



## National Energy Efficient Building Project

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# NATIONAL ENERGY EFFICIENT BUILDING PROJECT PHASE 3 - REPORT 1 DEEP DIVE PROJECT WORKSHOP AND SURVEY REPORT

Brisbane, Adelaide, Melbourne 2017

## Abstract

NEEBP Phase 3 consultation involved workshop in Brisbane, Melbourne and Adelaide to discuss the key factors affecting the capacity of regulators to verify compliance with the energy efficiency requirements of the National Construction code. This was followed up by a national survey. The raw data of these activities with some preliminary observations are contained within this report.

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## Contents

Executive Summary	i
1. Background to project	6
2. Methodology	6
3. Results discussion	3
4. Recommendations	19
5. Summary and Conclusion	23

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## Glossary and abbreviations

ABCB	Australian Building Construction Board
ABSA	Australian Building Sustainability Assessors
AIBS	Australian Institute of Building Surveyors
Class 1	Residential detached and semi-detached housing
COAG	Council of Australian Governments
CPD	Continuous Professional Development
EBP	Electronic Building Passport
EE	Energy Efficiency
GGE	Greenhouse Gas Emissions
HIA	Housing Industry Association
MBA	Master Builders Association
NCC	National Construction Code
NEEBP	National Energy Efficient Building Project

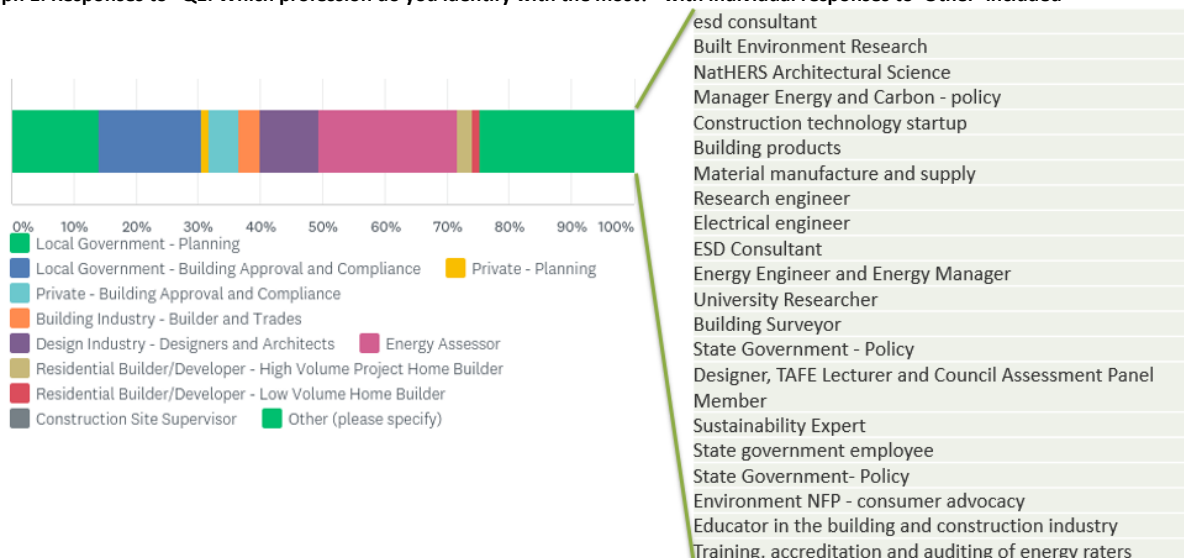
## Executive Summary

Sustain SA has delivered the National Energy Efficient Building Project (NEEBP) Phase 3 – Deep Dive Project (Improving Energy Efficiency Compliance) which was funded by the Council of Australian Governments (COAG) Energy Council National Productivity Plan and managed by the South Australian Government. dSquared and Healthy Environs provided support to this project based on their research experience in NEEBP Phase 2.

The NEEBP Deep Dive Project was tasked with consulting widely with private, commercial and local government regulators including planners, building surveyors, inspectors and associated officials. The primary aim of the consultation was to determine the priority activities to support regulators to further energy efficiency compliance for Class 1 (residential) buildings in Australia. The three workshops undertaken in Brisbane, Adelaide and Melbourne and the National Regulator Needs Survey, investigated the systems, tools, regulations and capacity building activities to enhance building energy efficiency compliance nationally. This project sought to validate previous research (NEEBP phases 1 and 2) regarding regulator priorities and value add to NEEBP activities already underway.

Responses to the Regulator Needs Survey were received from a variety of professions, shown in Graph 1 (below). Local Government opinion is well represented in the survey responses, as are the opinions of Energy Assessors. Whilst the private sector and various sectors of the building and design industries are slightly underrepresented in the survey, combined input from these professions was obtained across the consultation scope (survey and workshops).

**Graph 1: Responses to “Q1: Which profession do you identify with the most?” with individual responses to ‘Other’ included**



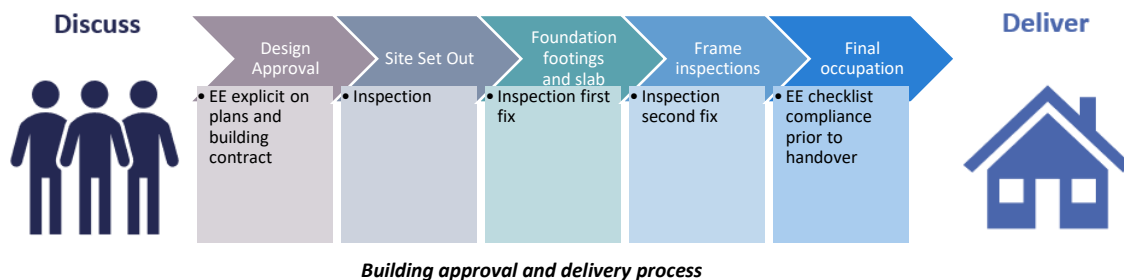
The completed survey responses and the input from the final project workshop (held in Melbourne) were reviewed to refine the observations into key actions. The results of the entire consultation process have validated some of the earlier findings of NEEBP phases 1 and 2 and established priority actions needed for regulators to drive compliance in energy efficiency. This report provides recommendations for further consideration and assessment, prior to final recommendations being presented to the to the National Energy Productivity Plan (NEPP), COAG Energy Council or, if appropriate, Building Ministers Forum or State Building Regulatory agencies.

**From assessing the outcomes of this project, there are clear recommendations for regulations and tools that will enhance energy efficiency compliance through the planning approval and building process, as follows:**

1. That Energy Efficiency (EE) should be explicitly outlined on the plans and building contract.
2. That a mandatory National EE Compliance Audit system or protocol should be developed and implemented.
3. That an EE compliance review checklist be undertaken prior to handover from the builder to the owner.

These recommendations are shown below in Diagram 1, which represents part of the design approval development and handover process.

**Diagram 1: Recommended pathway to delivering energy efficiency compliance through tools, systems, and regulation.**

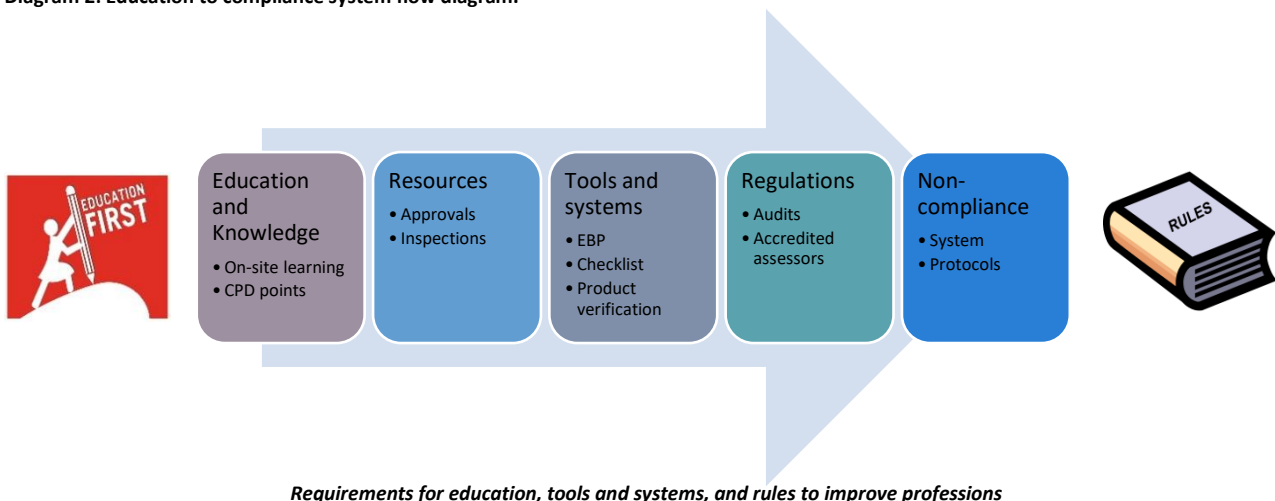


**Additionally, clear recommendations emerged on the systems and tools required to enhance energy efficiency. They are as follows:**

1. There is a need to develop a non-compliance system or protocol at a national level
2. Education, knowledge and training are essential and should be linked to Continuous Professional Development (CPD) points and undertaken on site where possible.
3. That an Electronic Building Passport (EBP) as a phone or tablet application (app) or web enabled program would be useful. It should be implemented using a 'phased in' approach, with product and installation verification systems being the top priority for an EBP system.
4. That resources and protocols be developed for auditing and inspections for use by assessors, builders, trades, planners and regulators.

Diagram 2 represents a systems approach for education through to compliance focussed activities. Some of these activities can take place concurrently. Consultation with the relevant stakeholders is required to find the optimal timing of each approach.

**Diagram 2: Education to compliance system flow diagram.**



The full recommendation list and process of filtering is contained within Appendix 7.

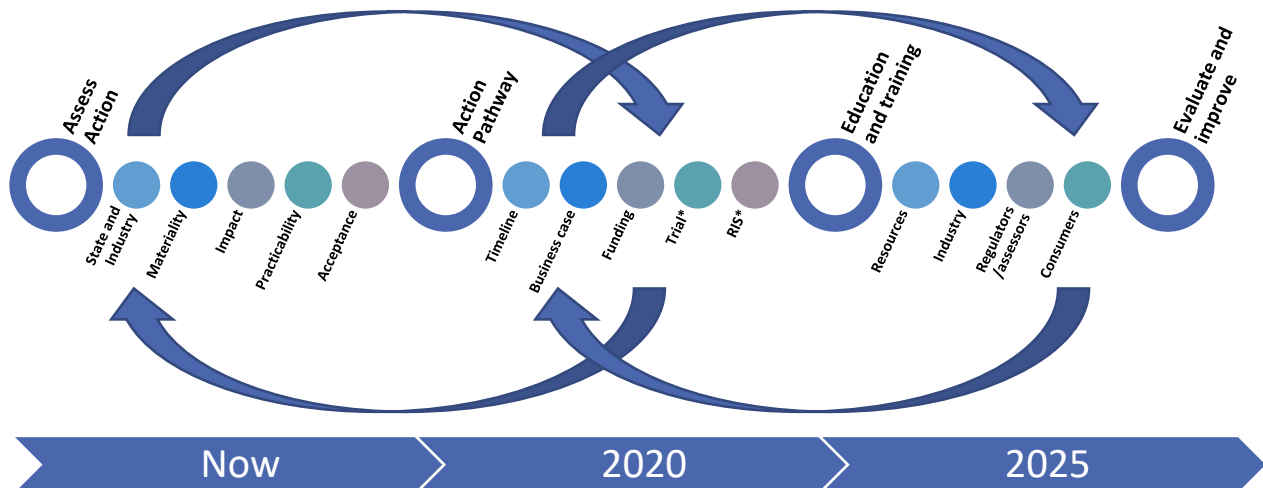
### Prioritisation and recommendations.

Following analysis from this consultation, a follow up survey was undertaken to test and validate the priorities. The results of this survey can be found in Report 2 Appendix 8 pg.88.

The final 6 recommended actions have been developed through a comprehensive review of the data, the feedback from the workshops, and comments provided through the Regulator Needs Survey. While we cannot give a statistical certainty to these actions being supported nationally or across all stakeholders, it is our professional opinion any action implemented will provide a positive improvement in national energy efficiency compliance.

Each action outlined will need to be assessed as to their political and material acceptance for all stakeholders. An action pathway will need to be developed based on an agreed evaluation system which is supported by education and training. The pathway should be geared to the success of all the actions. The Implementation Pathway in Diagram 3 is shown as a linear system, however depending on varying industry and political response or commitment some steps can be skipped or revisited. Because of this the expected timeline is fluid and as such the diagram only provides an indication of when actions could be implemented.

Diagram 3: Implementation pathway



The following 6 actions are considered the key high-level actions that will provide the best opportunity to support a regulatory system to improve energy efficiency compliance in Class 1 housing in Australia. There are complementary actions that have been raised through this project that are outlined in the body of this report (see pg. 24 and 25). It is important to note that a comprehensive plan across all six actions will cover off on tools, systems, regulations and capacity building to enhance energy efficiency compliance. There is no silver bullet; compliance requires all parts of the energy efficiency value chain to pull together.

Furthermore, it needs to be noted that the actions should be assessed against affordability, practicality, cost impacts, industry acceptance; and, market acknowledgment of the need for consistency and change, before implementation.

#### **Action 1**

*Mandate that energy efficiency rating documentation is a part of all building designs and plans, prior to building approval.*

#### **Comment**

It was clear from the survey feedback and the workshops that this was considered a very high priority in creating a nationally consistent approach. All respondents to the prioritisation survey believed this would improve energy efficiency compliance. This action received the highest score when respondents were asked to rank all 16 actions in order of priority, and was viewed as the most critical for implementation 'Now'.

#### **Action 2**

*Regulate to ensure that there is an energy efficiency compliance sign off prior to handover and occupancy*

#### **Comment**

A complementary action that supports Action 1, this action was to ensure that what has been designed and approved is delivered at handover to the owner or investors. This action aims to create an assurance that the house (as designed and rated) performs to those standards. Given that a key reason for delivering on energy efficiency compliance (as put forward by Brisbane and Adelaide Workshop attendees, and validated through the National Regulator Needs Survey) was to reduce heating and cooling demands. This action supports previous NEEBP consultation suggestions for validating performance outcomes for energy efficiency compliance in housing.

#### **Action 3**

*Regulate for mandatory and appropriate energy efficiency knowledge and skill training across all professions and trades involved in the building process*

#### **Comment**

In all workshops the need for increased knowledge and skills in delivering on energy efficiency requirements was highlighted. This action aims to increase the quality of compliance and ensure that basic issues such as sealing, insulation and installation improve.

#### **Action 4**

*Develop a national product verification system to ensure EE of products supplied to builders meet Australian or appropriate standards and that those products are installed correctly*

#### **Comment**

Product substitution of non-compliant products from the products specified in the (ideally) EE compliant design, was flagged as a key issue at the Brisbane workshop and reinforced throughout the subsequent workshops and survey process. Whether substitution occurs due to cost-cutting or the owner/investor's personal aesthetic preferences, the system needs to promote the long-term economic benefits of energy efficient compliance and ensure it is not compromised by inferior products or poor installation.

#### **Action 5**

*Develop a national audit/inspection system that can be applied across all states, territories and climate zones.*

## Comment

To ensure that energy efficiency requirements have credibility in the industry and in the market, it is important that energy efficiency compliance is treated comparably to safety audits for worksites and materials. An audit inspection of all parts of the value chain associated with building energy efficiency and the professional sectors involved (builders, products, work quality regulators, assessors) will provide transparency and improve market perception and performance of Class 1 houses in the long term.

## Action 6

*Increase consumer awareness of the value of energy efficiency compliance in reducing heating and cooling loads, improving comfort and quality of life and reducing power bills.*

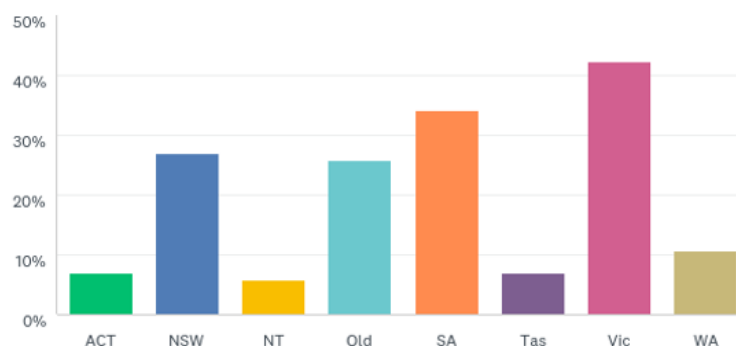
## Comment

One issue that was consistently raised through the workshops, was that there was a need to educate the market on the reasons for energy efficiency compliance so that two things occurred; one the conversation with the builder prior to building approval ensures that energy efficiency compliance is not considered an add on expense when achieving approval; and, two that when a house is ready for occupancy acknowledgement that the house will perform according to the approved energy rating through a process such as a pre occupancy checklist.

## General recommendations for progressing priority actions

1. Assess each recommendation according to materiality, impact, practicality and acceptance
2. Due to the lack of responses to the survey from NT, TAS, WA and ACT (shown in Graph 2, below) it is suggested that some further work on validating the results be undertaken prior to full recommendations being presented to the Ministers forum.
3. Although this project dealt with Class One buildings, it would be advisable to consider a similar process dealing with Class 2 apartment buildings. Though both Classes have similar compliance issues, assumptions about the results should not be taken as being easily transferable to other building types.

Graph 2: Graph of responses to “Q4: Which state(s) do you mainly operate in?” where more than one state could be selected.



## 1. Background to project

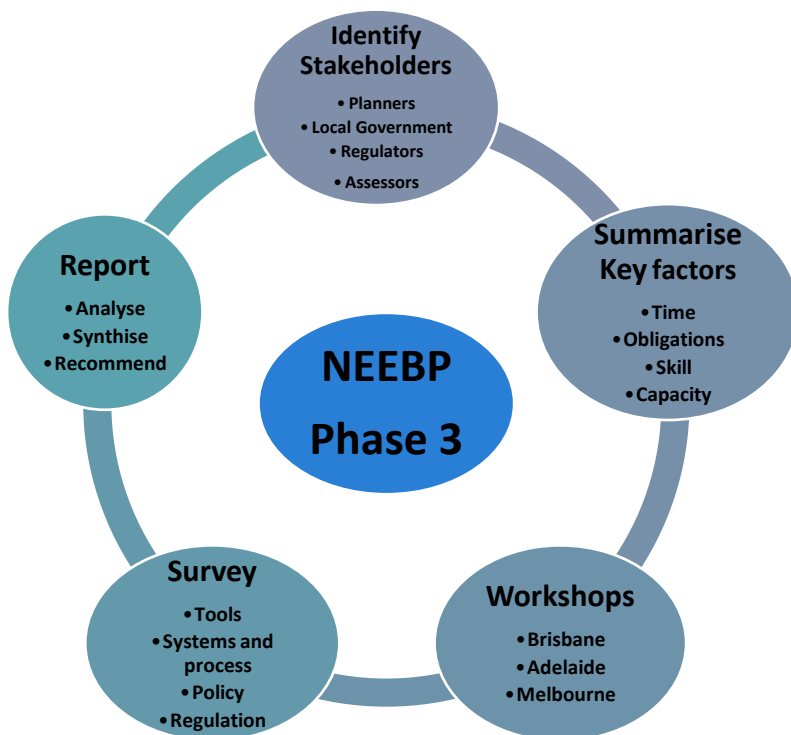
The objective agreed between the Commonwealth and the State of South Australia for NEEBP Phase 3 consultation was to identify and prioritise the key factors affecting the capacity of regulators to verify compliance with the energy efficiency requirements of the National Construction Code.

The project scope sought to consult with private, commercial and local government regulators including; planners, building surveyors, inspectors and associated officials.

At project onset, it was expected that the project would develop a set of recommendations to the Commonwealth for future focus areas to support regulatory stakeholders, such as:

- Providing access to systems
- Products or processes
- Real time data monitoring
- Remediation and verification tools
- And/or regulatory change

Diagram 4: Outline of project approach



**Diagram 4** provides an outline of the approach that was undertaken to deliver the project.

This process was essentially: consult with stakeholders, understand the key factors affecting energy efficiency compliance, run workshops, develop a process for creating actions and then via a survey give direction to recommendations.

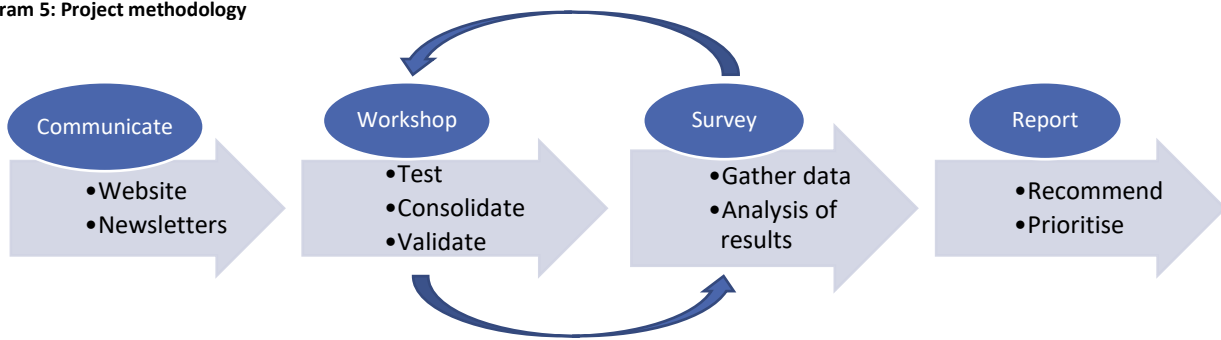
This led us to refine the input into the report by undertaking a survey with workshop participants to validate and prioritise findings.

This final report contains the analysis and synthesis of the project and the recommendations.

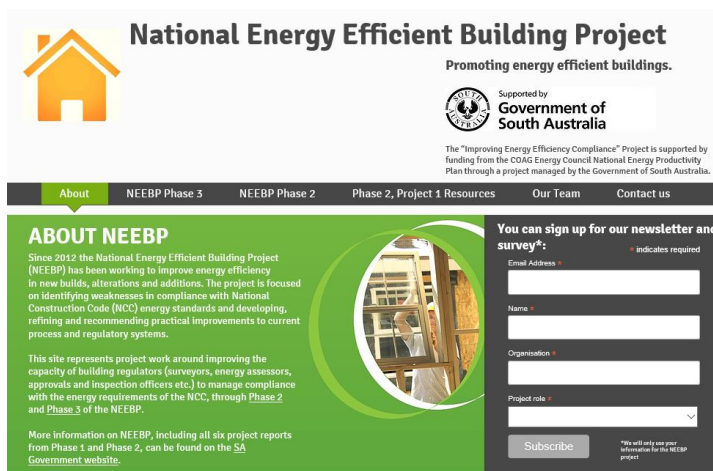
## 2. Methodology

The project methodology is outlined in Diagram 5. Communication was an essential first step before undertaking workshops to inform the development of a National Regulator Needs Survey. There was a feedback loop between workshops and between the survey development and analysis. At the final workshop, participants were asked to provide observations from the data, and develop recommendations and preliminary timelines for implementation. The results have informed this final report with the observations and recommendations for action.

Diagram 5: Project methodology



## Communication



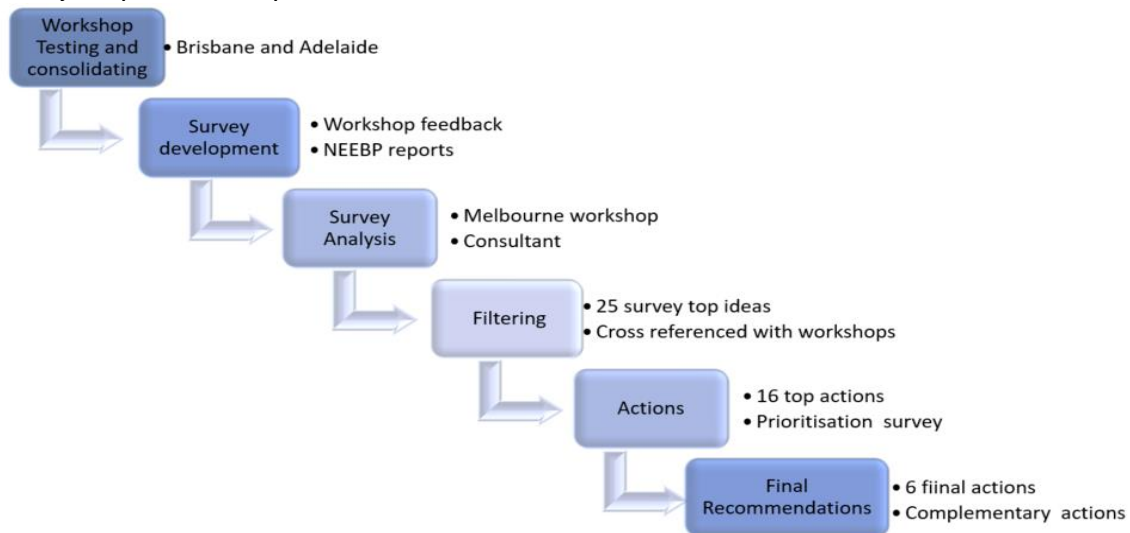
The first step was to re-engage with the 20 pilot councils from the Phase 2 projects around the auditing checklist and the Electronic Building Passport, through newsletters linked to the Website and other data bases supplied by SA Government. This also then formed the basis of future communications on the project, such as the workshop invitations, survey distribution and project updates.

**Website:** <http://neebp1.wixsite.com/energycompliance>

## Developing our report actions and recommendations

The survey and workshops (Brisbane, Adelaide and Melbourne) provided the foundation of the reports actions and recommendations. To develop a set of priorities, we adopted a phased filtering approach (which included the consultation through the Melbourne workshop) to test key findings. From the initial Regulator Needs Survey consultation 25 recommendations were developed. This was narrowed to 16 recommendations following cross reference analysis of the survey outcomes with the National Regulator Needs Survey and responses from each workshop. These 16 were then tested with the workshop participants through a Prioritisation Survey to provide some direction to the final actions and recommendations. Following this survey, it was then refined to 6 high level priority actions with supporting complementary actions. The process of establishing the final recommended actions is outlined in Diagram 6, below.

Diagram 6: Project implementation steps 1-6



## Workshops

Working through the SA Government we undertook three workshops. We appreciated the collaborative work of the South Australian Government who were responsible for recruitment, venue and logistics working with their local and interstate colleagues. Each workshop had a distinct purpose.

Participants in the workshops included representatives from Master Building Association (BMA), Housing Industry Association (HIA), Australian Institution of Building Surveyor's (AIBS), Australian Building Sustainability Association (ABSA), Builders, Planners, Environmental Sustainable Development (ESD) consultants, State Government and Local Government.

### Workshop outline

The project workshop process adopted a tiered consultation approach. In the Brisbane workshop the aim was to test out the energy efficiency landscape, including the identification of key issues and questions that could be potentially addressed and answered in the survey. Then in the Adelaide workshop, participants worked to consolidate these issues and value-add to the survey. The survey that incorporated these issues was then released over a 5-week period and the data was collated for verification and validation at the workshop in Melbourne.

Each workshop followed a three-step process. The workshops did not address technological issues or ratings system issues.

#### Step 1 Provide information context and background to the project

- Background of NEEBP Phase 3
- Where does the Deep Dive project fit (See Diagram 4) especially in relation to NCC and NEEBP projects
- What was in and out of scope for discussion in the workshop.

#### Step 2 Engage participants in dialogue on their experiences:

- Expectations and why they were here
- Experiences with class one housing EE compliance
- Issues concerning EE compliance

#### Step 3 Provide the foundation for next steps:

- Brisbane – testing the scope of the work, test the process and survey development
- Adelaide – consolidation of the information unlocking potential tools and issues
- Melbourne – validation of workshop outputs, survey results and recommendations

To provide clarity and focus in the workshops we outlined that the workshop would not address:

- Technical specifications on star ratings or the code
- Specification and standards of energy efficiency
- Whether we should have compliance or not
- Shifting responsibility – we all have a role to play
- Capacity building for Trades

Participants were however asked if there were any issues they felt need to be addressed then they were to record and provide those thoughts throughout each workshop.

### **Brisbane workshop**

The Brisbane workshop was designed to set the scene and verify topics for consultation through the subsequent survey and workshops. It also enabled us to recap the NEEBP agenda in understanding issues before working through to the approaches that were needed to improve energy efficiency compliance. The workshop involved a co-creation process with a diverse range of participants including designers, builders, building assessors, planners, building surveyors, peak industry bodies representatives and Government policy personal.

### **The Adelaide Workshop**

The Adelaide workshop was planned to consolidate and retest the Brisbane workshop outcomes. Participants were asked to reflect on what Brisbane had discussed and how they fitted into the key outcomes of the project.

### **Melbourne workshop**

The Melbourne workshop scope sought to further refine recommendations and priorities based on the data. We asked the Melbourne workshop attendees to analyse the survey evidence from their own sector's perspective and to create the path forward to implementing actions. Those actions were then co-created and refined through the workshop.

## Survey

The National Regulator Needs Survey was developed to explore the issues arising from the workshops and provide some hard data to back up workshop findings on a national scale.

The Survey Monkey website was used to create the survey and distribute it nationally through the project newsletter. Those targeted were contacts from pilot councils involved in previous NEEBP projects, regulators and industry professionals who had signed up to the newsletter via this project's website, workshop participants, and the Government's NEEBP database.

The 45 survey questions reflected a comprehensive list of issues and opportunities to improve energy efficiency compliance based on the workshop outcomes. The survey also reflected the key topics from the breadth of work undertaken during Phase 1 and Phase 2 of the NEEBP over the last 4 years.

85 people responded to the survey, with 62 people completing all questions. The raw data can be found in Appendix 4.

Some of the observations made from the survey were validated at the Melbourne workshop. A list of 16 priority actions were then refined, based on these observations and the recommendations from the Melbourne workshop. These actions were then sent to the 45 workshop participants in the form of a Prioritisation Survey for further validation, ranking of importance, and consideration of possible implementation timelines. Results from this survey and the previous work then shaped the outcomes of the project.

Results from both surveys are discussed further on in this report.

### Limitations to the methodology, data gathering and the project.

Throughout the project some of the project research team experienced some limitations with the data gathering. There were tight timeframe constraints that affected survey response and feedback due to changes in project delivery and unforeseen circumstances. The Adelaide workshop shifted from first week in July to the last week in July, creating a pressure point on survey development and the time available for survey responses and analysis prior to the Melbourne workshop.

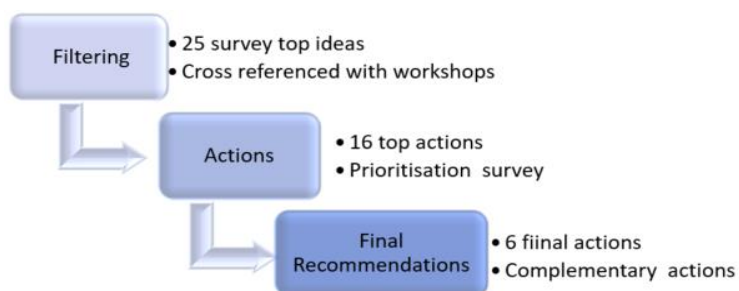
- Issues such as timing, process to obtain survey link, length of survey and length of survey questions may have reduced participation numbers.
- The survey did not always have negative complementary data questions to flesh out peoples point of views.

## Report and recommendations

This final report provides observations and draft recommendations to the client for future analysis and final presentation to the NEEBP working group by the South Australian Government, working on behalf of partnering States and Territories.

In finalising the draft report recommendations (as previously outlined in the project pathway, see Diagram 7), the numerical data from the National Regulator Needs Survey was cross referenced with comments made through workshops and the survey to provide a list of 25 top ideas for consideration.

Diagram 7: Project implementation steps 4-6



These were then consolidated into 16 key actions based on cross-over and relationships between the 25 top ideas. These 16 key actions were then sent to the workshop participants in the form of a Prioritisation Survey. The questions asked were around validation, prioritisation through ranking the actions, and the possible timelines for implementation.

Because of this Prioritisation Survey, these key actions were further consolidated into 6 priority actions. Complementary actions to those 6 priorities to further assist in energy efficiency compliance, arose from the remaining 10 key actions.

### 3. Results discussion

The results discussion provides a brief overview of the process and some highlights from the three areas of data collected (i.e. workshops, survey and prioritisation survey). It does not explore each question in detail. Detailed analysis is available in Appendix 4, and it is this analysis that provides the context for the direction of the observations and recommendations in this report.

#### Workshops

##### Brisbane workshop

An important consideration was to understand the reasons participants were involved and why they thought we needed to address energy efficiency compliance for Class 1 houses. The reasons given were:

Encourage better design	Reduce heating and cooling impacts (affordability)
Reduce carbon emissions (GGE)	Improve quality of life of people
Reduce the load on the grid	Improve internal comfort
Aspirations' don't meet the building approval performance	No mechanism to check compliance with the code
Significant variation in knowledge and understanding	Cost implications and competition affecting quality delivery
After contract is signed EE (and other compliance issues) become a variation and therefore considered a cost to the owner.	

A key question that was asked throughout the project was: *What is the best way to confirm the building complies with the approved plans through energy efficiency inspection?* Which led to further questions around whether *inspections should be compulsory or random?*

Participants were asked what they thought they needed to enhance energy efficiency compliance and the timeline of when those actions should be implemented which informed the survey and the final report recommendations. In Brisbane it was clear that issues such as the compliant energy efficiency measures outlined in the design not being used in the final construction, were affecting energy efficiency compliance standards of new builds

Table 1: Sample of data obtained from the Brisbane workshop

What we want:	Goals by 2020	What we would want for 2025
EE inspectors developed and approved	Increased skills for EE assessors	Improved EE compliance
Consistency in EE assessments	More use of Universal Certificate. (UC) for NatHERS	Transparency of EE assessors
Skill improvement of EE assessors <ul style="list-style-type: none"> <li>Upgraded courses</li> </ul>	Assessor accreditation <ul style="list-style-type: none"> <li>Licensing assessors and trades etc.</li> <li>One-day mandatory course</li> </ul>	Auditing & QA of assessors
Variable stringency to comply	Knowledge of EE for all trades	As-built performs as-designed
CPD for builders linked to license for CPD Points for professions	Equivalent stringency across DTS & star ratings	No loopholes in EE compliance
Random Auditing by QBCC	Increased auditing for higher risk projects	Majority of buildings comply
Electronic building passport/manual All trades 'singing off the same song-sheet'	Complete knowledge base for project documentation	Easy to use electronic passport Smart phone app that builders need to upload EE evidence to Qld. Govt/QBCC portal that can be accessed by certifier and owner
User behaviour	Smart meters with variable tariffs	You pay more if you use more
EE in design stage with soil etc. (B.A.I., Noise) EE req's on plans	Project total cost controlled No EE surprises Designer checklist Better construction contract/quotes	Every house/dwelling is compliant with EE standards prior to signing of contract for construction
Mandatory EE stage inspection(s) during construction	Energy compliances at loan stage (prelim design) – completion certificate at final stage	
Enforce quality and compliance of imported products and materials		
EE requirements on Local Government Plans	Upgrade awareness of EE in Council areas for new developments	EE requirements in DA approval for new residential development

Through weight of responses, the Brisbane workshop attendees also emphasised that increasing the industry's capacity to produce energy efficiency compliant housing through education was a key area in need of exploration

**The clear issues to focus on for the survey were to provide:**

- *Sector-wide education and capacity building to provide the knowledge and skills to include energy efficiency at the design stage, before contracts and pricing.*
- *Certainty for the consumer that their building is energy efficient. It was suggested that this should be through a certificate with details of what is in the building and an energy efficiency rating following an inspection after completion.*

**Brisbane workshop participants**



Participants broke into groups and looked at compliance from the standpoint of a regulator, a professional (i.e. an assessor, builder or designer) and a consumer. After defining the issues and possible solutions, each group was asked to provide 6 questions that could help shape the Regulator Needs Survey.

The following questions were considered of high importance from a consumer, regulator and professional perspective and were reframed in the survey development. The full list is provided in See Report 2, Appendix 1 for raw data.

**Regulator:**

1. *What is the best way to confirm the building complies with the approved plans through energy efficiency inspection? e.g. Should inspections be compulsory or random?*
2. *How can we improve information transfer between project participants? Is the answer to that an Electronic Building Passport?*
3. *Should the specifications for energy efficiency be compulsory on all dwelling plans?*
4. *Should all building professionals be required to do CPD for annual renewal? Should we consider mandatory accreditation for energy assessors?*

**Professionals:**

1. *How confident are you in the application of energy efficiency requirements? 1-10 etc + other comments box*
2. *Does your profession/trade require ongoing training/PD points?*
3. *Do you think your profession/trade should have mandatory CPD point/training for energy efficiency? – Yes/no + please explain*

We asked participants to put themselves in the view of the consumer and, although out of scope of the project, questions raised provided some useful insights into compliance system requirements from a consumer' perspective.

**Consumer:**

1. *Would you like to avoid additional unexpected costs for energy efficiency measures by obtaining you energy efficiency report pre-building contract?*
2. *Would you like your building contract to include costing for energy efficiency measures such as insulation?*

## Adelaide workshop

The Adelaide workshop was planned to consolidate and retest the Brisbane workshop outcomes. Participants were asked to reflect on what Brisbane had discussed and how they fitted into the key outcomes of the project. See Report 2 Appendix 2 pg. 5 for the workshop raw data:



Adelaide workshop discussion

In addition to confirming key points raised from the Brisbane workshop, the following value add topics were raised by Adelaide participants:

- *Social Justice and quality assurance – getting what you paid for*
- *To drive changes in manufacturing process industry*
  - *Improve products*
  - *Better design*
- *Improve quality of building assessments*

Some of the comments arising in discussion included:

- *The areas of non-compliance (seals etc) are not even on the radar at planning stage*
- *Site area and conditions: i.e. long narrow blocks approved at land division don't suit energy compliance*

Although not relevant to the survey they highlighted some frustration with issues that affect energy efficiency compliance.

The Adelaide workshop participants outlined the key factors that affect energy compliance (refer Table 2). Common themes emerged around assessors, the need for tools and resources to check compliance and education capacity building.

**Table 2: List of key factors affecting compliance, Adelaide workshop.**

<i>Assessors not accredited who work for builders</i>	<i>Lack of options to prove compliance</i>
<i>In Adelaide – certain development plans support materials and colours that go against energy efficiency performance (hills face zone) don't like use of light colour roofs.</i>	<i>The current tools available for energy assessment are not perfect and don't reflect actual performance</i>
<i>Continued learning and development for assessors</i>	<i>No specific inspections for energy efficiency compliance during construction</i>
<i>Volume builders. Sales teams don't understand passive design [therefore] = poor design for energy efficiency</i>	<i>Under resourcing of the inspector bodies within Local Government</i>
<i>Unaccredited assessors</i>	<i>Lack of CPD for assessors</i>
<i>Builders doing their own assessment;</i>	

In response to: 'What is the biggest disconnect affecting compliance with energy efficiency requirements regarding the NCC and Planning regulations for Class 1 buildings, alterations and additions, and Class 2 buildings?', the following snapshot of attendee response suggests common emerging themes to be addressed during the survey.

1. Compliance with energy efficiency is not prioritised over life safety; resourcing issue?
2. Inability to identify specific products onsite; i.e. Are the pink batts actually R3 as specified?
3. The assessment of energy efficiency completed after planning consent

These three issues were reinforced in Adelaide and helped to shape survey questions for regulation, product specification and improving when energy efficiency compliance should be undertaken. Evidence of this can be seen in Diagram 1.

On the subject of tools and systems for improving compliance in SA and nationally, there was a general agreement with the Brisbane workshop outcomes, of the need for auditing of key areas, better systems to check compliance, and education for energy efficiency compliance inspectors. Suggestions raised are summarised in Table 3.

**Table 3: Suggestions from the Adelaide workshop which supported responses from Brisbane regarding tools and systems.**

System Improvements	Key Areas for Auditing
Post-build testing	Building what is approved and specified
Stopping project home builders doing energy efficiency assessments internally	Products comply with appropriate standards, as specified
Limited number of assessments an assessor can sign-off on per week. This will stop mass off-sharing of work and poorly trained data inputs	Energy efficiency assessments
Mandatory product marking and identification (easy for inspectors to confirm products installed)	Increase in inspection points
Assessment tools that use current products (available) (prevents product substitution)	Follow up testing after construction
Bring energy efficiency compliance forward for planning consent	

Extending on the Brisbane workshop scope, participants of the Adelaide workshop were asked a series of questions about the most important approaches to energy efficiency compliance by timeframe. This data was collated (together with responses to some of the other questions) and refined for consideration for the creation of the survey.

Once all the information from the workshop was gathered and assessed for relevance to the project it was cross-referenced with the draft survey, to ensure that the Regulator Needs Survey was informed by the workshop outcomes and previous NEEBP studies. A look at the refining and cross-referencing process is captured in Table 4, below.

**Table 4: Brief cross-reference of Adelaide workshop responses with Brisbane data. Value-adds from Adelaide analysed in terms of likely timeframe**

Agreed with Brisbane	12 months	2020	2025
Building what is approved and specified and built	Mandatory inspection at insulation stage	Simplify the system	Regulation and resources
Need for products comply with appropriate standards as specified	Certificate of occupancy for class 1A buildings	Tighten regulations	Trade training
Audit energy efficient assessments	Eliminate non-accredited assessors	Educate industry and the market	Elegant enforced regulation
Follow up testing after building	Mandatory contractual compliance	Provide fit for purpose tools	The base checklist
Mandatory inspections of products, installation and assessors	Audit of assessors - some poor examples obvious	Product regulation	Make sure validity of rating is accurate and as built validates original rating
Need for education of Assessors and CPD point program			Make sure each stakeholder in industry has greater accountability
			Make sure energy rating tools are fit for purpose
			Make sure you have suitable resources to police

But others at the Adelaide workshop also raised new questions which had to be considered for input :

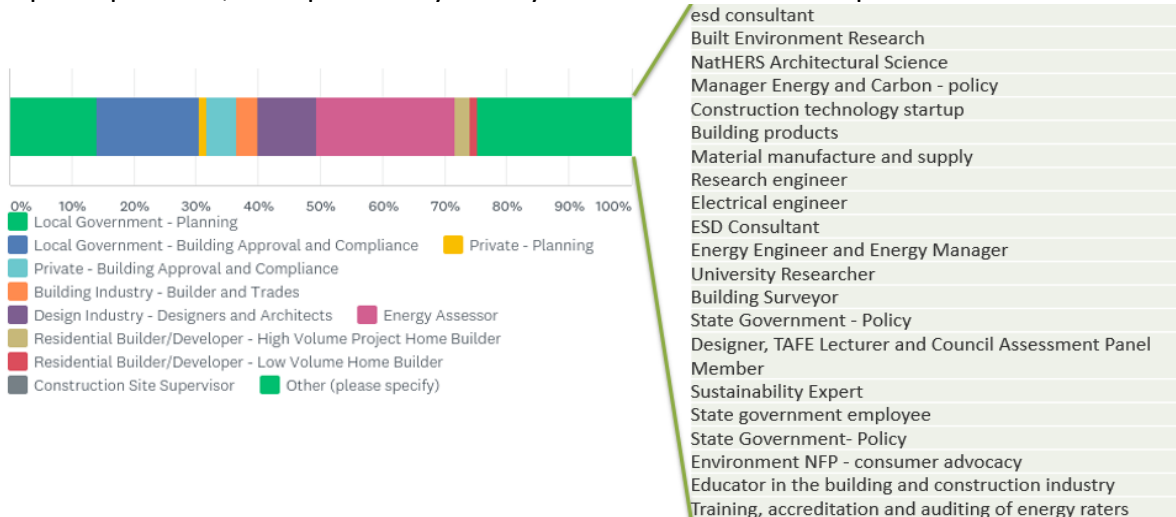
*“What is the level of court action or complaints either by regulatory authorities or dissatisfied clients concerning energy efficiency?”*

This question, along with a selection of responses and questions from the Adelaide workshop, were considered outside the scope of this project, but showed the potential need for further research.

## Melbourne workshop

The Melbourne workshop scope sought to further refine recommendations and priorities based on the data. An outline of the data was provided detailing professional backgrounds of respondents and their experience with Class One housing (for example, Graph 1 reproduced below) was shown to attendees to show the diversity of people who responded to the survey.

Graph 1: Responses to “Q1: Which profession do you identify with the most?” with individual responses to ‘Other’ included



## Melbourne – Analysing the data and providing observation



We asked the Melbourne workshop attendees to analyse the survey evidence from their own sector’s perspective and to create the path forward to implementing actions. Those actions were then co-created and refined through the workshop. As a result, each action was then cross referenced against these criteria:

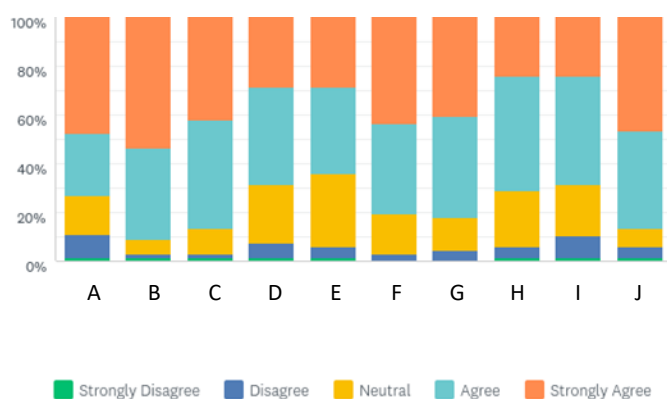
- **Desirable and *Material***
- **Viable**
- **Practical and impactful**

The criteria were designed to provide industry with an indication that actions for recommendation would be cost-effective, worthwhile and improve accountability

without (in some cases) significantly changing what industry is already required to comply with regarding energy efficiency. Due to time constraints participants were unable to review all data sets.

The process through which the Melbourne workshop was run began with a quick information and background session, so that attendees were on the same page as to purpose of the project, survey and workshop. They were then shown some data results before splitting into small groups to make assessments on positive and negative aspects of the data, and provide some possible recommendations. A worked example of the work undertaken on the data obtained from question 10 (see Graph 3) can be seen below. Selected important observations and recommendations from the workshop can be seen in Table 5, below.

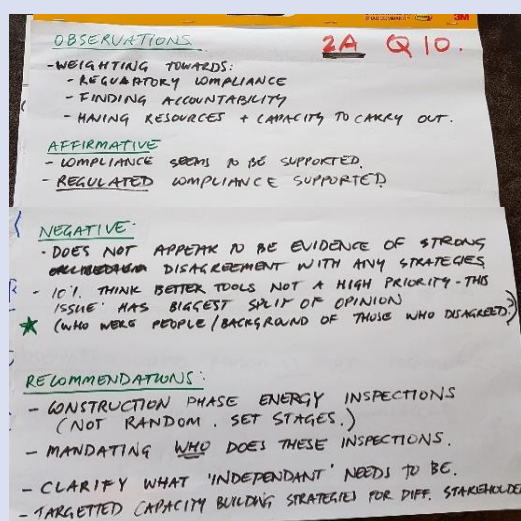
Graph 3: Example of the data given to Melbourne workshop attendees  
Q10: To what extent do you agree or disagree that the following would enhance energy efficiency compliance?



**Legend Q .10**

A	Improved regulations	F	Clearer responsibility and understanding by professionals and trades across the building cycle
B	Increased capacity to carry out inspections and assessment	G	Better awareness of energy efficiency compliance requirements and cost and performance implications of non-compliance
C	Increased resources to support energy efficiency compliance across industry regulators and assessors	H	Easier access to quality data on energy efficiency compliance and as-built performance
D	Greater consistency in energy efficiency rating	I	Better systems and tools that enable regulators and industry to meet compliance more easily
E	More time to focus on compliance in building design and approval stages	J	Clearly identified and defined accountability of industry, regulators and assessors to deliver high performance homes

**Raw analysis of the data for question 10**



The weighting of the data analysis suggested that compliance regulation and accountability were important considerations.

Most strategies had some degree of support.

The group had split opinions on what the data was showing (regarding tools not being a high priority) and they inferred that this could have been influenced by the background of the respondents.

Recommendations from this question have influenced the final recommendations. The actions influenced are Action 3 and Action 5 (see Recommendations).

Through this process, there were opportunities for individuals to raise further important issues or questions that they thought may not have been covered. These include the following example quotes:

1. A reality check that local Government planners will always be generalist. They are not and never will be energy efficiency focused and if they are going to rely on an accreditation scheme, that the scheme had better be solid.
2. How far can we go determining compliance during construction?
  - *Verifying Builder's certification*
  - *Undertaking Testing pressure - thermal comfort*
  - *Having Multiple inspections*
3. What *non-compliance* data do we have from the states and how accurate is it?

Other general comments made by participants which reinforced the final recommended actions were

- The need for regulatory verification as opposed to a voluntary mechanism
- Adoption nationwide of existing state regulations and policies
- Post construction inspection pre-occupation

An example of the type of analysis to questions in the survey by the Melbourne workshop is provided in table 5.

**Table 5: A snapshot of the data analysis by the Melbourne workshop (A full break down of this is provided in Appendix 3b)**

Survey Question	Observations	Recommended Action	Timeline
2: 11	Data says do it at design phase, however it needs to be included as mandatory inspections.	Emphasise system and mandated in as built. Revisit need at first fix/second fix to achieve better outcomes (post construction is too late).	n/a
2: 13	Cost impacts. Who is responsible? – issue is no one wants to be in this space. Why would you if you can be personally liable?	Pre-occupancy sign-off by independent accredited person.	2020
2: 16	All agree as built compliance critical. Product substitution a big issue. Training and skills.	System to verify as built contract. QA systems designed and Mandated. Industry training needs to be Peer to Peer – people listen to people like themselves.	2020
2: 20		Better (well) resourced auditing program. Do a national checklist now and widely promote to all players on-site. Get buy in from all states and industry associations. Be clear who is being audited and what for and for what purpose. Work out who does the auditing... is this a new role?	n/a
Survey Question	Observations	Recommended Action	Timeline
2: 23	High % of responses want (energy efficiency) factored into building contract.		Now
3: 25	Energy Efficiency Checklist in contract documents.	Energy Efficiency Checklist in contract documents.	Now
3: 28	Product certification does not cater for product substitution. Lack of required inspections to verify compliance.	Develop EBP with all required functions.	Start Now, finish by 2020
4: 34		Mandated by regulation/legislation. Audit individual doing energy assessment (using all compliance methods). Legislate for as-built mandatory inspection (e.g. California) Systems to verify product specifications as-built.	n/a
4: 35	Accredited assessors are regularly audited. CPD program for accredited assessors and architects.	Regular auditing and program for all stakeholders.	n/a

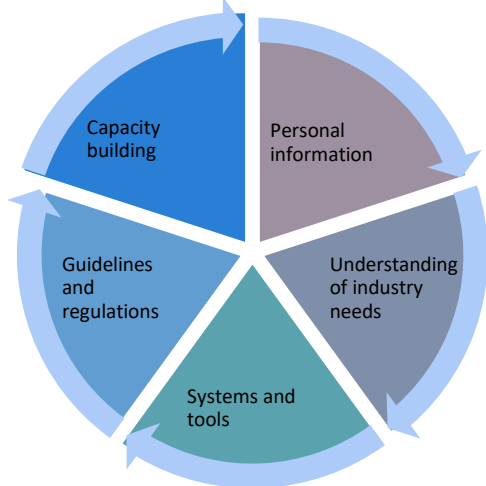
The common emerging themes from the validation workshop in forming the recommendations were:

1. Energy efficiency factored into building contract.
2. EPB developed to identify specific products onsite.
3. Audit system needs to be mandated and consistent for all stakeholders.
4. Need an as built verification or pre-occupancy sign off.

## Survey

The survey was designed with reference to issues raised in the NEEBP Phase 2 projects concerning the audit checklist and EBP, as well as industry consultation in late 2016. It was then shaped by the feedback received, and the issues raised during the workshop process informed the finished survey that was sent out nationally. The survey raw data can be found in Appendix 4.

Diagram 8: Survey sections



The survey was sectioned into 5 parts (see Diagram 8, left) which totalled 45 questions in total. 85 people responded although only 62 completed the full survey. We included all responses to all questions in analysing the data and used the percentages and weighted averages, rather than the raw numbers, as the defining factors. The survey results were then assessed by the Melbourne workshop participants and collated into priority actions. The observations found below under each survey section heading are a combination of priority actions from the Melbourne workshop and input from Sustain SA based on an analysis of the survey data.

### Section 1: Personal Information: Summary of results

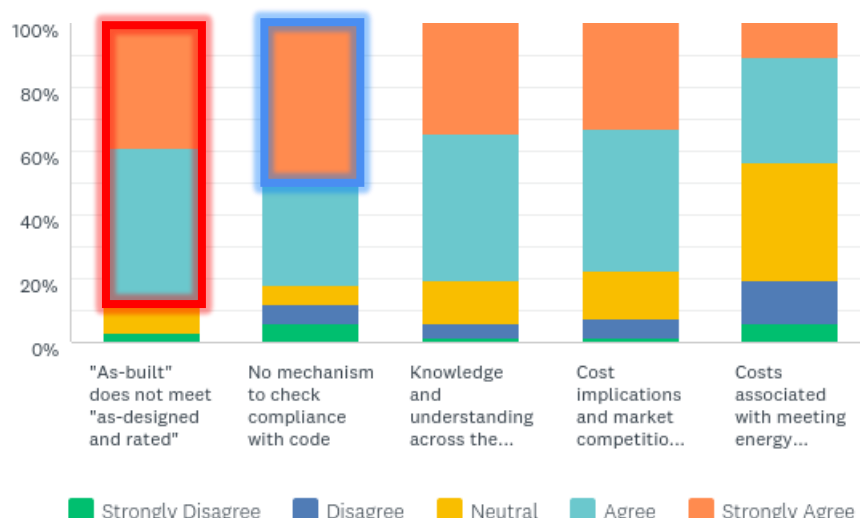
In general, the eastern seaboard states and South Australia were most represented in the survey responses, with 55% also indicating they had over ten years of experience in residential energy rating approval. A significant number of people involved in local government planning and building approval responded to the survey and over 50% of all respondents were in the age group 35-55.

### Section 1: Personal Information: Observations and actions

1. Due to the lack of response to the survey by NT, TAS, WA and ACT it is suggested that some further work on validating the results be undertaken prior to full recommendations being presented to the Ministers forum.
2. That although this project dealt with Class One buildings, it would be advisable to consider a similar process dealing with Class 2 apartment buildings although they have similar base issues assumptions about these results shouldn't be taken as easily transferable to other building types.

### Section 2: Understanding of Industry Needs: Summary of key results with worked examples

When assessing the causes affecting energy efficiency compliance, over 85% at least agreed that as-built does not meet as-designed-and-rated (outlined with a red box, Graph 4), and over 50% strongly agreed that there was no mechanism to check compliance with the code (outlined in blue, Graph 4). When assessing possible actions, a large percentage of respondents at least agreed that increased capacity to carry out inspections and assessments, clearly identified and defined accountability of industry, regulators and assessors to deliver high performance homes, and increased resources to support energy efficiency compliance across industry, regulators and assessors; would enhance energy efficiency compliance.



Graph 4: "Q8: In your experience, to what extent do you agree or disagree that the following are affecting energy efficiency compliance?" (with certain zones highlighted for reference)

As can be seen by the observational data in the example in Table 6, each question was analysed through:

- An observation of the raw data from a positive and negative perspective
- A weighted average of the data
- Some validation by the Melbourne workshop (which didn't cover all questions) on the questions they chose to analyse.

**Table 6: Sample observations and recommendations for the question "Q8: In your experience, to what extent do you agree or disagree that the following are affecting energy efficiency compliance?" *Italics indicates input from Melbourne workshop.***

Positive Observations	<ul style="list-style-type: none"> <li>• Over 85% of those surveyed agreed (approximately 40% strongly) that when 'as-built does not meet as-designed-and-rated' energy efficiency compliance is affected</li> <li>• 50% strongly agreed that there was no mechanism to check compliance with code</li> </ul>
Weighted Average Observations	<ul style="list-style-type: none"> <li>• All options received a weighted average over 4 (where agreement is high) bar the last option around cost variation</li> </ul>
Negative Observations	<ul style="list-style-type: none"> <li>• The least agreed upon factor was that 'costs associated with meeting energy efficiency compliance may be treated as a variation after contract is signed' with 37% of responses neutral, and only 43% at least agreeing</li> </ul>
Recommendations	<ul style="list-style-type: none"> <li>• <i>State government consumer affairs could promote that contract variation for energy efficiency is technically illegal / malpractice</i></li> <li>• <i>Maintain strong focus on independent inspection and audit regime during construction phase</i></li> <li>• Need to develop systematic regime to check energy efficiency compliance with the Code</li> <li>• Capacity building and resources are an essential component in improving energy efficiency compliance</li> </ul>

The weighted average analysis, which is detailed in the raw data (see Appendix 4) provides an indicator of the order of responses from highest to lowest priority, or level of agreement (among others). Sometimes, due to the way a question is worded or because of how the overarching issue is perceived, all answers may skew positive or negative. This means that a 90% approval rating for an option from a question with overall high weighted averages may not be as critical as a 70% approval rating for an option from a question with low weighted averages overall. In some cases, the weighted average is indicative of bias, with regulatory actions often scoring higher than non-regulatory actions, simply because the survey was sent mainly to regulators. Weighted average is included to show an indication of data spread.

As a result, some recommendations were formed based on survey outcomes from each question by Melbourne workshop attendees and Sustain SA. When cross referenced with other questions (such as those asked in workshops or comments made as part of the survey) this then led to a first cut recommendation list. More detailed analysis of all questions is contained in Appendix 4.

## Section 2: Understanding of Industry Needs: Key observations and actions

From the data analysis and list of recommendations, highlighted in Table 7 (see Report 2, Appendix 4.2 for more detailed analysis) it became obvious that the following summary recommendations will need further analysis, filtering and testing:

1. Implement a consumer awareness program by
  - Working with state government consumer affairs
  - Regulating enforcing energy efficiency compliance as part of the contract
2. Implement a national mandatory auditing system which includes
  - Set stages for the audit
  - Who does the audit
  - Auditing the people involved in planning construction and assessment
  - Product specifications and installation
  - Audit tools
  - Training and education system
  - Pre-handover audit
  - Adequate resources and funding
3. Implement a capacity building program

- Education knowledge and training program
- Develop appropriate resources
- Providing consistent approach and code of practice
- On-site training for product specification and installation

**Table 7: List of raw recommendations arising from Section 2: Understanding of Industry Needs. *Italics indicates input from Melbourne workshop.***

Q. No.	Recommendations
7	<ul style="list-style-type: none"> <li>• Opportunity to provide consumer awareness on the value of energy efficiency compliance in reducing heating cooling loads, improving quality of life and reducing power bills</li> </ul>
8	<ul style="list-style-type: none"> <li>• <i>State government consumer affairs could promote that contract variation for energy efficiency is technically illegal / malpractice</i></li> <li>• <i>Maintain strong focus on independent inspection and audit regime during construction phase</i></li> <li>• Need to develop systematic regime to check energy efficiency compliance with the Code</li> <li>• Capacity building and resources are an essential component in improving energy efficiency compliance</li> </ul>
10.	<ul style="list-style-type: none"> <li>• <i>Construction phase energy inspections (not random. set stages)</i></li> <li>• <i>Mandating who does these inspections</i></li> <li>• <i>Clarify what independent needs to be</i></li> <li>• <i>Targeted capacity building for different stakeholders</i></li> </ul>
11.	<ul style="list-style-type: none"> <li>• Introduce mandatory additional verification inspections</li> <li>• Emphasise systems and mandated in as built</li> <li>• Revisit need @ first fix /sec fix to achieve better outcomes (post construction is to late)</li> <li>• Need to address issues at three stages</li> <li>• Design development approval...energy efficiency must be part of contract and on plans</li> <li>• During construction stage audit inspection regime should be mandated at agreed times</li> <li>• Checked prior to handover for occupancy</li> </ul>
12	<ul style="list-style-type: none"> <li>• <i>Through building contracts builder is to be made responsible for compliance</i></li> <li>• <i>Strength warranty insurance to specifically cover energy efficiency compliance</i></li> <li>• <i>Need to streamline to ensure transfer of information is consistent and efficient</i></li> </ul>
13	<ul style="list-style-type: none"> <li>• <i>Pre-occupant sign off by independent accredited person</i></li> <li>• Mandatory auditing tools</li> <li>• Increased knowledge and awareness training on energy efficiency</li> <li>• Consistent code of practice to deliver energy efficiency compliance</li> </ul>
14	<ul style="list-style-type: none"> <li>• Mandatory Auditing, knowledge and training and consumer awareness introduced now</li> <li>• On site product verification and substitution product regimes should be considered for 2020/ 2025</li> <li>• Voluntary auditing and self-regulation less likely to achieve energy efficiency compliance</li> </ul>
15	<ul style="list-style-type: none"> <li>• A phased in approach of mandatory auditing should include correct windows installed and correct roof insulation installed well</li> </ul>
16	<ul style="list-style-type: none"> <li>• <i>System to verify as built contract</i></li> <li>• <i>QA systems designed and Mandated</i></li> <li>• <i>Industry training needs to be Peer to Peer -people listen to people like themselves</i></li> <li>• <i>System to verify as built construction</i></li> <li>• <i>QA Systems designed and mandated</i></li> <li>• <i>Trade and builder training skills</i></li> <li>• Post occupancy auditing or checking was not seen as important</li> </ul>
17	<ul style="list-style-type: none"> <li>• <i>National data base beneficial if it enables tagging on-site and in real time at design implementation for certifier to check. Can form part of EPB so that it enables low cost audit off site</i></li> <li>• Pre-occupancy audit would be useful</li> </ul>
18	<ul style="list-style-type: none"> <li>• Support the pre-occupancy sign off by an independent accredited person</li> </ul>
19	<ul style="list-style-type: none"> <li>• Regulation to enforce pre-audit before occupation or handover</li> <li>• Work on liability and thermal testing not supported</li> </ul>
20	<ul style="list-style-type: none"> <li>• <i>Better (well) resourced auditing program</i></li> <li>• <i>DO a national checklist now and widely promote to all players on site</i></li> <li>• <i>Get buy in from all states and industry associations</i></li> <li>• <i>Be clear who is being audited, what for &amp; for what purpose. Work out who does auditing. A new role?</i></li> </ul>
21	<ul style="list-style-type: none"> <li>• Mandatory verification process for energy efficiency product supplied according to specs meets standards and installed correctly</li> </ul>
22	<ul style="list-style-type: none"> <li>• <i>On-site training for building products and installation and knowledge delivery</i></li> </ul>
23	<ul style="list-style-type: none"> <li>• High % of responses want (energy efficiency) factored into building contract</li> </ul>

### Section 3: Systems and Tools: Summary of key results

From the data analysis and list of recommendations, highlighted in Table 8 (see Report 2 Appendix 4.3 for more detailed analysis) there was some clear directions emanating from the data in this section.

Regarding the Electronic Building Passport (EPB) system, there was a clear indication that it would be a useful tool for regulators and should take the form of a tablet or phone application (app). Respondents said that it should include a system for ensuring the correct products are used and installed, the ability to upload all documents around design and material specification, and the ability to look up climate zone specific energy efficiency requirements.

It was widely held that an energy efficiency checklist should be included in the building contract. It would need to be easy enough to use to allow for post-approval checking for variations occurring during the build period such that a rating assessment can be made available prior to handover.

A product verification system was considered highly useful and necessary system to implement. Respondents indicated that it should include the set-up of a national database of products and specifications and a tagging system to ensure that what was specified is supplied. It would also need to be flexible enough to match substituted products and materials to ensure they meet standards, should design variations occur during the build phase.

The product verification system is considered a key component of the EPB and shared similar needs with the checklist around design variations during construction, so it is easy to see how these three systems could be integrated together when implemented.

- *Include products and installations*
- Tablet or phone app
- Upload all materials documents specs and design
- Location look up for climate zones

An energy efficiency checklist / and rating assessment

- Inbuilding contract
- Prior to handover
- Post approval checking with variations occurring during the build period

Product verification system

- National data base of products and specifications
- Tagged system to ensure specified is supplied
- Verification for identifying energy products and materials and products substitution meets required standards

**Table 8: Raw recommendations arising from observations from Section 3: Systems and Tools. *Italics* indicates input from the Melbourne workshop.**

Q No.	Recommendations
24:	<ul style="list-style-type: none"> <li>• Checklists and energy ratings certificates (possible electronic) to form part of the building contract and approved documentation</li> <li>• Compliance checklists should be available prior to handover</li> </ul>
25:	<ul style="list-style-type: none"> <li>• <i>Energy efficiency Checklist in contract documents</i></li> <li>• <i>Energy efficiency checklist as part of contract is strongly supported,</i></li> <li>• <i>Not to tie builder into post occupancy performance as deemed unfair</i></li> <li>• Verification system for specified products to be developed which could be part of an electronic system</li> </ul>
26:	<ul style="list-style-type: none"> <li>• <i>Ensure transparency in any strategies undertaken</i></li> <li>• EPB which includes verification system for products and installations should be further investigated and part of a phased in approach</li> </ul>

**Table 8: Raw recommendations arising from observations from Section 3: Systems and Tools. *Italics* indicates input from the Melbourne workshop.**

Q No.	Recommendations
27:	<ul style="list-style-type: none"> <li>• <i>Develop standard data collect checklist available to all home inspections via internet available through tablet or smart phone app</i></li> <li>• <i>Make all (data) available via onsite based app or software</i></li> <li>• <i>Must cover design, construct, as built, - (must) integrate across whole cycle</i></li> <li>• <i>Integrate assessment with post approval checks to recalculate (energy efficiency) on site as current state of energy efficiency compliance</i></li> </ul>
28:	<ul style="list-style-type: none"> <li>• <i>Develop EBP with all required functions and Include in EBP</i></li> <li>• <i>Upload of materials documents, specs and design</i></li> <li>• <i>Tagging systems of materials so know what has been supplied to tie into multiple checkpoints</i></li> <li>• <i>Product and material verification system</i></li> </ul>
29:	<p>An EBP should include the following elements that support compliance with energy efficiency</p> <ul style="list-style-type: none"> <li>○ product's energy efficiency compliance documentation', followed by</li> <li>○ 'show design energy efficiency compliance' and</li> <li>○ 'verification system for identifying energy efficiency products and materials'</li> </ul>
30:	<ul style="list-style-type: none"> <li>• Need a national data base of products and specification data base and substitution products for easy look up on site as part of EBP</li> <li>• Energy efficiency compliance requirement look up based on climate zone</li> </ul>

#### Section 4: Guidelines and Regulations: Summary of key results

From the data analysis and list of recommendations, highlighted in Table 9 (see Report 2 Appendix 4.4 for more detailed analysis) the following directions are to be further explored.

##### Building design approval process

- Energy efficiency explicitly laid out on plans prior to building contract approval
- Energy efficiency certification checked and provide prior to handover
- National guidelines for energy efficiency
- Independent assessment system

##### Audit

- Mandated by legislation – construction and pre-occupancy
- Assessors doing EE compliance and ratings
- Installed building products and materials
- Trades people

##### Non-Compliance

*Development non-compliance approach as a national system*

**Table 9: Raw recommendations arising from observations from Section 4: Guidelines and Regulations. *Italics* indicates input from the Melbourne workshop**

Q No.	Recommendation
Q31:	<ul style="list-style-type: none"> <li>• There should be greater regulations for energy efficiency compliance for new houses</li> <li>• Regulation may assist the industry to integrate and pull together to deliver energy efficiency compliance</li> </ul>
Q32:	<ul style="list-style-type: none"> <li>• Energy efficiency explicitly outlined on plans prior to building contract approval</li> <li>• Energy efficiency certification checked and provide prior to handover</li> <li>• Role of the financial institutions approval for loans and legal liabilities need further discussion and input and consensus about their role in energy efficiency compliance if at all</li> </ul>
Q33:	<ul style="list-style-type: none"> <li>• Energy efficiency requirements outlined on plans ... for building approval' NOW</li> <li>• Energy efficiency compliance referenced in a standard building contract' NOW</li> <li>• 'Mandating energy efficiency audits during the building cycle' and 'Pre-occupancy energy efficiency rating verified': 2020 or earlier</li> </ul>
Q34:	<ul style="list-style-type: none"> <li>• <i>Mandated by regulation/ legislation</i></li> <li>• <i>Audit individual doing energy assessment (using all compliance methods)</i></li> <li>• <i>Legislate for as built mandatory inspection e.g. California</i></li> <li>• <i>Systems to verify product specifications as built</i></li> <li>• Self-regulation reporting not seen as effective</li> </ul>
Q35:	<ul style="list-style-type: none"> <li>• <i>Regular auditing and program for all stakeholders</i></li> <li>• First 2 areas for auditing should include <ul style="list-style-type: none"> <li>○ energy efficiency assessors</li> <li>○ Installed building products and materials</li> </ul> </li> </ul>
Q36:	<ul style="list-style-type: none"> <li>• <i>Post occupancy follow up over years</i></li> <li>• Audits should occur during construction and at pre-occupancy</li> </ul>
Q37:	<ul style="list-style-type: none"> <li>• Over 80% (moderate to high) viewed auditing of tradesperson as justified and supported</li> <li>• Increasing transparency of work done by industry needs further unpacking to understand what this means and how this could be achieved</li> </ul>
Q38:	<ul style="list-style-type: none"> <li>• <i>Opportunity to provide guidance on how to deal with non-compliance</i></li> <li>• <i>Introduce strategies to identify non-compliance early</i></li> <li>• <i>Get people talking about compliance</i></li> <li>• <i>Make repercussions of non-compliance meaningful i.e. no occupancy permit</i></li> <li>• Development non-compliance approach as a national system</li> </ul>
Q39:	<ul style="list-style-type: none"> <li>• <i>Inspect prior -suggest pre-plaster</i></li> <li>• In developing a potential national non-compliance response system consideration should be given to pre-handover checklists and no handover until compliance is reached</li> </ul>
Q40:	<ul style="list-style-type: none"> <li>• Develop a national independent assessment system and accreditation system of energy efficiency compliance</li> </ul>
Q42:	<ul style="list-style-type: none"> <li>• develop national consistent guidelines for energy efficiency</li> </ul>

## Section 5: Industry Capacity Building: Summary of Key results

It is clear from Table 10 (see Report 2, Appendix 4.5 for more detailed analysis) that there is a need to develop a national system for education and training that covers knowledge and understanding of products, product technology and building systems for energy efficiency compliance that contributes to CPD points training and accreditations regimes within professions

**Table 10: Raw recommendations arising from observations from Section 5: Industry Capacity Building. *Italics indicates input from the Melbourne workshop***

Q. No.	Recommendations
Q43:	<ul style="list-style-type: none"> <li>Ensure all training and development contributes to CPD points training and accreditation regimes within professions</li> </ul>
Q44:	<ul style="list-style-type: none"> <li>Develop consistent national guidelines that can be used as training guides for CPD points for all parts of the design development and approval and assessment professions for class one houses</li> </ul>
Q45:	<ul style="list-style-type: none"> <li>Develop a national system for education and training that covers knowledge and understanding of products, product technology and building systems for energy efficiency compliance</li> </ul>

### Summary

The survey outcomes provide an indication of the approach needed to help assessors, regulators, planners, inspectors, surveyors and associated officials enhance energy efficiency compliance.

It was clear that there is a need to address the design, approval and handover process to ensure energy efficiency compliance. The responses from the surveys and workshops suggest that this can be achieved by improving systems that are already in place and explicitly ensuring that energy efficiency is called up as a requirement to be addressed in:

- Design and Building contracts
- Building approval processes
- Handover to the end beneficiary of the building

The survey respondents supported a mandated approach as the best way to proceed.

Similarly, in addressing the need for improvement in systems and tools, it was clear that products supplied as specified and correctly installed was one of the most important parts of ensuring compliance since quality of product and installation affected the performance of the house. As such it is important to address:

- Product verification systems
- Quality of installing product during construction affecting energy efficiency performance
- An audit inspection process that could assist in improving the system of product supply and install

Regulations are strongly indicated as priorities for action from the surveys. The regulatory actions are supported by the need for education resources, systems and training. As such the following considerations should be addressed:

- Specific requirements for energy efficiency in training, development and professional courses
- Development of resources such as checklists and national guidance
- An Electronic Building Passport system developed for implementation

The survey was aimed to deep dive into consultation on improving energy efficiency compliance and as a result some people also suggested through the survey and results analysis that there was a need to address non-compliance as part of a total system.

## Survey prioritisation

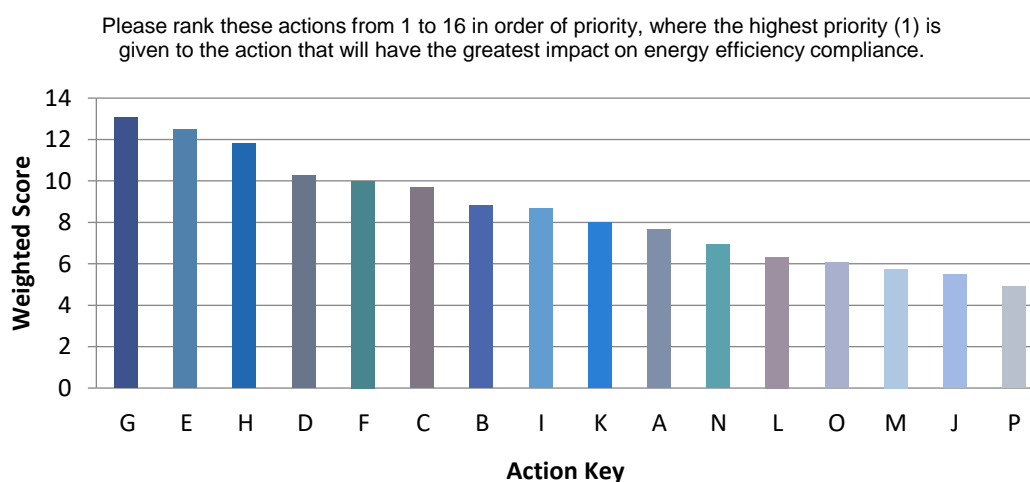
The observational recommendations as described in the above section and the initial 28 top recommendations further outlined in Report 2 Appendix 5, were consolidated and refined into the following 16 raw recommendations in Table 11. These actions were then tested for their validity, their order of priority and their ideal implementation timelines in the Prioritisation Survey.

**Table 11: 16 top combined 'raw' actions that were refined for the prioritisation survey**

<b>Tools and systems</b>	<i>Phase in the development of national EPB system across EE compliance factors</i>	<i>Product verification system and process for EE product supplied according to specs meets standards and installed correctly</i>	<i>Development non-compliance approach as a national system</i>
	<i>Develop a national - Audit/inspection system to improve compliance that can be applied across states and climate zones</i>	<i>Audit during construction at least 2 – 3 stages of the building process</i>	<i>Develop a national standard EE checklist to be used at the start and end of the building, design development and handover process</i>
<b>Regulations</b>	<i>EE on all design building plans prior to approval</i>	<i>EE part of building contract</i>	<i>EE compliance sign off prior to handover occupancy</i>
	<i>Verification system for products specs and substitution</i>	<i>Mandatory knowledge and training in EE across professions</i>	<i>Develop national accreditation system for EE assessors</i>
<b>Education and capacity building</b>	<i>Ensure all training and development contributes to CPD points training and accreditation regimes within professions</i>	<i>Consumer awareness on the value of energy efficiency compliance in reducing heating cooling loads, improving quality of life and reducing power bills</i>	<i>Develop consistent national guidelines that can be used as training guides for CPD points for all parts of the design, development, approval and assessment professions for class one houses.</i>
	<i>On- site training for building products and installation and knowledge delivery</i>		

The survey was sent to workshop attendees only and was available for one week. Although only 13 people responded there was enough evidence in the data to be able to provide a top 10 priority action list and suggest a timeline. Graph 5 shows the overall ranking of the actions by respondents, where each action has been assigned a letter for ease of reading. The actions the letters correspond to is part of Table 12, which also includes data on preferred timelines for implementation.

**Graph 5: Prioritisation Survey – Q4 (Ordered by weighted score. A high weighted score indicates an action ranked highly by respondents)**



**Table 12: List of actions in order of priority, with suggested timeline**

Rank	Statement	Key	Time
	<b>Top 10 Priority Actions</b>	<b>No.</b>	
1	Mandate that energy efficiency rating documentation is a part of all building designs and plans, prior to building approval.	G	Now
2	Mandate an EE inspection audit during construction at 2-3 stages of the building process	E	Now/2020
3	Regulate to ensure that there is an energy efficiency compliance sign off prior to handover and occupancy.	H	Now
4	Develop a national audit/inspection system that can be applied across all states and climate zones.	D	2020
5	Develop a nationally standardised energy efficiency checklist to be used at the beginning of building approval and at the end of construction for consumers to discuss with their builder.	F	Now
6	Develop a national system, guideline or protocol for how non-compliance with NCC energy efficiency compliance is addressed.	C	Now
7	Develop a national product verification system to ensure EE of products supplied to builders meet Australian or appropriate standards and that those products are installed correctly	B	Now
8	Develop regulations to include energy efficiency documentation in building contracts.	I	Now
9	Regulate for mandatory and appropriate energy efficiency knowledge and skill training across all professions and trades involved in the building process.	K	Now
10	Develop and implement a national Electronic Building Passport system (in the form of a mobile phone or tablet application) that shows the energy efficiency compliance of both the rated and approved design and the building products specified.	A	2020
	<b>Remaining 6 Priority Actions</b>		
11	Increase consumer awareness of the value of energy efficiency compliance in reducing heating and cooling loads, improving comfort and quality of life and reducing power bills.	N	Now
12	Develop a nationally standardised accreditation system for residential building energy efficiency assessors.	L	Now
13	Develop consistent national guidelines for energy efficiency compliance with the National Construction Code that can be used for accredited training and development.	O	Now
14	Ensure all energy efficiency compliance training and development contributes to recognised CPD points and accreditation regimes within each trade or profession.	M	2020
15	Develop regulations to verify that post-approval product or design substitutions meet approved energy efficiency rating standards and are Code compliant.	J	2020
16	Where possible, undertake professional skills training on-site on energy efficiency compliance with the NCC requirements and all building product and material systems selection, performance and installation.	P	2020/2025

Initially, each of the questions in the National Regulator Needs Survey which contributed to the 25 observational recommendations (see Report 2, Appendix 5) were filtered into the above 16 actions. These have since been refined to the below 6 Key Actions. In the Recommendations section of this report, these actions have been expanded on with suggested complementary actions. Contained below are this report's 6 Key Actions, with direct reference to the questions from the National Regulator Needs Survey from which they developed.

**Action 1** (Based on Q 11, 20, 23, 24, 25, 27, 29, 32, 33, 40)

*Mandate that energy efficiency rating documentation is a part of all building designs and plans, prior to building approval.*

**Action 2** (Based on Q 11, 13, 16, 19, 24, 27, 32, 36, 39, 40)

*Regulate to ensure that there is an energy efficiency compliance sign off prior to handover and occupancy*

**Action 3** (Based on Q 10, 13, 16, 17, 18, 22, 43, 44, 45)

*Regulate for mandatory and appropriate energy efficiency knowledge and skill training across all professions and trades involved in the building process*

**Action 4** (Based on Q 10, 14, 15, 17, 21, 25, 26, 28, 29, 34)

*Develop a national product verification system to ensure EE of products supplied to builders meet Australian or appropriate standards and that those products are installed correctly*

**Action 5** (Based on Q 9, 13, 14, 15, 16, 20, 34, 35, 37, 40)

*Develop a national audit/inspection system that can be applied across all states and climate zones.*

**Action 6** (Based on Q 7, 38)

*Increase consumer awareness of the value of energy efficiency compliance in reducing heating and cooling loads, improve comfort and quality of life and reducing power bills.*

#### 4. Recommendations

The recommendations arising from this project provide a way forward based on the evidence presented from consultation and survey. We acknowledge that some can be started now, but may not be fully implemented until 2020, 2022 or 2025. Others will require funding, so will require political leadership and collaboration across jurisdictions and industry sectors, and others will require strong advocacy for specific adjustment and change to policy or procedures.

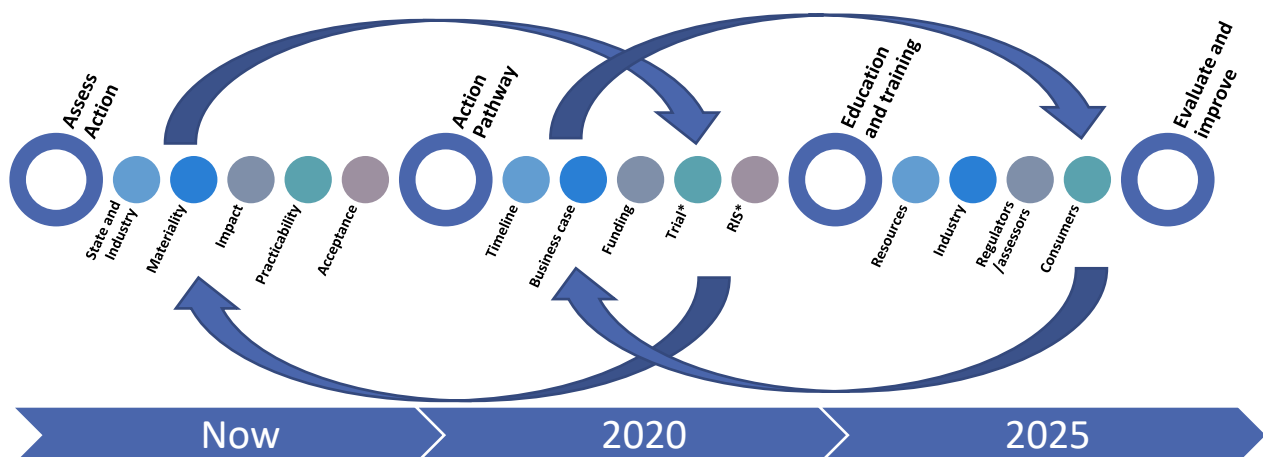
This project was tasked to provide directions towards the next steps for the National Energy Efficiency Buildings Project (NEEBP) and Measure 32 of the National Energy Productivity Plan (NEPP). This process was based on the feedback from building regulator industry workshops and surveys, and was not intended to provide definitive processes for those actions to be implemented, nor to cross reference against other government or industry approaches. Based on our experiences and the tangible outcomes of the workshop and survey process we have suggested the following high-level implementation pathway for action.

As many of the results of this work need further testing we recommend that the following 3 steps be undertaken by the NEPP Major Project Implementation Team (MPIT) prior to providing formal recommendations to the NEPP, COAG Energy Council or, if appropriate, Building Ministers Forum or State Building Regulatory agencies.

1. *Assess each recommendation according to materiality, impact, practicality and acceptance.*
2. *Due to the poor response to the survey by NT, TAS, WA and ACT it is suggested that some further work on testing or validating the results in these jurisdictions be undertaken.*
3. *Although this project primarily dealt with Class One buildings, it would be advisable to consider a similar process dealing with Class 2 apartment buildings. While they share similar issues, assumptions from these results may not be easily transferable to other building classes.*

The feedback from the workshops and the data from the two surveys point to the following 6 Key Actions that can be undertaken now. All actions need further cross-referencing against other work being undertaken by the Commonwealth, State, Territory and Local Governments and industry bodies such as the Australian Building Codes Board, Australian Institute of Building Surveyors, Association of Building Sustainability Assessors, Building Designers Association (Vic) and others involved in the building energy regulatory arena.

Diagram 9: Implementation pathway



All the Actions will require a process of analysis and assessment not limited to steps outlined in Diagram 9. Some actions can be implemented now while others will require considerably more time. The process

should be considered fluid and each step will need to be fine-tuned and tested. Some of the actions as described below have complementary actions that could be completed in parallel depending on funding and resources.

We believe that the crucial issue of energy efficiency compliance is ensuring that the end user or beneficiary of the work (industry consumer, owner, investors) is well informed of the approach. The general principle of transitioning from the ‘*carrot-*’ to the ‘*stick-*’ approach of educate, incentivise, regulate, trial, comply and then sanctions or punitive measures for non-compliance, should be considered for the implementation of each action. Note that these actions, implementation pathways and complementary actions will require support of industry, local and state governments and the commonwealth.

### Action 1: Energy efficiency compliance at start of design process

*Mandate that energy efficiency rating documentation is a part of all building designs and plans, prior to building approval.*

#### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess Action</li> <li>Develop legislative and regulatory pathway</li> <li>Consider role of complementary actions</li> </ul>	<ul style="list-style-type: none"> <li>Prepare RIS if required</li> <li>Develop national pilot project to test approach</li> </ul>	<ul style="list-style-type: none"> <li>Pilot system and refine:</li> <li>Educate industry and consumers</li> </ul>	<ul style="list-style-type: none"> <li>Implement and assess</li> </ul>

#### Complementary Actions

- Develop a nationally standardised energy efficiency checklist to be used at the beginning of building approval and at the end of construction for consumers to discuss with their builder.
- Develop and implement a national **Electronic Building Passport system** (in the form of a mobile phone or tablet application) **that shows the energy efficiency compliance of both the rated and approved design.**
- Develop regulations to include energy efficiency documentation in building contracts

### Action 2: Energy efficiency compliance at end of construction process

*Regulate to ensure that there is an energy efficiency compliance sign-off prior to handover and occupancy*

#### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess Action</li> <li>Develop handover EE compliance assessment procedure and non-compliance protocol</li> <li>Refine Phase 2 Audit Checklist</li> <li>Develop legislative and regulatory pathway</li> </ul>	<ul style="list-style-type: none"> <li>Undertake initial consultation</li> <li>Prepare RIS if required</li> <li>Develop national pilot project to test approach</li> <li>Undertake national awareness program</li> </ul>	<ul style="list-style-type: none"> <li>Build capacity in industry and assessors</li> <li>Pilot system and refine:</li> <li>Educate industry and consumers</li> <li>Consider regulatory approach to non-compliance</li> </ul>	<ul style="list-style-type: none"> <li>Implement and assess</li> <li>Ensure outcomes ready for second stage NCC implementation</li> </ul>

#### Complementary Actions

- Develop a nationally standardised energy efficiency checklist to be used at the beginning of building approval and at the end of construction for consumers to discuss with their builder.
- Develop a national system, guideline or protocol for **how non-compliance** with NCC energy efficiency compliance is addressed.

### Action 3: Energy Efficiency Education and Training

*Regulate for mandatory and appropriate energy efficiency knowledge and skill training across all professions and trades involved in the building process*

#### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess Action</li> <li>Undertake initial consultation</li> <li>Assess gaps of current courses against needs for refinement</li> <li>Adjust to fill gaps</li> </ul>	<ul style="list-style-type: none"> <li>Develop national pilot materials</li> <li>Build capacity in industry and assessors</li> <li>Assess need for regulatory mandate</li> </ul>	<ul style="list-style-type: none"> <li>Implement in industry programs for CPD points</li> <li>Pilot new systems and refine</li> <li>Educate industry and consumers</li> </ul>	<ul style="list-style-type: none"> <li>Course accreditation review</li> <li>Implement and assess</li> </ul>

#### Complementary Actions

- Develop consistent national guidelines for energy efficiency compliance with the National Construction Code that can be used for accredited training and development
- Develop a nationally standardised **accreditation system** for residential building energy efficiency assessors.
- Where possible, undertake professional **skills training** on-site on energy efficiency compliance with the NCC requirements and all building product and material systems selection, performance and installation.
- Ensure all energy efficiency compliance **training and development** contributes to recognised CPD points and accreditation regimes within each trade or profession.

### Action 4: Energy Efficiency Products and Installation verification

*Develop a national product verification system to ensure Energy Efficiency of products supplied to builders meet Australian or appropriate standards and that those products are installed correctly*

#### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess action</li> <li>Use Phase 2 pilot to inform first stage for product and installation verification systems</li> <li>Map the supply chain and installation pathway for 5 products</li> <li>Build a EE compliance EPB dashboard</li> </ul>	<ul style="list-style-type: none"> <li>Outline the product verification system and pilot with 5 products</li> <li>Link system to EPB or equivalent</li> <li>Build capacity in industry educators and assessors</li> <li>Prepare approach for non-compliance</li> </ul>	<ul style="list-style-type: none"> <li>Pilot national system and refine:</li> <li>Educate industry and consumers</li> <li>Consider program of consumer education</li> </ul>	<ul style="list-style-type: none"> <li>Implement and assess</li> </ul>

#### Complementary Actions

- Develop and implement a national Electronic Building Passport system (in the form of a mobile phone or tablet application) that shows the energy efficiency compliance of both the rated and approved design **and the building products specified**.
- Where possible, undertake professional skills training on-site on energy efficiency compliance with the NCC requirements and all building product and material systems selection, performance and installation.

## Action 5: Energy Efficiency Systems

*Develop a national audit/inspection system that can be applied across all states and climate zones.*

### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess Action</li> <li>Draft a national EE Audit / Inspection System</li> <li>Develop a 12-month trial of the Audit/ Inspection system and associated resources</li> </ul>	<ul style="list-style-type: none"> <li>Implement 12-month trial of system NEEBP stage 2 checklist as a guide</li> <li>Evaluate the trial</li> <li>Evaluate capacity of system to implement nationally</li> </ul>	<ul style="list-style-type: none"> <li>Based on the trial and feedback develop national education program and accredit providers</li> </ul>	Implement assess and refine

### Complementary Action

*Mandate an Energy Efficiency inspection audit during construction at 2-3 strategic stages of the building process, including one at the intersection of lock-up and second fix.*

## Action 6: Energy Efficiency Consumer Awareness

*Increase consumer awareness of the value of energy efficiency compliance in reducing heating and cooling loads, improving comfort and quality of life and reducing power bills.*

### Implementation Pathway

2017 -2018	2018-2019	2019-2020	2020-2025
<ul style="list-style-type: none"> <li>Assess action</li> <li>Develop consumer material by climate zone</li> <li>Research value proposition</li> </ul>	<ul style="list-style-type: none"> <li>Test material through Action 1 – 5 to maximise resource efficiency</li> </ul>	<ul style="list-style-type: none"> <li>Pilot system and refine: Educate industry and consumers</li> </ul>	Implement, assess Refine

### Complementary Actions

*Develop a nationally standardised energy efficiency checklist to be used at the beginning of building approval and at the end of construction for consumers to discuss with their builder.*

## 5. Summary and Conclusion

The Deep Dive Project provides an indication of the areas that need to be addressed from the perspectives of regulators, assessors, planners, designers and industry to enhance energy efficient compliance for class one housing.

In regard to ensuring that energy efficiency requirements are complied with during the design and building approval, and delivery process, there were three clear actions that came out of the project.

- Regulate explicitly for Energy Efficiency (EE) to be on plans for building planning approval to be given
- That an EE checklist or recalculation of the energy compliance and ratings system be completed and made available to owners, investors and or regulators prior to handover
- That a regulatory audit system that covers the EE compliance of standards of the products and installation is necessary

Diagram 10: Developing a pathway forward to delivering energy efficiency compliance through education, tools and systems, and regulation.

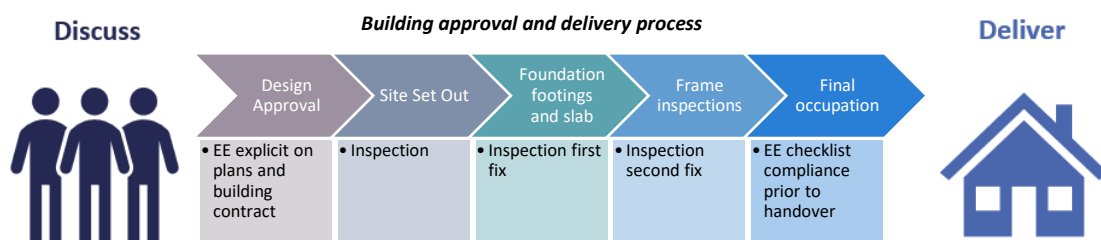


Diagram 10 provides an overview of the when some of the actions need to occur during the various stages between design approval and final occupation, through the 'discuss to deliver' process for EE compliance.

Stage 1: Ensure EE is explicitly on plans at design approval

Stage 2: Ensure audit system is developed and implemented with suggested audit points at

- 1/ Site set out
- 2/ Foundation footings and slab
- 3/ Frame inspections

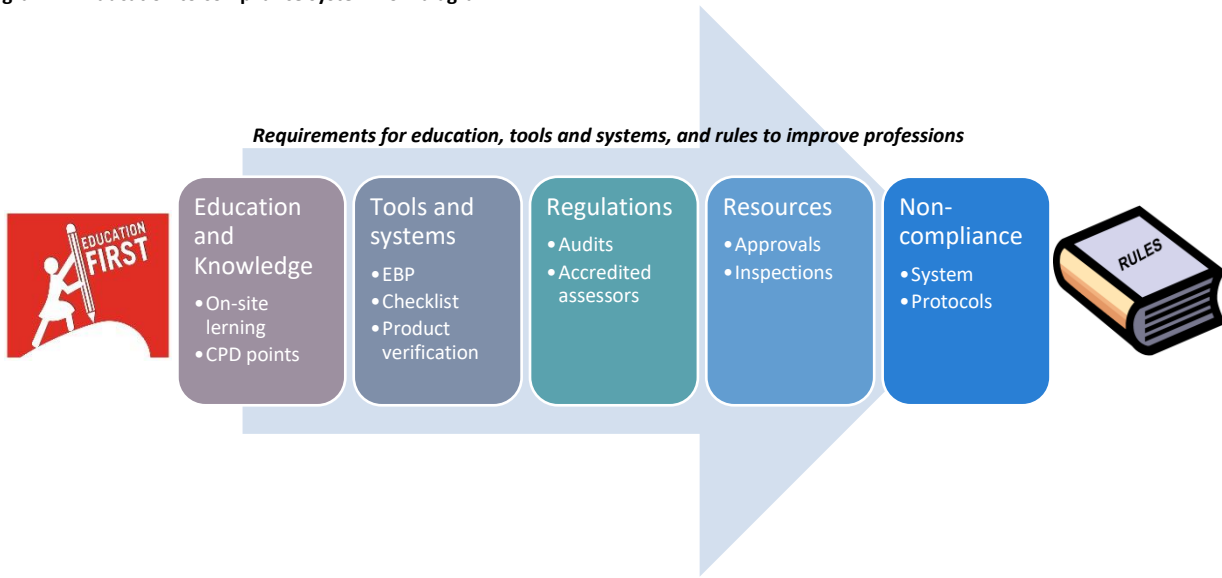
Stage 3: Ensure an energy efficiency compliance checklist is completed and signed off prior to handover to the owner or investor.

It is important that any regulatory regime is backed up by

- Education, knowledge and training programs
- Tools and systems that supports all stakeholder's industry such as an Electronic Building Passport.
- Assessment personal that are credible and subject to assessment themselves
- Resources that enable people to comply with the requirements of Energy Efficiency and lead to continuous improvement and transparency.

Diagram 11 shows the systems approach. This is to move from a non-punitive education and capacity building approach in the outset to a more regulated regime that contains non-compliance protocols. Before that stage can be met, implementing regulation alongside effective tools and systems, and increased resources can effectively increase compliance. Although shown as a linear process, actions may be taken in parallel and integrated to create the most cost-effective and efficient pathway to energy efficiency compliance.

Diagram 11: Education to compliance system flow diagram.



If Australia is going to have improvement in compliance with Energy Efficiency for Class 1 housing, then there needs to be a consistent process of how non-compliance is dealt with nationally. More work is needed in this area including understanding the extent of the issues.

As noted by feedback from industry (refer to Report 2, Appendix 6) there is a need to ensure that cost and economic implications are taken into consideration. Therefore, a more in-depth testing of the recommendations, actions and observations need to occur. The outcomes of this project should be tested in jurisdictions that were under-represented in the workshops and the survey, and tested with other stakeholders to provide a comprehensive road map of actions to fund an enhancement of an energy efficiency compliance regime.