporting role through property inspection reports</td>
<td>Currently not skilled in energy efficiency</td>
<td>Selecting energy efficient options in case of equipment breakdown and replacement</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;Little incentive currently to upskill in energy efficiency as it is unlikely to lead to increased profits</td>
</tr>
<tr>
<td>Real estate agents</td>
<td>Not currently active—could play a supporting role through sales and marketing</td>
<td>Currently not skilled in energy efficiency</td>
<td>Communicating a dwelling’s energy efficiency features and performance to prospective buyers or renters</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;Little incentive currently to upskill in energy efficiency as it is unlikely to lead to increased profits</td>
</tr>
<tr>
<td>Renewable energy installers</td>
<td>High—key influencer of design and installation of renewable energy systems</td>
<td>Compliance with existing regulatory and safety standards for designing and installing renewable energy</td>
<td>No clear gaps identified</td>
<td>CPD provided by industry associations; mandatory for retaining accreditation with the Clean Energy Council</td>
</tr>
<tr>
<td>Strata managers</td>
<td>Not currently active—could play a role in building operations and upgrades</td>
<td>Currently not skilled in energy efficiency</td>
<td>Basic knowledge of energy use and energy data&lt;br&gt;Basic knowledge of upgrade opportunities to encourage inclusion of energy efficiency in forward capital planning</td>
<td>Relatively weak culture of upskilling and CPD&lt;br&gt;Little incentive currently to upskill in energy efficiency as the skills are not demanded by strata corporate bodies</td>
</tr>
</tbody>
</table>

SOURCE: ACIL ALLEN, STAKEHOLDER CONSULTATION
4.1 Skills needed to support energy efficiency

This section outlines the skills needed for achieving energy efficiency outcomes, throughout the entire building and at discrete stages of the building lifecycle.

4.1.1 Cross-cutting skills needed throughout the building lifecycle

A number of cross-cutting skills are required across the building life-cycle and are common to most of the actors in the supply chain. These are:

— **An understanding of the building system and appreciation of the role each actor plays in achieving energy efficient outcomes.** This systems view includes an understanding for each professional and trade of the impact that role has for energy efficiency outcomes. For example, a builder or installer needs to have a broad understanding of the impact particular design or product specifications can have on the energy efficiency outcomes for a dwelling. In contrast, the architect or building designer should have the skills to prepare specifications in such a way as to clearly communicate the importance of a particular design or product choice to the builder or installer.

Importantly, as well as an understanding of their own role, the different trades need to have an appreciation of each’s others tasks and roles in delivering high quality and high efficiency dwellings. Stakeholders commonly remarked that there can be a tendency for one trade to undo the work of others when undertaking their own specific role; however, there is also a need for the builder to take a more active role in managing the quality of outcomes during the construction stage.

— **Needing to keep up with changing products and technologies.** The building system is becoming more complex, with new products, standards and technologies being introduced continuously. Upskilling the existing workforce is a challenge highlighted among many of the supply chain actors, particularly those without an established culture of CPD. Product suppliers were seen as a key source of information, but usually only provide training on their own product selection. A key skill requirement therefore is the ability to request and interpret product specifications, thus equipping designers, architects and tradespeople involved in product selection to keep abreast with changing product offerings. However, entirely new technologies such as smart appliances and smart metering, which increase the availability of energy data, and therefore the potential for energy management, are likely to require entirely new skills such as analytics and data capture.

— **An understanding of what energy efficiency means for consumers, beyond meeting minimum regulatory requirements.** Consumers place more emphasis on features such as comfort, well-being and good quality, rather than energy efficiency or technical performance. Once the building professionals and tradespeople understand energy efficiency from a customer’s perspective and have a common language expressing these concepts, they will be able to better communicate advantages of more efficient designs and products, and thus be more effective advocates for energy efficiency.

4.1.2 Building design

As discussed in section 3.2.1, **architects and building designers** play the key role in designing an energy efficient dwelling. Stakeholders also noted that on larger developments the acquisition team (including consultants, architects and other professionals working on master plans) need to have an understanding of energy efficiency and sustainability requirements so that these can be costed in as part of the feasibility study for the project. In addition, it was noted that builders may in some cases play a role in the design stage, but others primarily focus on working off pre-defined plans.

The key technical skills required to embed energy efficiency at the design stage are:

— an understanding of existing minimum standards as outlined in regulations and building codes, and how to comply with these

— an understanding of how site characteristics (such as climate zone and microclimate, cool breeze access, and solar access) affect design requirements

83 Stakeholder consultations.
— knowledge of energy efficient design techniques and elements, including consideration of building envelope, glazing, insulation, orientation, natural ventilation, shading, and thermal mass
— knowledge of energy efficient materials, technologies and products, and how to specify their use in the building plans.84

Overall, stakeholders noted that the basic principles of energy efficiency design are fairly simple, and suggested that going ‘beyond compliance’ does not require a different skillset from that required to meet minimum requirements under the NCC. Rather than skills, the key limiting factors for architects and designers in delivering energy efficiency outcomes include:
— site selection, which may not always be optimal for energy efficiency
— requirements for features such as large windows which may contradict energy efficiency principles
— preference to allocate project budget towards cosmetic elements such as kitchens.

Supporting trades (electricians, HVAC professionals, and plumbers) may also play an assisting role in the planning stage, particularly for large multi-unit apartments. Of these, HVAC professionals are likely to have the most involvement; however, the extent of their contribution usually depends on the building type, and they are more likely to be involved in the design of large apartment buildings and high-end designed single dwellings. Some volume builders may engage a HVAC designer early on, but this is not a universal practice.85

The key skills required for HVAC professionals relate to the appropriate sizing of equipment, which requires a broad general knowledge about the building system (including considerations such as wall construction, orientation, exposure, windows, and moisture). In the context of energy efficiency, selection of appropriately sized equipment requires an understanding of the impact building design has on reduced heating and cooling needs of the dwelling.86

Plumbers are the least likely to be involved in the design stage, and are primarily focussed on compliance with minimum standards. Around 10 per cent of plumbers have specialised in energy efficient products, and this cohort is more likely to be involved in building design in an advisory capacity.87

Other actors that play a role in the design stage are thermal assessors and certifiers.

A NatHERS certification requires understanding of the construction process, including knowledge of how to interpret drawing and plans, and the skill to advice on how elements such as insulation will affect a building’s thermal performance.88 Some stakeholders suggested that, as buildings become more complex, there will be a greater role for energy or thermal assessors to advise building designers and architects on how to meet minimum energy efficiency standards.

As outlined in section 3.2.3, building certifiers are focussed on ensuring that the design complies with legislative and regulatory requirements, and concentrate on checking and verifying building documentation against codes and regulations.

4.1.3 Construction

The majority of professionals and trades in the residential building supply chain are involved in the construction stage, in different capacities. The main responsibility for the construction process lies with the builder, who is responsible for ensuring that the dwelling meets design specifications, client requirements and minimum regulatory standards. Key skills related to achieving energy efficiency outcomes are:
— interpreting and implementing plans and drawings prepared by an architect or building designer
— knowledge of good construction techniques and how to achieve compliance with minimum requirements

85 Stakeholder consultations.
86 Ibid.
87 Stakeholder consultations
88 BDAV 2012 and stakeholder consultations.
knowledge of how to select energy efficient products, and substitutability of products while still achieving the desired energy efficient outcomes

monitoring the proper installation of construction materials, equipment, and appliances by the relevant supporting trades.\textsuperscript{69}

Some stakeholders emphasised that, from a builder’s perspective, the skills and techniques required to construct a building compliant with existing regulations are the same as those needed to constructing (for example) a dwelling with an 8-star rating. Rather than an entirely new skill set, the focus is on the knowledge of the products to use, and how to install these appropriately.

For single dwellings, architects and building designers may be involved in the construction process as contract managers on behalf of a client. However, their ability to influence the energy efficiency of the finished construction will depend on the contractual arrangements the prospective home owner has entered into with the builder. In cases where the architect or building designer is brought in as a subcontractor at the design stage, they will have limited ability to ensure that energy efficient design considerations are followed through in the construction process. The skills of the client were noted by stakeholders as a key factor in influencing the contractual arrangements.\textsuperscript{90}

Similarly, volume builders may employ an architect or a building designer, but their role in ensuring follow-through of energy efficiency design considerations is likely to depend on the extent to which these are valued by the builder.\textsuperscript{91}

Each of the supporting trades (electricians, glaziers, HVAC professionals, insulations installers and plumbers) are also involved in the construction process. These trades often (but not always) work as independent subcontractors for the builder, and may be paid on a volume basis rather than for their time. Stakeholders unanimously agreed that correct installation and commissioning of energy efficient products is the key skill required from tradespeople. Key considerations for each trade are outlined below.

- **Electricians** need an understanding of energy efficiency solutions, including new and emerging technologies such as battery storage.

- **Glaziers** need a good understanding of the existing regulatory requirements, and product options (including the properties of various products) to meet minimum requirements. Using appropriate techniques in installation is also a key skill, as more efficient products may have differing requirements for handling and installation.

- **HVAC professionals**, in addition to system design and sizing skills outlined above, need knowledge about appropriate installation of energy efficient products. In particular, it was noted during stakeholder consultation that, as HVAC technology has become more energy efficient, it has also become more sensitive. As a consequence, mistakes during installation can reduce optimum performance and even wipe out potential efficiency gains.

- **Insulation installers** are focussed on occupational health and safety and the current Australian Standards for insulation products and installation, but do not have a role in specifying materials to be used. Therefore, the key skill needed is the correct and appropriate installation of insulation.

- **Plumbers** need skills in the selection and appropriate installation of energy efficient plumbing solutions such as solar hot water.

In addition, building certifiers (NSW) or surveyors (Victoria) conduct inspections during construction. However, under the current regulatory regime, the appropriate installation of energy efficiency measures is not verified during site visits. As a result, there is a gap between building performance as designed and as built, and reported widespread under-compliance with the minimum standards as set out in the NCC.\textsuperscript{92}

\textsuperscript{69} NSW Board of Vocational Education and Training 2009, Skills for Sustainability, Skills Australia 2011, and stakeholder consultations.

\textsuperscript{90} Stakeholder consultations.

\textsuperscript{91} Ibid.

4.1.4 Sales and leasing

Real estate agents and property managers have the primary role at the sale and leasing stage, and could play a role (but currently do not) in informing buyers, sellers, landlords and tenants about the sustainability and energy performance of a dwelling. This could include communication on energy rating results in a voluntary or mandatory scheme of disclosure. Key skills for performing this role are:

— understanding of the design features and technological solutions that improve a home’s energy efficiency performance
— understanding the meaning of a dwelling’s energy rating
— valuing a dwelling’s energy efficiency features and rating
— communicating the benefits of energy efficiency to consumers in clear terms they can relate to
— communicating the results and meaning of a dwelling’s energy rating to consumers.

4.1.5 Building occupation

Across all dwelling types—single dwellings, apartments, as well as owner-occupied and rented properties—electricians and plumbers play a role during building occupation, particularly in recommending replacements in case of equipment breakdown. Skills needed include:

— understanding of energy use and options to save energy
— understanding of energy efficient products and technologies available on the market and their appropriate application
— proper installation of energy efficient equipment to avoid call-backs or complaints from customers
— communication skills to be able to convey the benefits of energy efficient products to customers in a way they can relate to and provide advice on options.

HVAC professionals could play a role in equipment maintenance, particularly in larger multi-unit developments, but currently are not extensively involved.

Property managers arrange equipment repairs and maintenance for rented properties. Currently, they primarily rely on tradespeople to select and purchase appliances and equipment, and do not play a significant role in relation to energy efficiency. In rented properties, tenants are typically responsible for paying energy bills but decisions about appliances and equipment are made by building owners. As a result of this split incentive, property managers who are hired by property owners have no incentive to advocate for more energy efficient options at the point of equipment breakdown.

Finally, home owners were noted by many stakeholders as a key actor that also require a general understanding about energy efficiency and the potential for upgrades to deliver cost savings and improve comfort.

4.1.6 Renovations and retrofits

The professions and trades involved in building design and construction are also involved in renovations and retrofits, although the exact combination will vary depending on the size and scale of the project. The technical skills needed are largely the same as those outlined in sections 4.1.2 and 4.1.3. However, an increased emphasis is placed on the communication skills outlined in section 4.1.1.

In apartment buildings, strata managers (with the assistance of other specialists) could play a role in advising owners’ corporations on forward planning of capital works, including replacing plant and equipment with more efficient alternatives at end of life.

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93 Green Gurus 2011, Greening the Real Estate Industry and stakeholder consultations.
96 Stakeholder consultations.
97 Ibid.
98 Ibid.
Finally, similarly to building occupation, home owners were noted by many stakeholders as a key actor during renovations and retrofits. Skills required include a general understanding about energy efficiency and the potential for upgrades to deliver cost savings and improve comfort.

4.1.7 Residential energy advisors

Home energy advisors identify options that householders may implement to reduce a dwelling’s energy consumption. These may range from no and low cost alternatives that can be implemented immediately to more substantive retrofit measures. Additionally, advice may be provided on options to minimise the sustainability impact of the home more broadly, for example through providing tips on reducing water consumption and waste.

The skills required for providing energy efficiency advice depend on the nature and scope of the investigation being undertaken. At its most basic, the advisor role can consist of providing home owners with information on the energy efficiency impact of various options under consideration when building work, such as a renovation, is being undertaken. In contrast, an in-depth assessment would require technical skills related to:

— understanding of energy use and thermal performance of a dwelling
— collecting and analysing energy and other relevant data
— identifying and assessing options to improve the dwelling’s energy performance
— identifying the cost of measures to improve energy performance
— assessing how lifestyle choices affect energy use and helping households understand how they can change their energy use
— communicating results to householders, including prioritisation of various options.

Delivery of home energy efficiency advice requires a visit to a person's home, and an inspection of the features of the dwelling. Required soft skills in this context include:

— basic problem solving skills if requisite information on appliances and equipment is not immediately visible
— an ability to interact and communicate with consumers, and be sensitive to the fact that they are entering a person’s home
— privacy considerations and dealing with customer’s data (such as energy bill and photos taken on-site) appropriately.

The importance of soft skills is highlighted by the range of complaints received by the Australian Department of the Environment, Water, Heritage and the Arts during the course of the Green Loans program. The most frequent complaints from households relating to the conduct of assessments included:

— assessors not spending enough time at the household
— assessors not turning up for the booking, or not contacting the householder after making a booking
— the householder believing that the assessor’s knowledge was limited
— improper assessor conduct (such as rudeness)
— a different person arriving to conduct the assessment than the assessor who made the booking.99

Skills required to deliver energy advice among low income or vulnerable households

A range of not-for-profit sector service providers offer energy efficiency advice to low income and vulnerable households and, in addition, government initiatives may support home energy assessments among low income households.100 In this context, stakeholders noted that energy advisors need to have an understanding of what energy efficiency actions are within the householder’s capacity to implement, and an ability to link the household to services that may fund part of intervention. In addition, the energy advisor needs interpersonal skills to be able to understand the

challenges faced by the householders, and differentiate between different groups (such as those vulnerable to energy bills, vulnerable to other factors, and low income generally).

Position of the energy advisor role in the residential housing supply chain

As noted in section 3.2.4, the energy advisor role is currently largely dormant in the private sector, and is currently linked to government and not-for-profit initiatives targeting low income households. In the future, the energy advisor role could be embedded in the residential housing supply chain at a number of points.

— Depending on policy and program design choices, the energy advisor role could be embedded into the functions of the energy rater. However, if this is a desired outcome, the additional skills needed to provide in-depth advice to households need to be incorporated into skill and accreditation requirements for energy raters.

— If energy ratings become more prevalent the demand for energy efficiency upgrades in the residential housing market may increase. In this context, it is possible that households may wish to engage energy advisors to give detailed and in-depth advice on upgrade opportunities. However, large scale uptake of targeted home assessments has historically only occurred in the context of supporting government initiatives such as the Green Loans scheme. It is therefore unclear whether householders will be willing to pay for an additional assessment, above and beyond the price of an energy rating.

— The advisor role may be embedded throughout the supply chain. A number of key actors, including building designers, architects, builders and tradespeople play a role in advising households on design options and equipment selection during renovations and at the point of equipment breakdown. In the context of schemes, such as home energy ratings, driving up demand for energy efficiency among households, these decision points naturally provide an opportunity to advocate for more energy efficient outcomes. However, to fulfil this role, industry participants need additional skills to be able to assess the impact of various options on home energy performance, communicate the impacts and benefits to householders, and perform simple financial calculations such as estimating bill savings and payback periods.

4.1.8 Residential energy ratings

Residential energy ratings can take place at multiple stages in the dwelling’s lifecycle, depending on how the policy and rating tool have been designed. The rating can be prepared at the point of sale or lease, during building occupation to provide guidance on cost effective energy efficiency improvements, or after a renovation or retrofit to assess improved performance.

The technical skills required to deliver ratings will likewise depend on the policy intent as well as the design and focus of the tool, but are expected to include:

— understanding of energy use and thermal performance of a dwelling
— collection of data and information to support the energy efficiency rating (including usage and calibration of measuring equipment)
— assessment of the impact of building elements and installed equipment on the energy efficiency and thermal performance of the building
— using the rating tool(s) and associated software.101

Operational ratings tools may in, addition, require skills related to assessing the cost of running appliances and equipment. Finally, in the context of multi-unit residential dwellings, energy ratings skills for common areas are commensurate with those needed for a commercial energy efficiency assessment such as NABERS.

Importantly, the role of the energy rater is distinct from that of an energy/thermal assessor. The latter assesses the energy consumption of a dwelling as designed, while an energy rater focuses on the performance of the dwelling as constructed. Therefore, the technical skills required for energy ratings are different than those required for thermal assessment; as a consequence, while the same individual may undertake both tasks, the two roles as distinct.

101 Source: ACIL Allen and stakeholder consultations. As ACIL Allen has not been provided with details of the design of the rating tools, a more in-depth assessment of skills required is not possible in the context of this report.
Further, in contrast to an energy/thermal assessment of a building’s design, residential ratings of existing dwellings require a visit to a person’s home and an inspection of the features of the dwelling. Consequently, the delivery of energy ratings requires a range of soft skills not necessarily needed by energy/thermal assessors who undertake a computer-based assessment of building designs and plans. The required soft skills for energy raters are broadly the same as those for an energy advisor and include:

— basic problem solving skills if requisite information on appliances and equipment is not immediately visible
— an ability to interact and communicate with consumers, and be sensitive to the fact that they are entering a person’s home
— privacy considerations and dealing with customer’s data (such as energy bill and photos taken on-site) appropriately.

**Skills required to deliver energy ratings among low income or vulnerable households**

The roll-out of the Victorian Residential Efficiency Scorecard will be delivered through not-for-profit organisations, including organisations providing community services. It is therefore likely that at least some of the ratings will be conducted among low income or vulnerable households. In this context, stakeholders noted that energy raters need specific skills to meet the needs of low income or otherwise vulnerable households. These skills are broadly the same as those required for energy advisors working among this cohort, and centre on:

— an understanding of what energy efficiency actions are within the householder’s capacity to implement
— an ability to link the household to services that may fund part of intervention
— interpersonal skills to understand the challenges faced by the householders
— the ability to differentiate between different groups (such as those vulnerable to energy bills, vulnerable to other factors, and low income generally).

**Which actors are seen to be well-placed to conduct home energy ratings**

Building designers, particularly those who already work in renovations, were highlighted by many stakeholders as a group well-placed to conduct home energy ratings. Importantly, building designers already interact with householders. They would therefore be well-equipped to perform in-house work, and would also be more likely to have a good understanding of an existing building’s use.

Property inspectors is another cohort which could undertake home energy ratings. Although they do not currently report on the building’s energy efficiency specifically, they could be well-placed to do so, given their background and role as trusted advisor for prospective buyers. However, the role of delivering ratings (paid for by the current owner) would need to be de-coupled from the role of providing a property inspection report (paid for by a prospective buyer).

NABERS assessors and companies in the commercial sector that currently perform energy efficiency audits was flagged by some stakeholders as a potential group which might choose to undertake home ratings and audits as well. However, other stakeholders suggested there is little overlap between the commercial and residential sectors.

Stakeholder views on the appropriateness of builders and tradespeople to take on an additional role as a home energy rater were mixed. Some suggested that builders, plumbers and electricians (especially those looking to step down from a more active role) could be potential candidates for performing energy ratings. However, some stakeholders opined that electricians and plumbers would likely be prohibitively expensive, unless the rating is coupled with another reason to visit the premises.

In NSW, tradespeople looking to step down from a more active role were one of the groups opting to undertake home assessments under the Home Power Savings Program. This experience indicates...
that there is some potential for this cohort to take on an additional role as a home energy rater. However, stakeholders noted that additional skills would be needed in relation to performing the assessment, and advising householders on options to improve the home’s energy performance.

**Which actors are not seen to be well-placed to conduct home energy ratings and audits**

Certifiers (or surveyors) were raised by some stakeholders as an opportune group to conduct home energy ratings and audits. However, other stakeholders noted that there is currently a shortage of people entering the profession. In addition, obligations on certifiers are increasing as initiatives such as swimming pool regulations are introduced, and they would be unlikely to have the capacity to take on additional roles.

Real estate agents were deemed by some stakeholders to be a suitable group for conducting home energy ratings, particularly if the tool is simple to use. However, on balance, the stakeholders cautioned against this role for real estate agents, both because they would not be likely to have the required skills, and would possibly not be seen as a trusted source by prospective home owners. However, as highlighted above, real estate agents were seen to play a role in promoting the rating and dwellings energy performance to prospective buyers.

Thermal assessors (at least those without a building design background) were highlighted as a cohort that would not necessarily be the best suited for conducting home energy ratings. In addition to differences in technical skills, NatHERS assessors rarely interact with householders and would not necessarily have the soft skills required.

**The ability of the market to adapt to a mandatory energy rating scheme**

As discussed in section 2.6, the NSW Government has indicated in the Draft Plan to Save NSW Energy and Money the possibility of transitioning from a voluntary to a mandatory scheme. A key consideration in the successful transition from a voluntary scheme to a mandatory regime relates to the availability of suitably skilled individuals in the market to deliver the required volume of home ratings.

- **Level of skills needed to deliver robust ratings.** Generally speaking, the higher the skills need, the smaller the pool of people already in the market with the required skills, while more minimal skills requirements will increase the pool of potential raters.

Without an in-depth assessment of the proposed rating tool, it is not possible to substantively comment on this issue. However, based on information provided to ACIL Allen, it would appear that in both NSW and Victoria the delivery of ratings might not require in-depth understanding of building energy efficiency principles. This in turn suggests that the pool of potential assessors may be reasonably large and may draw on actors across the residential building supply chain.

- **Commercial incentives to deliver ratings.** A number of stakeholders highlighted that, for market players to begin to provide home energy ratings, the pricing would need to be sufficiently high to enable raters to run a business. This is closely linked to both the minimum required skill level to deliver ratings as set by government in any accreditation regime and the calibre of people likely to be attracted to undertaking the function.

A lower skill requirement leading to a larger pool of people with the potential to deliver ratings will, logically, mean a more competitive market and hence a lower price for ratings (assuming that the price is not regulated). As a result, the government’s required skill level is likely to also form a skills ceiling, as people with a higher skill level will likely be able to earn a higher income through other activities and may choose not to participate in the market. This trade-off between the required skill level and the number of potential energy raters highlights the need to align the scheme’s training and accreditation requirements with the intended policy objectives.

- **Lead-time provided to the training and education sector to provide training.** DELWP has identified that existing courses in home sustainability assessment can meet the competency requirements for delivery ratings using the Residential Efficiency Scorecard. The courses are currently only available online and interstate, but as the course content has already been developed, RTOs will be able to roll out training in response to market demand. However, this is preconditioned on the provision of a sufficient lead-time and confidence among RTOs that the course offering will be met by demand.
Based on qualitative advice from industry stakeholders consulted as part of this project, it would appear that the industry will have the skills and capacity to deliver energy ratings under a mandatory scheme. A number of industry actors that could step in to deliver energy ratings have been identified. Some actors may choose to do this on a full-time basis, for others it may be a part-time job or an additional component of their existing business. However, this assessment is limited by its qualitative nature and the limited pool of stakeholders consulted for this project.

Importantly, the experience of the Home Insulation Program\textsuperscript{106} and the Green Loans program\textsuperscript{107} highlight the need for industry consultation on skills needs, the effective incorporation of these in training and accreditation requirements, and a sufficient lead-time to set up the systems and training to ensure that the required skills levels are met.

4.2 Do the required skills exist and what are the skills gaps?

Stakeholders noted that \textbf{architects} and \textbf{building designers} are primarily focussed on meeting regulatory requirements, and this is where their current skill set as a profession is focussed.\textsuperscript{108} However, only a small niche of the market (estimated at 5-10 per cent) will reach beyond minimum compliance standards to consider higher energy efficiency solutions. A clear message from the consultation is that customers need to prioritise energy efficiency (among other competing considerations, such as aesthetics) for it to be incorporated in building projects.

However, stakeholders also noted that architects, building designers and builders need better skills in translating energy efficiency to a language that consumers can relate to. Rather than focusing on the technical aspects of energy efficiency, building professionals should focus on the comfort, quality and wellbeing aspects that energy efficient dwellings bring about, as well as the associated energy and bill savings. In addition, some stakeholders suggested that the knowledge of energy efficiency products is not strong, and that the decision on what gets installed is pushed back on suppliers.

Stakeholders reported an underappreciation of energy efficiency and its benefits for customers among \textbf{builders}. This results in substitution of products and materials during the construction stage, potentially leading to poorer (under-compliant) energy performance. However, this was seen as a result of building practices and a fragmented model relying on a wide range of independently operating sub-contractors, rather than in skills and knowledge as such.

In contrast, some stakeholders suggested that builders do have the skills and knowledge to construct dwellings that exceed minimum compliance levels, if this is well specified and/or requested by the customer. For example, it was noted that if requested to construct a 10-star dwelling, builders would have the contacts and know-how to obtain any new skills and knowledge they might need.

CPD courses currently available for builders are discussed in section 5.3. However, only a small proportion of builders and contractors have participated in these.

Lack of verification by \textbf{building certifiers} and \textbf{surveyors} of energy efficiency standards during the construction phase was highlighted by some stakeholders as the key opportunity for improving the energy efficiency performance of new-builds. Should the regulatory regime change to include greater focus on compliance with minimum energy efficiency standards, new skills and training would be needed. Key areas of development include an understanding of building thermal performance and skills to assess the impact of substitutions made during construction relative to the designer’s specification.

Stakeholders indicated that \textbf{tradespeople} are experiencing gaps in relation to energy efficiency skills and overall, there is not a strong culture in upskilling. Lack of knowledge and skills in installation of energy efficient products was highlighted as a substantial gap.

Energy efficiency skills among \textbf{HVAC professionals} in the residential sector were deemed to be not sufficient, leading to over-sizing of equipment and thus greater than necessary energy consumption. This was seen to be largely driven by a desire to be conservative and avoid householder complaints in


\textsuperscript{107} ANAO 2010.

\textsuperscript{108} As an example, the Australian Institute of Architects noted that the course on Section J of the NCC is one of its most attended CPD courses.
case of under-performance, rather than commercial motivations relating to sale of larger or more expensive equipment.

**Electricians** have a good technical understanding of compliance requirements. Energy management and energy use is a knowledge gap, as are soft skills needed to communicate energy efficiency opportunities to householders.

As mentioned above, **plumbers** are primarily focussed on compliance with existing regulations, rather than exceeding minimum compliance levels. During the Green Skills Agreement, a number of training programs existed aiming to upskill the workforce on topics such as grey water and solar hot water. However, with the withdrawal of government support, the impetus for energy efficiency training has fallen away. As an estimate, 10-15 per cent of the workforce were upskilled at that time; however, in the current climate, the motivations for upskilling are not strong (these are discussed further in section 5.6.5). Overall, it was reported that skills gaps may exist in how to install energy efficient equipment correctly.

**Glaziers** are also primarily focussed on minimum regulatory requirements and the products complying with these. Skills required to exceed minimum compliance levels exist in pockets, but there is not a consistent approach throughout the industry.

A cross-cutting issue identified across the builders and supporting trades was a greater need to understand the building system, and how building products and design choices work together to deliver energy efficient outcomes.

**Real estate agents** have been identified as a group which could play a supporting role in communicating a dwelling’s energy efficiency features and performance to potential buyers and renters. However, at present, the skills to perform this function are not considered to exist among the profession; some stakeholders suggested that, due to this knowledge gap, agents may provide misleading information to consumers.

This qualitative view expressed by stakeholders is supported by a recent survey of 140 real estate agents and property managers. Of these, 86 per cent of respondents stated that they understand home energy rating. However, only 34 per cent indicated that they are confident or very confident in communicating the home energy rating to prospective buyers or renters, while only 25 per cent indicated they find it easy or very easy to communicate about home energy rating tools to customers. The results seem to suggest that the understanding of a home energy rating is currently somewhat superficial (such as more stars equals better) but that there is no knowledge of the drivers of better energy performance.

**Strata managers** were highlighted as a group lacking basic knowledge of energy use and energy data. Energy efficiency training for this cohort would therefore need to begin with a grounding in energy consumption and bills, as well as financial literacy.

### 4.3 Motivations and challenges in accessing new skills and knowledge

The motivations for, and barriers to, accessing new skills and knowledge were very similar across the different supply chain actors. The discussion will therefore cover the trends in general terms, highlighting variations between groups where these are present.

Overall, three main drivers exist for upskilling. These are:

1. **Personal passion.** A passion for energy efficiency was highlighted by stakeholders as the key driver for those in the residential housing market supply chain who have already upskilled in energy efficiency. This cohort was highlighted by many as a ‘niche’ in the industry, representing at most 5 to 10 per cent of the market.

2. **Increased business opportunities.** The ability to generate more business, gain an edge over competitors or command a higher price for a service was noted as a key motivator for undertaking skills development and training in general.

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108 Romanach, L., Jeanneret, T. and Hall, N 2015
3. **Government regulation.** Past research has highlighted the importance of regulatory drivers and the incentives created by government programs and policies in driving skills development in industry.\(^{110}\) This view was affirmed in stakeholder consultations. The lack of long-term commitment by government was highlighted as an obstacle, and stakeholders noted that industry is unlikely to take up a course or training offering in the context of regulatory uncertainty. In addition, the absence of harmonisation across jurisdictions was noted as a disincentive to skills development and upskilling.

Closely linked with a regulatory mandate, the need to ensure awareness of industry standards and compliance with minimum requirements (including occupational health and safety) was noted as a driver for the uptake of training.

A lack of demand for energy efficiency from customers was noted as a key disincentive for skills development. Professionals and trades in the residential housing supply chain have many demands on their time. As a result, they are unlikely to take up training unless the new skills acquired bring a tangible benefit in terms of increased business opportunities or an added competitive advantage.

Some stakeholders, particularly those representing construction trades, suggested that, in the absence of a regulatory impetus, training would be very unlikely to be taken up, or that 95 per cent of the industry would only do training if it was a mandatory requirement.

In addition to these common themes, some key differences in motivations and barriers emerged during stakeholder consultations.

Professionals, particularly architects and building designers, tend to have a stronger culture overall in relation to CPD. However, a key barrier for taking up energy efficiency training is their limited ability to influence the outcome of the dwelling as constructed, reducing the motivation for skills development.

Many energy or thermal assessors are sole traders who, as a group, tend to be time poor. This, in combination with the associated compliance costs, acts as a disincentive for assessors to upskill. In this context, mandating accreditation as a requirement to undertake particular activities (as is done in NSW for BASIX assessments) is a key driver for the uptake of accreditation and CPD.

**Construction trades** are typically reported to have a relatively weak culture in upskilling and CPD. Overall, upskilling in energy efficiency was not seen to lead to more business or a higher salary and therefore the commercial motivation to invest time and money on gaining new skills is not present. As a specific example, stakeholders noted that insulation installers cannot command a higher wage as the result of having undertaken training or accreditation; however, the lack of financial reward for upskilling in energy efficiency is likely to hold true for most of the construction trades.

Further, stakeholders noted that, during the current period of strong activity, tradespeople are already fully employed, and do not have the incentive to take time off work to gain new skills. Many tradespeople work in small companies with fewer than five employees, and tradespeople are generally reported to be time poor. Lack of skills development is therefore a general problem across the industry, rather than one specific to energy efficiency, and many stakeholders expressed support for mandated CPD for the particular trade they represented.

**Real estate professionals** (agents and managers) are another cohort with a perceived weak culture in upskilling. Entry requirements into the professions are considered to be relatively low and, as a result, the overall skill level was not considered to be relatively low and, as a result, the overall skill level was not considered to be very strong by many stakeholders. While industry bodies are working towards improving professional standards for real estate professionals, energy efficiency is currently not a priority.

Additionally, stakeholders noted that there is a need to ensure that any training in relation to energy efficiency needs to be conducted very efficiently and does not require a significant amount of time away from the business, particularly for cohorts without a strong culture of upskilling.

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\(^{110}\) Skills Australia, 2011 and ACIL Allen, 2013.
4.4 Identifying champions and leaders among the industry

The following strategies can be suggested when government is seeking champions and leaders among industry to promote energy efficiency training.

A number of the industry organisations consulted as part of this study are already engaged in supporting energy efficiency among their respective supply chain actors. OEH and DELWP already collaborate with many of these, and these organisations may be able to provide introductions to individual companies which are strong advocates for energy efficiency and which have experienced the business benefits of implementing energy efficiency in the residential housing sector.

Further, a number of the organisations hold annual awards (for example, BDAV’s 10 Star Challenge and HIA’s GreenSmart Awards). This is another possible avenue for identifying leading performers likely to have experienced the value of upskilling in energy efficiency.

Finally, a number of larger companies now have corporate functions dedicated to sustainability and/or energy efficiency. Larger companies are likely to have greater resources to take on an advocacy function, but are nonetheless likely to require support to do so on an ongoing basis (refer to section 5.8 for further discussion).
This chapter provides an overview of the uptake of VET courses and industry-led CPD courses. It draws on a desktop review of available courses, as well as data from the National Centre for Vocational Education Research (NCVER) and industry bodies (where this has been made available to ACIL Allen) on uptake. Appendix B provides more detail on industry-led training and accreditation.

Training gaps exist for the cross-cutting skills identified in chapter 4:

— an understanding of the building system and appreciation of the role each actor plays in achieving energy efficient outcomes
— needing to keep up with changing products and technologies
— an understanding of what energy efficiency means for consumers, beyond meeting minimum regulatory requirements.

Table 5.1 provides an overview of training currently available to each of the actors in the residential housing supply chain, and highlights the key gaps for action.

<table>
<thead>
<tr>
<th>Key supply chain actor</th>
<th>Training currently available</th>
<th>Key gaps in the training offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architects and building designers</td>
<td>Increasingly incorporated in basic training CPD</td>
<td>Communicating and translating energy efficiency to language consumers can relate to energy</td>
</tr>
<tr>
<td></td>
<td>and further training available through industry organisations</td>
<td>efficiency outcomes in building drawings and plans</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up-to-date knowledge of energy efficiency products</td>
</tr>
<tr>
<td>Builders</td>
<td>Incorporated through optional modules in basic training</td>
<td>An understanding of the impact the substitution of products and materials can have of energy</td>
</tr>
<tr>
<td></td>
<td>Further training available through industry-led courses</td>
<td>efficiency and thermal performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A greater understanding of the building system and how products, design choices and the tasks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of each trade work together to achieve energy efficient outcomes</td>
</tr>
<tr>
<td>Building certifiers and surveyors</td>
<td>Not included in basic training</td>
<td>Skills in energy efficiency and building thermal performance to verify that the dwelling is</td>
</tr>
<tr>
<td></td>
<td>CPD and further training not available</td>
<td>constructed to the standard as designed</td>
</tr>
</tbody>
</table>

NCVER data reported prior to 2014 related to government-funded training only. A requirement for both public and private providers to report training activity was introduced in 2014. In some instances, such as Certificate III (apprenticeships), there are significant changes in enrolment and completions reported from 2013 to 2014. Full data is not yet available for 2016 so that reported data are unlikely to indicate the full scope of completions and enrolment.
<table>
<thead>
<tr>
<th>Key supply chain actor</th>
<th>Training currently available</th>
<th>Key gaps in the training offering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy or thermal assessors</td>
<td>A Certificate IV required for accredited assessors; accreditation only mandatory in NSW CPD and further training available through industry organisations</td>
<td>Increased understanding of the building system and greater advisory capacity may emerge</td>
</tr>
<tr>
<td>Energy raters and advisors</td>
<td>Existing courses currently not on offer in NSW and Victoria</td>
<td>Provide RTOs with sufficient lead time and confidence to roll out courses</td>
</tr>
<tr>
<td>Electricians</td>
<td>Technical skills to install energy efficient equipment covered by basic training</td>
<td>Skills relating to the assessment of energy use, energy management options and communicating findings to consumers are lacking from the training offering.</td>
</tr>
<tr>
<td>Glaziers</td>
<td>No dedicated basic training available Training available through industry association</td>
<td>No specific training gaps</td>
</tr>
<tr>
<td>HVAC professionals</td>
<td>Not included in basic training CPD and further training not available</td>
<td>Selecting appropriately-sized equipment</td>
</tr>
<tr>
<td>Industry insulation installers</td>
<td>Training and accreditation available through industry bodies; limited uptake</td>
<td>Proper installation of energy efficient equipment</td>
</tr>
<tr>
<td>Plumbers</td>
<td>Incorporated in basic training Further training available through an industry-led courses; limited uptake currently</td>
<td>No specific training gaps in Victoria; training not available in NSW</td>
</tr>
<tr>
<td>Product suppliers and manufacturers</td>
<td>Dependent on professional background</td>
<td>No specific training gaps</td>
</tr>
<tr>
<td>Property inspectors</td>
<td>Dependent on professional background No specific training and CPD available</td>
<td>Unknown, dependent on professional background</td>
</tr>
<tr>
<td>Real estate agents</td>
<td>Not included in basic training Further training available through industry-led courses; limited uptake</td>
<td>No specific training gaps</td>
</tr>
<tr>
<td>Strata managers</td>
<td>Not included in basic training CPD and further training not available</td>
<td>Basic knowledge of energy use and energy data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basic knowledge of upgrade opportunities to encourage inclusion of energy efficiency in forward capital planning</td>
</tr>
<tr>
<td>Renewable energy installers</td>
<td>A range of VET courses available; CPD provided by industry associations</td>
<td>No specific training gaps</td>
</tr>
</tbody>
</table>

**SOURCE:** ACIL ALLEN, NCVER, STAKEHOLDER CONSULTATIONS

### 5.1 Architects and building designers

Energy efficiency is, to an increasing degree, incorporated in basic training for architects and building designers. As a result, new entrants to these professions come equipped with a greater understanding of energy efficiency than previous generations.

A range of CPD programs are available for architects and building designers. Key upskilling opportunities are:

- AIA seminars and courses covering requirements under the NCC, as well as energy efficient and sustainable design. Seminars focussed on compliance with the building code are the most popular.
- BDAV seminars, webinars and workshops on regulatory requirements, as well as energy and thermally efficient design.
- Residential Architects Training, developed and delivered by AIA with co-funding from OEH. The five seminars on sustainable residential architecture delivered in 2016 had an average audience of 65 each, with a total of 350 places filled. The seminars are expected to be run again in 2017.
— SustainAbility Design Specialist Masterclass, a four-day course developed and delivered by BDAA in partnership with AIA and Australian Living and with co-funding from OEH. In 2017, 70 architects and building designers have taken up the course. It is expected to run to 2019, training up to 400 designers.

Architects and building designers can obtain voluntary accreditation in energy efficiency and/or sustainability through two schemes. These are:

— Green Star Accredited Professional, managed by the Green Building Council of Australia. The accreditation is focused on the usage of the Green Star rating tool and is applicable to a range of building professional working on Green Star projects.

— Certified Passive House Designer/Consultant, by the Australian Passive House Association. Certified designers need a qualification and experience in a building-related discipline. There are no prerequisites to become a certified consultant, although knowledge of building construction and building design is an advantage. There are six certified designers and consultants in NSW, and 44 in Victoria (a breakdown between these two categories was not available).

5.2 Building certifiers and surveyors

Energy efficiency training is not readily available for building certifiers and surveyors and is not included as part of a core qualification. The Australian Institute of Building Surveyors’ CPD offering includes a short online course on energy efficiency (waste management).

5.3 Builders

The Certificate IV in Building and Construction, the entry requirement for becoming a licensed or registered builder, includes energy and thermally efficient construction as elective modules, but not as a core requirement. However, some stakeholders did not consider many of the modules to be relevant to industry needs, and generally the formal training options on energy efficiency for builders were not considered to be strong. There are no VET sector qualifications specific to energy efficiency explicitly aimed at builders.

Builders’ motivation to take up elective modules on energy efficiency is likely to depend on their previous exposure to the topic. This could be either through skills in their trade qualification, or the extent to which they have participated in industry-led upskilling.

Stakeholders noted that energy efficiency is becoming increasingly embedded in the trade qualifications. However, as builders typically have a number of years’ experience in their specific trade before choosing to take on additional responsibilities, it is likely to take some time before this knowledge is filtered through.

Four main industry-led training schemes, with associated accreditations, are available for builders. These are:

— Certified Passive House Tradesperson. The five-day course and associated accreditation is aimed at providing building contractors with the skills and knowledge required to understand how to build to the International Passive House standard. Currently, there are four accredited builders in NSW and 30 in Victoria.

— GreenSmart Professional training course and accreditation. The two-day course HIA provides recognised environmental building skills for more sustainable residential design and construction. Around 6,000 people have been trained through the program nationwide. Of these an estimated 2,000-3,000 are builders and contractors. Other participant groups include building designers and product suppliers.

— GreenSmart Kitchen and Bathroom training course and accreditation. The one-day training by HIA covers sustainable building practices and products in kitchen or bathroom projects. No information has been provided on uptake.

113 This comment excluded the modules developed under the Master Builders Green Living—Domestic course.
— **Master Builders Green Living—Domestic.** The Green Living course was originally developed by the Institute of Sustainable Futures at the University of Technology Sydney in 2005 following the receipt of a federal government grant. In 2013-14, the program was incorporated as optional modules in the Certificate IV in Building and Construction. In the last five years, nearly 1,300 aspiring builders have taken up the training. There are currently around 160 accredited Green Living builders across Australia.

### 5.4 Energy assessors and advisors

#### 5.4.1 Energy assessors

Accredited NatHERS assessors are required to complete the Certificate IV in NatHERS Assessment. Overall, 198 students have enrolled in the certification in NSW since it became available in 2014, with 114 reported by NCVER to have completed the course. However, given that the data for 2016 are provisional, it is possible that completion numbers are higher. In Victoria, 705 students have enrolled and 124 are reported to have completed the course. Since the commencement of the course, the number of RTOs offering the course has fallen from five to three.

The reasons for low completion rates cannot be determined from this dataset. However, broader analysis of low completion rates in VET indicate that adult students may take longer to complete a qualification or that students enrol in a qualification with the intention of completing only those modules of immediate relevance to them. Overall, NatHERS assessors have expressed dissatisfaction with the course, and it is currently subject to review and redevelopment.

#### 5.4.2 Energy advisors

Between 2010 and 2014, three courses were relevant for energy auditors:

— Basic Home Sustainability Advice (for volunteers)
— Certificate IV in Home Sustainability Assessment (HSA)
— Course in Home Sustainability Assessment.

In NSW, 164 students enrolled in these courses, with only 15 reported completions. The majority of enrolments were for the Course in Home Sustainability Assessment, but completions were only reported against the Certificate IV in Home Sustainability Assessment. In Victoria, 112 students enrolled in the home sustainability assessment course or certificate, and 14 completions were reported for the certificate.

No training providers in NSW or Victoria currently offer these courses; however, the HSA is currently under review.

### 5.5 Real estate professionals

The basic training for real estate agents does not include components on energy efficiency. Two CPD courses are available to the profession. These are:

— **Get Up To Speed On Home Energy Rating and BASIX.** This short course was funded by the OEH and hosted by REI NSW. The course aims to enable real estate agents to gain a competitive edge by leveraging a BASIX certificate at the point of sale, with a target of training 100 agents. However, uptake was weaker than anticipated, with 21 agents trained. OEH is currently investigating options to leverage the resources developed through this course.

— **Liveability Real Estate Specialist training.** This course teaches real estate agents and property how to identify, appraise, list and sell properties with ‘liveability’ features (strongly correlated with energy efficiency) at the point of sale or lease, and to understand why they are important to the potential for reduced running costs and increased comfort. Energy ratings are covered as part of the Liveability Framework, which is updated regularly to reflect latest policy and regulatory developments.

Development of the course commenced in 2010, and during the period 2013-15, 112 agents were trained in NSW, 50 in Victoria and 458 in Australia as whole. In 2016, the Liveability Framework was
acquired by CSIRO and no courses were held that year. Courses are scheduled to recommence in September 2017.

5.6 Tradespeople

5.6.1 Electricians and renewable energy installers

Training for electricians is technically focussed. Stakeholders suggested that the training for electricians provides them with the technical skills to install energy efficient equipment. However, skills relating to the assessment of energy use and communicating findings to consumers are lacking from the training offering.

Table 5.2 outlines current and past VET courses on energy efficiency and renewable energy installation. In NSW, a total of 308 students enrolled in the available courses during the period 2012-2016, with only 29 recorded completions. Of these, 153 enrolments were recorded for the Certificate II in Sustainable Energy (Career Start), but only five completions were recorded. Though it cannot be confirmed with this dataset, it is probable that low completion rates may be due to drop-out rates at the pre-apprenticeship stage or early transfer to a Certificate III (apprenticeship).


In Victoria, 360 students enrolled in training, and 52 completed a course. The majority of enrolments were for the Certificate IV in Renewable Energy (141 enrolments), the Certificate IV in Electrical—Photovoltaic systems (107 enrolments) and the Certificate III in Renewable Energy—ELV (99 enrolments). The majority of completions, at 48, were recorded for the Certificate IV in Electrical—Renewable Energy.

<table>
<thead>
<tr>
<th>TABLE 5.2</th>
<th>VET COURSES FOR ELECTRICIANS AND RENEWABLE ENERGY INSTALLERS</th>
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<tbody>
<tr>
<td><strong>Course availability or uptake</strong></td>
<td><strong>Electricians</strong></td>
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<tr>
<td><strong>Uptake</strong></td>
<td>Certificate II: Sustainable Energy (Career Start)</td>
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<td><strong>No completions</strong></td>
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<td><strong>Uptake unknown</strong></td>
<td>Skillsets in:</td>
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<td></td>
<td>– Identify Energy Efficiency Strategies</td>
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<td></td>
<td>– Electrical Installations Sustainability Strategies</td>
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<td></td>
<td>– Energy Efficiency Systems Integration</td>
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<tr>
<td></td>
<td>– Providing advice on lighting products</td>
</tr>
<tr>
<td><strong>Not offered in NSW or VIC</strong></td>
<td>Certificate II in Electrical Wholesaling</td>
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<tr>
<td></td>
<td>Certificate IV:</td>
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Master Electricians Australia launched an energy efficiency training course in 2013, which aimed to give electricians the skills to provide energy efficient solutions to their customers. The course was discontinued after funding from the Australian Government was withdrawn.\textsuperscript{114}

5.6.2 Glaziers

There are no dedicated VET training courses for glaziers. The Australian Window Association runs a course on advanced energy, covering energy efficiency principles in glazing. The four-hour course is customised for AWA members and delivered in-house to 10-15 participants at a time.

5.6.3 HVAC professionals

The following VET sector qualifications are currently registered for HVAC professionals:

- Certificate IV:
  - Air-conditioning Systems Energy Management and Control
  - Electrical-Air-conditioning Split Systems
- Diploma in Electrical and Refrigeration and Air-conditioning
- Graduate Certificate in Energy Efficient HVAC Design

A Vocational Graduate Certificate in Energy Efficient Heating, Ventilation and Air-Conditioning (HVAC) Design was previously available, but has since lapsed.

No RTOs currently provide these qualifications in NSW or Victoria. There are no CPD courses available for HVAC professionals in the residential housing sector.

5.6.4 Insulation installers

The Industry Insulation Installers Course is an accredited training, provided by the Association of Wall and Ceiling Industries and ICANZ. It covers five units from the Certificate III in Wall and Ceiling Lining. To date, 300 installers nationally have completed the course. An accreditation is also available for installers. Currently, 20 people hold an accreditation.

5.6.5 Plumbers

Stakeholders noted that sustainability became embedded in basic qualifications for plumbers in 2013-14 and, as a result, graduating plumbers already have undertaken some of the skill development in this area.\textsuperscript{115}

Master Plumbers delivers the Course in Environmentally Sustainable Plumbing Technology at the Plumbing Industry Climate Action Centre in Victoria. This is a reaccreditation and update of the original Master Plumbers Course in Green Plumbers Environmental Solutions which ran for 10 years.

Uptake for the course was strong around 2009-2011 at the height of the drought. Government rebates for sustainable installations in homes led to strong consumer demand, encouraging plumbers to develop their business offerings. Since 2014, in the context of reduced rebates and easing of drought conditions, demand for sustainable plumbing lessened and as a consequence so did demand for the training course. In addition, most plumbers who wanted to specialise in this niche sector had already completed their training.


\textsuperscript{115} Plumbers typically focus on sustainability more broadly, including water efficiency, rather than solely on energy efficiency skills.
Plumbers express preference for enrolling only in the specific topics that interest them, rather than completing the whole course. Around 1,200 plumbers have completed at least one module of the course. However, in 2016 only 10 students enrolled, with similar numbers expected in 2017.

5.7 Cross-cutting training initiatives

5.7.1 The National Energy Efficiency Building Project

The National Energy Efficient Building Project (NEEBP), co-funded by all Australian states and territories through COAG, works towards improving energy efficiency in new-builds, alterations and additions. The project is focused on identifying weaknesses in compliance with the NCC energy standards and on developing, refining and recommending practical improvements to current process and regulatory systems.

As part of phase three of the project, several cross-cutting industry training initiatives are due to be rolled out from October 2017 onwards. These are specifically designed to bring together key actors from the supply chain which might not typically collaborate. Training initiatives to be rolled out are:

— Systems Thinking in Residential Buildings, targeted at building designers, builders, project managers, specifiers and regulators.
— Energy Efficient Design, an accredited certificate contributing towards a Diploma in Building Design.
— Building Science Fundamentals (full & abbreviated), targeted at building designers, builders, project managers, regulators, and building trades.
— Managing Building Seal for Energy Efficiency, targeted at building trades, installers and apprentices.
— Residential Energy Efficiency Compliance in the NCC, targeted at building designers, builders, regulators, project managers, specifiers and building trades.

5.7.2 The Supply Chain Sustainability School of Australia

The Supply Chain Sustainability School of Australia is a national, not-for-profit initiative, based on a model currently operating in the UK. The objective of the school is to increase sustainability knowledge and competency among supply chain participants in the Australian construction and infrastructure sectors, with a particular focus on small and medium-sized companies.

The school provides resources in a range of formats including e-learning, case studies, training workshops and supplier days. These are organised across 10 key sustainability themes, including energy and carbon.

Once registered, members complete a self-assessment and receive a 10-point action plan. Members are able to track and benchmark progress against other members’ de-identified scores, and update their action plan as they progress from beginner to intermediate to advance.

Membership of the school is free and provides access to the online resources. Workshops and supplier days are provided at a discount to members. As of September 2017 the school had over 1,100 registered members Australia-wide and reports that participation in its energy efficiency training offering is in the hundreds.

5.8 Challenges faced by training providers

Training providers, both in the formal VET sector and in industry, face a range of challenges relating to the development and ongoing provision of training programs. General barriers common across all training providers include:

— lack of consistent policy direction from government, including long-term commitment to policies, strategies and funding opportunities
— the need for national harmonisation across state-level policies and initiatives
— rapid technological change making it challenging to keep training programs relevant and up to date
— sourcing teachers with relevant skills to deliver training.

In the context of these challenges, successful courses focus on the outcome for the student, with particular emphasis on how the training leads to improved business or employment opportunities.
The following paragraphs discuss the challenges for VET and industry training providers, respectively. Issues specific to the VET sector include:

— **The VET sector funding model does not support the provision of short training courses needed by industry.** TAFEs and RTOs are funded to provide full qualifications, rather than the short courses and Skill Sets in demand by industry. This results in a mismatch between supply and demand, particularly for upskilling the existing workforce. As a result, drop-out rates for courses may be high as trainees register for a full qualification while only intending to complete a few select modules.

— **The effort and expense associated with developing a new training course.** A number of steps, including developing training modules, obtaining accreditation with the Australian Skills Quality Authority and upskilling trainers to deliver the content, must be completed before the new training can be advertised to prospective students. This requires significant upfront investment, both financially and in staff time, for which funding is not readily available.

— **Time taken to update an existing qualification.** It was noted that updating an existing national qualification is a time-consuming process. Therefore, after a period of emphasising national qualifications, states such as Victoria have again begun to develop their own courses.

As a result of these issues, the VET sector overall can be perceived to be insufficiently responsive to business needs. However, the VET sector is faced with weak demand overall from industry, coupled with a funding model which discourages the provision of short courses rather than full qualifications. It then appears that the motivations and opportunities (in the absence of external support through grants and other funding) for the VET sector to develop new courses are limited.

Issues relating to demand and funding are also pertinent to industry-led training, as courses can be expensive to develop, maintain and deliver. Two key drivers exist for industry bodies engaged in training provision:

— to drive the direction of professional development where this has been well-established

— a desire to increase the professional standards in market segments where basic skills and/or ongoing knowledge development has traditionally been weak.

However, energy efficiency is one of many competing concerns on most organisations’ agenda (with the exception of industry bodies such as the Energy Efficiency Council and Clean Energy Council solely dedicated to the topic). In the absence of other drivers, such as regulation, consistent policy direction or funding opportunities, industry-led investment in energy efficiency training is therefore likely to be ad-hoc and intermittent.

As an example, CSR Building Products, in conjunction with the Building Designers Association of Australia (BDAA) and the Housing Industry Association (HIA), ran a series of seminars for designers, architects and builders in 2016 on the products and building science principles that lead to better building performance during design and construction. However, in the absence of funding support and collaboration with a dedicated training organisation, this is likely to remain a one-off effort.

As an example of the success that can be achieved in supporting industry-led training, Sustainability Victoria provided funding to the Master Builders Association of Victoria (MBAV) for a sustainability training position for an initial three-year period. The seed-funding provided a kick-start for the initiative and demonstrated that demand for the role existed among MBAV’s membership. As a result, the role was created as a full-time position after the initial funding from Sustainability Victoria was exhausted.

Finally, experience from the roll-out of the Liveability Real Estate Specialist framework and training indicates that:

— developing a training program from the ground up may take several years

— marketing messages:
  – should aimed at the competitive advantage the training would give in the marketplace
  – need to be tested among the target audience, rather than assuming one size fits all

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116 Stakeholder consultations.
117 Ibid.
there is a need to move away from technical energy efficiency and sustainability jargon to more accessible language.\textsuperscript{118}

5.9 Quality of training and accreditation schemes

This study has not examined the curricula of the energy efficiency and energy management courses currently available, and has not consulted with students having partaken in those courses; consequently, a detailed review of the quality of the current energy efficiency and energy management training programs and accreditation schemes has not been possible within the scope of this study. However, the following general comments can be made in relation to the training offering.

Energy efficiency and energy management are fields with rapid technological change, and as a result the required knowledge (particularly of products and technologies) needs continual updating. Courses and accreditation schemes which focus on the fundamental principles and techniques underpinning energy efficiency and energy management, as well as the skills to ‘learn how to learn’ in a changing environment are more likely to result in long-lasting outcomes than those focusing on specific products.

Nonetheless, in a rapidly changing environment courses and accreditation schemes need to be updated on a regular basis to ensure that the content and skill/knowledge requirements remain current. Therefore, courses and accreditations undergoing regular review (at least every two-to-three years) are more likely to result in better outcomes.

Finally, the quality of teachers is essential for achieving learning outcomes. As well as developing course content and marketing strategies to encourage uptake, focus needs to be placed on ‘training the trainers’, to ensure they have the required skills to effectively deliver course content to student.

\textsuperscript{118} Ibid.
6.1 General findings

The following key findings apply across the residential housing supply chain generally.

6.1.1 Nature of the residential housing supply chain

1. **The residential housing supply chain is a highly-fragmented system.** Professionals and tradespeople tend to work in silos, with little cross-communication or understanding of how the different roles interact and affect energy efficiency outcomes. As a result, it is common that changes and substitutions to the building design during construction lead to the finished building being less energy efficient than originally designed. In addition, tradespeople can undo or compromise the energy efficiency measures installed by others.

2. **Lack of enforcement means that mandated minimum energy efficiency outcomes are not achieved.** The fragmented nature of the supply chain and lack of a compliance regime means that the energy performance of finished buildings may not meet the original design standard and/or minimum regulatory requirements. Promoting a shared understanding among the actors in the supply chain will support the realisation of energy efficiency outcomes; however, a robust compliance regime coupled with communication of dwelling performance as constructed to consumers are necessary conditions to transform the incentives among industry actors.

6.1.2 Motivations for accessing new skills and taking up training

3. **Commercial incentives drive industry skills development.** Overall, energy efficiency is still considered to be a niche market. The majority of the residential housing industry supply chain will only invest in skills development if it can bring a business advantage in the form of more customers or a price premium. However, stakeholders indicated that, faced with a demand for energy efficiency skills and knowledge from customers, building professionals and tradespeople would often find ways to access the required know-how through informal learning and existing networks. This suggests that informal learning is prioritised over formal training programs, unless the latter can provide a clear advantage in terms of business or job opportunities.

4. **Government can shape the demand for energy efficiency skills and training.** Government is another key driver shaping demand for skills development and training through its policy setting and regulatory function, for example creating new markets for activities such as home energy ratings. Any mandated training need to be consistent with the role of government, such as the public good in ensuring quality and safety standards. Further, training requirements need to consider the financial
and time costs of participating in training—costs that are too high will either result in skills gaps where people opt to not participate in training or in unregulated activity occurring.

6.1.3 Embedding energy efficiency skills in the supply chain

5. **Skills to communicate energy efficiency to consumers in a clear language to which they can relate are lacking among the residential housing supply chain.** Focusing on technical aspects of energy efficiency, rather than its benefits in terms of comfort, well-being and bill savings can be a barrier for consumer buy-in. However, stakeholders reported that these skills are not readily available in the residential housing supply chain currently. This lack of skills to communicate to consumers was identified as one of the key gaps preventing several actors in the residential housing supply chain for effectively advocating for more energy efficient solutions.

6. **The energy efficiency advisory role should be embedded throughout the supply chain.** When the energy performance of a dwelling is made transparent to consumers through a home energy rating, a number of actors in the residential housing supply chain could play a supporting role in advising home owners on potential improvements to building performance.

Embedding the advisory role among existing actors and enabling these to opportunistically advocate for energy efficiency upgrades when the home owner is already considering undertaking building works is likely to support the mainstreaming of energy efficiency from its current position as a niche market. Actors that could play this supporting role include architects/building designers and builders at the point when a home owner is considering undertaking a renovation. In addition tradespeople coming into contact with home owners at the point of equipment breakdown could play a role in advising and advocating for more energy efficient replacement options.

6.1.4 The balance between advanced skills and energy efficiency basics

7. **Attitudes to lifelong learning differ between groups and learning preferences are changing.** Many people in the residential housing supply chain are time poor. Not all professions and trades have a well-established culture of life-long learning. The cost of training, including the opportunity cost, can also be a deterrent for uptake. These considerations, coupled with technological change, mean that the approach to training needs to be updated. Traditional face-to-face training will continue to play a role. However, online training will provide opportunities for bite-sized, just-in-time learning on the go, as well as greater opportunities to undertake practical learning activities remotely.

8. **New technologies and products mean that remaining up-to-date on the latest developments is challenging for key actors in the residential housing supply chain.** New and changing products, technologies and standards mean knowledge needs to be continuously updated throughout the supply chain. Manufacturers play a role in informing the industry about new products and technologies, but tend to do this on an ad-hoc basis. Therefore, in the absence of a centralised database of energy efficient equipment, it can be challenging for the industry to keep abreast of latest developments.

9. **New skills will be needed to unleash the potential of new technologies, but first there is a need to focus on getting the basics right.** The increasing availability of energy data through smart meters and technologies such as interconnected devices provides new opportunities for energy management, but also requires new skills in analysing and interpreting the data. However, many stakeholders emphasised the need to improve basic skills and practices at all stages of the dwelling lifecycle to achieve minimum regulatory requirements as the most important action that can be taken to improve energy efficient in the residential built environment.

6.2 Skills and training gaps in the residential housing supply chain

Overall, the knowledge base on energy efficiency in the residential housing supply chain is not yet well-established. Where training on energy efficiency is available, uptake has been limited to a small proportion of the industry. Other actors have no defined skills development available to them.

Table 6.1 summarises the priority actors most likely to have an impact on a dwelling’s energy performance by lifecycle stage, and the key gaps currently preventing energy efficiency outcomes from being realised.
The following paragraphs discuss the key gaps and challenges for actors in the residential housing supply chain, grouped in six distinct categories.

1. **The occupation is undergoing professionalisation and there is no current energy efficiency training offering**

   *Strata managers* were regarded as a group in need of greater upskilling more generally, not only in relation to energy efficiency. The key challenges are upskilling the profession more generally, as well as embedding a culture of CPD.

   To date, energy efficiency of common areas has not been a consideration for strata corporate bodies, and strata managers have therefore had no incentive to upskill in this area. However, the development of the NABERS rating tool for multi-unit apartment buildings is aimed at stimulating demand in the sector. As a consequence, the incentives for strata managers to take up energy efficiency training may strengthen in the future.

   Given the relatively weak culture of upskilling among the profession generically, a useful starting point would be to collaborate with other parties interested in developing the profession, and seek to embed knowledge of energy efficiency basics in the core training offering. In the future, training could also be linked to the NABERS training tool, covering the key actions a strata manager can undertake to improve the rating.

2. **No dedicated training on energy efficiency exists**

   This is the case for *HVAC professionals* in the residential sector (although well-developed training in the commercial sector exists). Oversizing and lack of skills to install energy efficient equipment were highlighted by stakeholders as key skills gaps. In the context of energy ratings communicating a dwelling’s energy performance to consumers, the commercial incentives for HVAC professionals to undertake energy efficiency and gain the required skills may increase.

   *Certifiers* and *surveyors* currently have no access to dedicated energy efficiency training but also no incentive to take up training. Under the current regulatory regime, energy efficiency is not verified during or after construction. Should the regime change to include greater focus on compliance with minimum standards, new skills and training would be needed for certifiers and surveyors. Key areas of development include an understanding of building thermal performance and skills to assess the impact of substitutions made during construction relative to the designer’s specification.
Property inspectors are another group with no dedicated energy efficiency training. However, many property inspectors have a background as an architect or a builder, and therefore may have some pre-existing knowledge about energy efficiency considerations. This cohort has been identified as a potential group to deliver home energy ratings, and may be a candidate for future training schemes.

3. Past initiatives have built up some skills in energy efficiency, but current training offering is not strong

This is the case for electricians, where the Green Skills Agreement provided an initial impetus for energy efficiency related training. However, a lack of follow-through has meant that the training courses are no longer current or on offer. Further development is needed to update course content and ensure greater diffusion of energy efficiency knowledge among the trades. The emergence of new technologies, particularly in energy management, may create new business opportunities and therefore strengthen the incentives for upskilling.

4. Training courses in energy efficiency exist, but encouraging uptake can be challenging

Real estate agents are an example of a group for which dedicated training has been developed, but uptake among the profession has at times disappointed. Currently, it appears that there is little commercial incentive for agents to participate in training, as energy efficiency skills are unlikely to lead to higher profits. However, energy ratings at the point of sale or lease have been shown to result in a price premium for dwellings with a star rating, and the introduction of ratings systems in NSW and Victoria may therefore increase the commercial motivations for this group.119

Insulation installers and glaziers are other cohorts where uptake of training has proved challenging. Training exists for plumbers, but uptake in recent years has been weak. Take-up of energy efficiency training among builders has been relatively strong; however, take up of accreditation has been weaker, indicating that it does not provide added value in terms of increased business opportunities. Overall, the commercial motivations for these actors to implement energy efficiency are currently not strong, but may increase if energy ratings and other programs lead to an increase in demand for energy efficiency.

Energy and thermal assessors are often sole traders, and the opportunity cost of undertaking training can be high. As a consequence, assessors are likely to only participate in training and CPD where this is a regulatory requirement. As buildings are becoming more complex, a potential expansion of the assessor’s in the future is to provide more comprehensive advice to building designers and architects on how to meet minimum energy efficiency standards, requiring upskilling among the industry. However, demand for this service is likely to only materialise in the context of increasing stringency of minimum standards, and an effective compliance regime ensuring that buildings are constructed to the designed standard.

5. Training in energy efficiency exist, but achieving change in practice is dependent on client requirements.

Architects and building designers have an established culture of CPD, and encouraging uptake of energy efficiency related courses is less challenging than for other cohorts. However, this knowledge will only deliver outcomes if it is used in the design of new dwellings and renovation projects.

Energy efficiency outcomes are only realised when required or prioritised by the client. At present architects and building designers are perceived to lack the skills to communicate the benefits of energy efficiency to consumers, and as a result are unable to effectively advocate for energy efficiency among competing priorities such as aesthetics.

6. No gaps currently exist, but changing technologies require continual updating of both knowledge and content of training.

Renewable energy installers are well covered by existing training, with a number of VET training programs as well as a rigorous accreditation program in place. However, as new technologies such as battery storage emerge, industry participants will need CPD, and new training courses will need to come on stream to reflect technological trends.

6.3 Recommendations for addressing skills and training gaps

An active training market for energy efficiency skills exists in both NSW and Victoria, with a range of industry and VET sector providers offering courses at various points in the residential housing supply chain. The supply of training will largely be driven by demand from industry participants; however, to date the uptake of training has not been strong and energy efficiency skills and knowledge are not yet well established in the residential housing market supply chain. As a result, the skills and training gaps identified in this report may play a role in preventing technically feasible and cost effective energy efficiency outcomes from being realised in the residential housing market.

Training providers in the VET sector and in industry will take the lead in developing new training courses and updating the existing offering to meet future skills needs, and will do so largely in response to demand for training. However, government has a unique ability to provide leadership and coordination to a highly fragmented supply chain and can, therefore, support the training market in addressing skills and training gaps and encourage actors in the residential housing market to take up training. Actions to address the skills and training gaps can be framed around four objectives, discussed in the next paragraphs.

**Objective 1: strengthen the commercial incentive to engage in energy efficiency training.** The majority of the residential housing market supply chain will only participate in energy efficiency and energy management training if the skills gained provide a clear business advantage—in other words if the benefits of participating in training outweigh the costs. A core objective for government action is therefore to support uptake of training through strengthening the commercial incentive to gain new skills and knowledge and reducing the cost, including the opportunity cost, of participating in training.

**Objective 2: build a consistent base of knowledge throughout the supply chain.** The residential housing market supply chain is highly fragmented, with professionals and tradespeople often working in silos with little overlap. Likewise, the education and training opportunities currently available are largely focused on specific technical skills to perform a particular function. In this context of fragmentation and specialisation, government is uniquely placed to create the framework needed to ensure that actors in the residential housing supply chain share a common base knowledge about energy efficiency. Further, through providing clear signals of its policy priorities, government can encourage the incorporation of energy efficiency in the curricula for basic training for actors throughout the supply chain.

**Objective 3: offer training tailored to the needs of the audience.** The commercial incentives for actors in the residential housing supply chain to undertake actions supporting energy efficiency outcomes differ, and are in many cases influenced by government policies and programs. Further, different actors have varying degrees of influence over energy efficiency outcomes in dwellings, varying access to training and skills development and varying basic knowledge and skills in relation to energy efficiency. Therefore, the need to build a consistent knowledge base throughout the supply chain must be balanced with the need to ensure that the training offering is tailored to the context and incentives of the key actor(s) at which the training is aimed.

**Objective 4: build on the existing base when developing new initiatives.** A range of energy efficiency training programs are already available to actors in the residential housing supply chain, and a range of training providers from both the VET sector and industry are active in providing courses and developing new initiatives. Government action should seek to build on, rather than supplant or duplicate, these existing initiatives, and should be focussed on providing a greater degree of harmonisation to what is a fairly fragmented training landscape.

The remainder of the section discusses the strategies NSW and Victoria could adopt when seeking to address skills and training gaps in the residential housing market supply chain.

**Objective 1: strengthen the commercial incentive to engage in energy efficiency training**

1. **Pursue nationally consistent policy, with a long-term commitment to the development of energy efficiency skills**

Upskilling in energy efficiency is one competing priority among many, and industry associations, companies and individuals are likely to be reluctant to make substantial investments in initiatives they
believe to be of only short duration or which do not have broad applicability. Consequently, training initiatives need to be aligned with existing and planned government policies, programs and regulations which are likely to drive up the demand for energy efficiency in the residential housing sector.

In the past, changing government priorities and differences between jurisdictions have been key challenges for embedding energy efficiency in the residential housing supply chain on a sustained basis. Providing market participants with investment certainty is essential; training and upskilling initiatives—clearly linked to existing and forthcoming government policies and priorities—should therefore be planned on a 5-10 year time horizon, sending a clear signal of government commitment which has in the past been lacking.

Consistency across jurisdictions, where possible, will reduce transaction costs and further strengthen the signal of government commitment. As an example, NSW and Victoria could work towards harmonising their respective home energy rating tools and adopt a single set of training and accreditation requirements for delivering ratings. Further, both states should continue advocating for the national adoption of a harmonised rating system through COAG.

2. **Reduce the opportunity cost of participating in training**

Being time poor is often reported as an obstacle to upskilling, as is the cost (including the opportunity cost), especially for professions that are not used to undertaking training and CPD.

Through providing funding to industry partners to develop and deliver training courses, government plays a role in shaping the upskilling opportunities available to actors in the residential housing supply chain. Further, in the context of its own schemes where it sets a mandated minimum standard for participation, governments should consider the opportunity cost of its training and accreditation requirements.

To reduce the opportunity cost of accessing training, government should adopt the following principles when collaborating with industry partners and setting training requirements for its own schemes:

a) **Offer flexible training modes to suit diverse needs**

Training should be offered through multiple modes to suit the needs and priorities of different cohorts and individuals.

Some groups may prefer easy to access, bitesize training (such as videos that can be watched when on-the-go) that can be built on over time and accessed between engagements. This type of training can be coupled with questions or quizzes at the end to ensure that learning outcomes have been achieved. Others may prefer to learn through more traditional methods such as through face-to-face courses.

Finding the right method or methods to engage the desired audience is likely to require some experimentation, and it can be useful to offer participants a range of options to suit their individual learning styles and preferences.

b) **Retain balance between flexibility and rigour of training and accreditation requirements**

Many stakeholders expressed support for accreditation of people undertaking home energy rating. In addition, addressing the needs of vulnerable groups such as low income households, is likely to require specialist training. However, training and accreditation requirements that are too stringent will result in a lack of participation or in unregulated activity taking place. Any mandatory requirements for participation in a particular scheme therefore need to ensure a balance between the competing needs for rigour and flexibility.

**Objective 2: build a consistent base of knowledge throughout the supply chain**

3. **Provide harmonised and consistent base knowledge of energy efficiency to all actors in the residential housing supply chain**

The residential housing market supply chain is highly fragmented with industry actors often working in silos. Providing all industry actors with the same basic level of energy efficiency knowledge and skills through a harmonised training scheme would help develop a shared systems view of each actor’s role in delivering energy efficiency outcomes. This shared systems view should be coupled with tailored
training specific to each profession or trade to ensure they have the required technical skills to undertake energy efficiency actions in their day-to-day role.

While industry would take the leading role in developing and delivering the training, government can support the scheme through:
- providing policy certainty
- providing initial seed funding
- coordinating industry participants who may not normally collaborate
- providing a stamp of approval enhancing the credibility of the scheme.

Training should be relevant, targeted and scalable, allowing an individual to access basic skills relevant to their role, and gradually build their expertise as needed.

The basic training should focus on the systems view of energy efficiency to develop a shared understanding of how the entirety of the residential housing supply chain contributes to energy efficiency. Additionally, communicating the benefits of energy efficiency to consumers in a language they can relate to is a skill required throughout the supply chain.

The scheme could carry the same name through different housing lifecycle stages and for different industry actors, delivering a recognisable qualification or passport.

In addition, the scheme should include a single place where people can search and find training and/or information relevant to their particular need at that point in time.

4. **Embed energy efficiency in basic training for all actors in the residential housing supply chain.**

   While progress has been made for a number of industry actors to embed energy efficiency in the basic trade training or professional education, it is often as an optional module rather than a core course requirement.

   While developing training content is primarily a function of industry and the training and education sector, government can encourage the incorporation of energy efficiency in curricula through providing clear direction on its policy priorities. This will enable industry to work on training packages to be able to roll these out in a timely manner when the demand for training occurs.

**Objective 3: offer training tailored to the needs of the audience**

5. **Encourage uptake of existing training where this is already on offer**

   A range of key actors (such as architects, building designers, builders and real estate agents) already have access to training on energy efficiency, relevant to their specific role. Government should, in collaboration with industry, continue to encourage uptake of these courses.

   A role for government in promoting the uptake of training is through communicating the impact of its policies of the commercial incentives of actors in the residential housing supply chain. For example, the introduction of residential rating schemes may strengthen the incentives for real estate agents to gain new skills in how to effectively market properties with a higher rating.

   Further, government can support industry in addressing specific skills gaps (such as effectively advocating for the benefits energy efficiency in a language consumers can relate to) through providing seed-funding for new courses and initiatives.

6. **Develop training for industry actors where this is currently not available**

   A number of key actors (such as strata managers, property inspectors and electricians) currently have little or no access to energy efficiency training. This may be because:
   - previously available funding has been discontinued
   - energy efficiency is not seen as relevant to the role
   - the culture of upskilling is not strong
   - the industry is still developing professional standards and practices for its members.

   For these actors, government can support the development and uptake of training through:
   - communicating the relevance and benefits of energy efficiency (specific to the industry actor), strengthening the incentives to take up training—for example, in the context of residential energy ratings being available, property inspectors may come to play a greater role at the point of sale
Objective 4: build on the existing base when developing new initiatives

7. Work with existing schemes

A number of energy efficiency training schemes already exist and any new initiatives should seek to build on and enhance, rather than supplant, existing training.

For example, the Liveability Framework developed for real estate agents—aimed at providing the tools to clearly communicate the benefits of energy efficiency and sustainability to consumers—could form the basis of a training for other key actors on how to communicate the benefits of energy efficiency to consumers. As another example, the NEEBP, funded and coordinated through COAG, is already in place to identify and address weaknesses in compliance with the NCC energy standards.

8. Continue to work with industry partners in developing and delivering training

Through its coordinating role, government can facilitate consistent training for different actors at different parts of the supply chain. In addition, government leadership provides a quality stamp trusted by industry participants and sends a signal of longer-term policy commitment.

In turn, industry involvement helps ensure that training is seen to be relevant and current for the trades and professions. Additionally, industry associations play an important role in identifying training needs and promoting the offering to their members.
Table A.1 outlines the stakeholders consulted as part of this project.

**TABLE A.1 STAKEHOLDERS CONSULTED**

<table>
<thead>
<tr>
<th>Category</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architects and designers</td>
<td>Australian Institute of Architects</td>
</tr>
<tr>
<td>Builders</td>
<td>Building Professionals Board NSW</td>
</tr>
<tr>
<td></td>
<td>Master Builders of Australia (Victoria)</td>
</tr>
<tr>
<td></td>
<td>Housing Industry Association</td>
</tr>
<tr>
<td>Building inspectors, assessors and</td>
<td>Australian Building Sustainability Association</td>
</tr>
<tr>
<td>standards setters</td>
<td>Building Designers Association Victoria</td>
</tr>
<tr>
<td></td>
<td>Green Building Council of Australia</td>
</tr>
<tr>
<td>Education</td>
<td>Supply Chain Sustainability School of Australia</td>
</tr>
<tr>
<td></td>
<td>TAFE NSW</td>
</tr>
<tr>
<td></td>
<td>Melbourne Polytechnic</td>
</tr>
<tr>
<td></td>
<td>SkillsOz</td>
</tr>
<tr>
<td>Industry Reference Committees</td>
<td>Electrical IRC: Electrotechnology, Power and Communications Industries</td>
</tr>
<tr>
<td></td>
<td>(EPIC) Industry Training Board</td>
</tr>
<tr>
<td></td>
<td>Manufacturing IRC: Innovation &amp; Business Skills Australia</td>
</tr>
<tr>
<td>Not-for-profits</td>
<td>Kildonan Uniting Care</td>
</tr>
<tr>
<td></td>
<td>Brotherhood of St Laurence</td>
</tr>
<tr>
<td>Others</td>
<td>Energy Efficiency Council</td>
</tr>
<tr>
<td></td>
<td>Living Futures Institute Australia</td>
</tr>
<tr>
<td></td>
<td>National Energy Efficient Building Project</td>
</tr>
<tr>
<td>Products and service suppliers</td>
<td>Australian Institute of Refrigeration, Air Conditioning and Heating</td>
</tr>
<tr>
<td></td>
<td>Australian Windows Association (AWA)</td>
</tr>
<tr>
<td></td>
<td>CSR Building Products</td>
</tr>
<tr>
<td></td>
<td>Insulation Council of Australia and New Zealand (ICANZ)</td>
</tr>
<tr>
<td>Real estate industry</td>
<td>Green Strata</td>
</tr>
<tr>
<td></td>
<td>Real Estate Institute of Australia NSW</td>
</tr>
<tr>
<td>Category</td>
<td>Organisation</td>
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<tr>
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<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>Property Council of Australia</td>
<td>Weldonco</td>
</tr>
<tr>
<td>Specialised trades</td>
<td>Plumbing Industry Climate Action Centre</td>
</tr>
<tr>
<td></td>
<td>Master Plumbers Australia</td>
</tr>
<tr>
<td></td>
<td>National Electrical Contractors Association (NECA)</td>
</tr>
<tr>
<td>Invited, but chose not to participate</td>
<td>Green Business Audit &amp; Training</td>
</tr>
<tr>
<td>Others</td>
<td>Engineers Australia</td>
</tr>
</tbody>
</table>
INDUSTRY CPD AND ACCREDITATION
Table B.1 provides an overview of the CPD schemes currently on offer for actors in the commercial and residential sectors.

<table>
<thead>
<tr>
<th>Supply chain actor</th>
<th>Training name</th>
<th>Training topic</th>
<th>Developed by</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architects</td>
<td>Sustainable design</td>
<td>Promotion of energy efficient housing</td>
<td>Australian Institute of Architects</td>
<td>Online courses available include: The integrative design process – a new approach for sustainable design; Carbon centred approach to sustainable design; Climate driven design: energy efficiency by degrees; Inspiring sustainable design; Maximising energy efficiency in residential design; Sustainable design for low carbon footprint; Integrating solar technology.</td>
</tr>
<tr>
<td>Architects; Building designers</td>
<td>Sustainable design</td>
<td>Building Designers Association of Australia, NSW OEH, Australian Living</td>
<td></td>
<td>Sustainability Design Specialist (SDS) Masterclass is a comprehensive four-day training course that has been developed collaboratively by senior members of BDA Australia and Australian Institute of Architects to significantly raise the level of sustainability knowledge of residential building designers and architects. It covers four modules: thermal performance, water and waste water, energy systems, good materials.</td>
</tr>
<tr>
<td>Architects; Building designers</td>
<td>Building Design Association (Victoria)</td>
<td>Sustainable design</td>
<td>Building Designers Association of Australia (Victoria)</td>
<td>BDAV runs bi-monthly Metropolitan seminars; monthly webinars; quarterly regional seminars (6 regions); and additional workshops at need. For those unable to attend, and especially for our regional and interstate membership, DVDs and webinar downloads are available after the events.</td>
</tr>
<tr>
<td>Builders</td>
<td>Green Card-Spill Kit Introduction</td>
<td>Sustainable building</td>
<td>Master Builders Association Victoria</td>
<td>The “Green Card” offers basic awareness in a similar role as to the White Card (Construction Induction Training). No person should enter a building site without an understanding of the basic knowledge of obeying environmental procedures or the skills to competently operate environmental equipment.</td>
</tr>
<tr>
<td>Builders; surveyors</td>
<td>Annual CPD</td>
<td>Sustainable building</td>
<td>Australian Institute of Building Surveyors</td>
<td>Annual CPD as requirement of membership; includes short online course on energy efficiency (waste management)</td>
</tr>
<tr>
<td>Energy auditors</td>
<td>Energy Auditing to the Australian Standard</td>
<td>Energy efficiency assessment</td>
<td>Energy Efficiency Council</td>
<td>One day training program will give energy audit practitioners the skills and knowledge to deliver energy audits that meet with the Australian Standard 3598:2014 parts 1 &amp; 2.</td>
</tr>
<tr>
<td>Engineers (civil/structural)</td>
<td>Engineers Australia</td>
<td>Sustainable design</td>
<td>Engineers Australia</td>
<td>Design of photovoltaic systems; Environmentally sustainable manufacturing; Grid connected PV systems with battery storage; Solar power system fundamentals; Sustainable and safe design</td>
</tr>
<tr>
<td>Facilities managers</td>
<td>Energy management for facility managers</td>
<td>Energy management</td>
<td>Energy Efficiency Council</td>
<td>A one day Masterclass for facility managers looking to implement sensible energy management practices across their business</td>
</tr>
<tr>
<td>Facilities managers; Sustainable Building building operators; engineers</td>
<td>Sustainable Building Operation</td>
<td>Sustainable building</td>
<td>Australian Institute of Refrigeration, Air Conditioning and Heating</td>
<td>Sustainable Building Operation topics covered: Science of climate change; The building and its environment; The building as a system; The sustainable building; Managing the building; Changing performance; Review of case studies</td>
</tr>
<tr>
<td>Glaziers</td>
<td>Advanced Energy</td>
<td>Energy management</td>
<td>Australian Window Association</td>
<td>Course covers energy efficiency principles; glazing and BASIX calculators; window library; efficient glazing tool. The four-hour course is customised for AWA members and delivered in-house to 10-15 participants.</td>
</tr>
<tr>
<td>Supply chain actor</td>
<td>Training name</td>
<td>Training topic</td>
<td>Developed by</td>
<td>Description</td>
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</tr>
<tr>
<td>HVAC designers, installers and service technicians</td>
<td>Climate change, sustainability and HVAC</td>
<td>Sustainable building</td>
<td>Australian Institute of Refrigeration, Air Conditioning and Heating</td>
<td>Climate change, sustainability and HVAC topics covered: The sustainable building; Adapting to climate change; Energy consumption; Embodied energy; Energy sources; Building envelope, orientation and shading; Insulation and glazing; Lighting; Passive heating and cooling; Mechanical efficiencies; Alternative HVAC systems; Design strategies; Existing buildings; Building Information Modelling; Performance and operation strategies; Business cases. Focus on the commercial sector.</td>
</tr>
<tr>
<td>HVAC designers, installers and service technicians</td>
<td>NCC Volume 1 Energy Efficiency Provisions</td>
<td>Sustainable building</td>
<td>Australian Institute of Refrigeration, Air Conditioning and Heating</td>
<td>Provides training in the energy efficiency requirements for the NCC Volume One. It aims to provide practitioners with sufficient knowledge to successfully apply energy efficiency requirements for multi-residential, commercial and public buildings.</td>
</tr>
</tbody>
</table>
| Insulation installers | Insulation Handbook | Sustainable building | Insulation Council of Australia and New Zealand | This handbook has been developed to assist designers, specifiers and builders to:  
- determine the Total R-value of construction systems  
- increase energy efficiency and reduce environmental impact of building projects  
- assist in complying with the requirements of the Building Code of Australia, AS/NZS 4859.1 and energy rating software  
- demonstrate accepted industry installation practices  
- clarify and standardise the value of reflective foil insulation in typical building application |
| Plumbers | Plumbing Industry Climate Action Centre | Sustainable building | Master Plumbers’ Association | The course is designed around individual units or topics that relate to specific areas of sustainable plumbing, such as:  
- energy efficient plumbing  
- solar hot water  
- urban alternative water  
- suburban pump systems  
- environmental inspections. |
<p>| Property managers | Introduction to energy management | Energy management | Energy Efficiency Council | An introduction to energy management, so businesses can maintain their competitive advantage and increase productivity. |
| Property managers; Facilities managers | Battery storage for business | Energy management | Energy Efficiency Council | This masterclass is designed to help professionals confidently navigate through this new and complex environment. Masterclass participants will gain an understanding of both technical and financial considerations and the benefits, risks and usage scenarios for different battery chemistries. |
| Property managers; Facilities managers | Building the business case for energy efficiency | Energy management | Energy Efficiency Council | Identifying energy efficiency projects is a key step in reducing business costs and increasing productivity. This interactive training course helps participants plan, develop and communicate the business case for energy efficiency projects. |</p>
<table>
<thead>
<tr>
<th>Supply chain actor</th>
<th>Training name</th>
<th>Training topic</th>
<th>Developed by</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real estate agents</strong></td>
<td>Liveability Real Estate Framework</td>
<td>Promotion of energy efficient housing</td>
<td>The Centre for Liveability Real Estate</td>
<td>The Liveability Real Estate Framework is “features-based” framework which enables salespeople or property managers to simply and effectively identify a new collection of Liveability Features™ into the point of sale or rent. The training course enables sales agents and property managers to integrate these Liveability Features™ into their normal appraisal processes in a robust and systematic way.</td>
</tr>
<tr>
<td><strong>All supply chain actors</strong></td>
<td>Supply Chain Sustainability School</td>
<td>Sustainable building</td>
<td>Supply Chain Sustainability School</td>
<td>The objective of the School is to increase sustainability knowledge and competency among supply chain participants in the Australian construction and infrastructure sector, with a particular focus on small to medium enterprises. This is being achieved by providing an e-learning platform and face-to-face training for construction suppliers, contractors and service providers. This gives supply chain participants the knowledge and tools needed to meet increasing sustainability demands and performance benchmarks in a cost-effective manner.</td>
</tr>
</tbody>
</table>

Table B.2 provides an overview of the accreditation schemes currently on offer for actors in the commercial and residential sectors.

<table>
<thead>
<tr>
<th>Supply chain actor</th>
<th>Accreditation name</th>
<th>Accreditation topic</th>
<th>Managed by</th>
<th>Sector</th>
<th>Jurisdiction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architects; Building designers</td>
<td>Green Star Accredited Professional</td>
<td>Sustainable design</td>
<td>Green Building Council of Australia</td>
<td>Both</td>
<td>National</td>
<td>Completion of Green Star Foundation Course; participation in ongoing CPD; successful completion on the GSAP online exam.</td>
</tr>
<tr>
<td>Architects; Building designers</td>
<td>Certified Passive House Designer/Consultant</td>
<td>Sustainable design</td>
<td>Australian Passive House Association</td>
<td>Residential</td>
<td>National</td>
<td>Applicants will need to be qualified and experienced in a building related discipline to become a Passive House Designer. There are no prerequisites to become a Passive House Consultant, although knowledge of building construction and building design is an advantage.</td>
</tr>
<tr>
<td>Builders</td>
<td>Master Builders Green Living-Domestic</td>
<td>Sustainable building</td>
<td>Master Builders Association Victoria</td>
<td>Residential</td>
<td>Victoria</td>
<td>For accreditation, members must successfully complete the 2 units of competency linked to the course: CPCCBC4020A Build thermally efficient and sustainable structures; CPCCBC4021A Minimise waste on the building and construction site. Complete the accreditation form; complete the annual report attached and pay an annual fee of $95 after the first year; current registration with VBA.</td>
</tr>
<tr>
<td>Builders</td>
<td>GreenSmart</td>
<td>Sustainable building</td>
<td>Housing Industry Association</td>
<td>Residential</td>
<td>National</td>
<td>GreenSmart Professional Training is a 2-day course, providing recognised environmental building skills for more sustainable residential design and construction. The course covers: thermal performance, passive solar design and natural ventilation, design and operational issues for water and energy efficiency, selection of water and energy efficient appliances, lighting, sustainable building, design, marketing sustainable housing to clients.</td>
</tr>
<tr>
<td>Builders</td>
<td>Certified Passive House Tradesperson</td>
<td>Sustainable building</td>
<td>Australian Passive House Association</td>
<td>Residential</td>
<td>National</td>
<td>This course is aimed at building contractors looking to learn the skills and knowledge required to understand how to build to the International Passive House standard. This 5-day course covers the Building Envelope and Mechanical Systems specialities. You must be a qualified and experienced tradesperson or building design professional.</td>
</tr>
<tr>
<td>Builders; plumbers</td>
<td>GreenSmart - Kitchen &amp; Bathroom</td>
<td>Sustainable building</td>
<td>Housing Industry Association</td>
<td>Residential</td>
<td>National</td>
<td>The course covers: Sustainability in the Built Environment; Design Considerations; Materials and Fixtures; Energy Considerations; Greenwash; Promoting your GreenSmart Credentials; GreenSmart Professional Logos; Developing a marketing strategy; Reaching future clients; Useful resources and checklists; Relevant CPD points available.</td>
</tr>
<tr>
<td>Supply chain actor</td>
<td>Accreditation name</td>
<td>Accreditation topic</td>
<td>Managed by</td>
<td>Sector</td>
<td>Jurisdiction</td>
<td>Description</td>
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</tr>
<tr>
<td>Developers</td>
<td>EnviroDevelopment</td>
<td>Sustainable design</td>
<td>Urban Design Institute of Australia (Victoria)</td>
<td>Both</td>
<td>Victoria</td>
<td>Completion of EnviroDevelopment Course</td>
</tr>
<tr>
<td>Electricians; renewable energy installers</td>
<td>Solar PV Accredited Installer</td>
<td>Energy management</td>
<td>Clean Energy Council</td>
<td>Both</td>
<td>National</td>
<td>Successful completion of relevant qualification; electrical licence (for grid-connect installation); application to the CEC for provisional accreditation; full accreditation after 3 months with case study of successful installation.</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>NABERS Accredited Assessor</td>
<td>Building inspection</td>
<td>NSW Office of Environment and Heritage</td>
<td>Commercial</td>
<td>National</td>
<td>NABERS Accredited Assessor training, comprising introductory online course NABERS Essentials, a one day Core Assessor Course, and the Accreditation Modules for the tool(s) accreditation is sought for. No formal prerequisites, but relevant qualifications and technical expertise strongly encouraged. First assessments overseen by NABERS supervisors.</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>ESS Accredited Certificate Provider</td>
<td>Other accreditation</td>
<td>NSW Independent Pricing and Regulatory Tribunal</td>
<td>Both</td>
<td>NSW</td>
<td>None specified</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>Residential Thermal Performance Assessor</td>
<td>Sustainable design</td>
<td>Building Designers Association of Victoria</td>
<td>Residential</td>
<td>Victoria</td>
<td>Application to the Building Designer Association of Victoria, with Cert IV NatHERS Assessment as a prerequisite.</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>Home Sustainability Assessor</td>
<td>Energy efficiency assessment; installation and maintenance services</td>
<td>Building Designers Association of Victoria</td>
<td>Residential</td>
<td>Victoria</td>
<td>Certificate IV in Home Sustainability Assessment</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>NatHERS Accredited Assessor</td>
<td>Building inspection</td>
<td>Australian Building Sustainability Association</td>
<td>Residential</td>
<td>National</td>
<td>Certificate IV in Home Sustainability Assessment</td>
</tr>
<tr>
<td>Energy efficiency auditor</td>
<td>Victorian Energy Efficiency Target (VEET) Scheme</td>
<td>Energy efficiency assessment; installation and maintenance services</td>
<td>Essential Services Commission</td>
<td>Both</td>
<td>Victoria</td>
<td>Detailed application to the ESC</td>
</tr>
<tr>
<td>Supply chain actor</td>
<td>Accreditation name</td>
<td>Accreditation topic</td>
<td>Managed by</td>
<td>Sector</td>
<td>Jurisdiction</td>
<td>Description</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Engineers (civil/structural)</td>
<td>Certified Energy Efficiency Specialist</td>
<td>Energy management</td>
<td>Energy Efficiency Council</td>
<td>Commercial</td>
<td>National</td>
<td>A degree in engineering, architecture, surveying, construction management or project management OR a mechanical or electrical trade qualification plus 1 year work experience in implementing commercial building energy efficiency retrofits</td>
</tr>
<tr>
<td>Engineers (civil/structural)</td>
<td>Certified Energy Efficiency Leader</td>
<td>Energy management</td>
<td>Energy Efficiency Council</td>
<td>Commercial</td>
<td>National</td>
<td>A degree in engineering, architecture, surveying, construction management or project management OR a mechanical or electrical trade qualification plus 3 years’ work experience in implementing commercial building energy efficiency retrofits</td>
</tr>
<tr>
<td>Engineers (civil/structural)</td>
<td>Certified Measurement &amp; Verification Professional</td>
<td>Energy efficiency assessment</td>
<td>Energy Efficiency Council</td>
<td>Both</td>
<td>National</td>
<td>Participants in the Measurement and Verification Training Course will learn how to design an M&amp;V strategy for projects that complies with the International Performance Measurement &amp; Verification Protocol and to manage the savings verification process for both internal and external reporting.</td>
</tr>
</tbody>
</table>

*Source: Information obtained directly from industry associations and websites, July 2017.*
ABOUT ACIL ALLEN CONSULTING

ACIL ALLEN CONSULTING IS ONE OF THE LARGEST INDEPENDENT, ECONOMIC, PUBLIC POLICY, AND PUBLIC AFFAIRS MANAGEMENT CONSULTING FIRMS IN AUSTRALIA.

WE ADVISE COMPANIES, INSTITUTIONS AND GOVERNMENTS ON ECONOMICS, POLICY AND CORPORATE PUBLIC AFFAIRS MANAGEMENT.

WE PROVIDE SENIOR ADVISORY SERVICES THAT BRING UNPARALLELED STRATEGIC THINKING AND REAL WORLD EXPERIENCE TO BEAR ON PROBLEM SOLVING AND STRATEGY FORMULATION.