



Report for Department of the Environment and Energy  
**INTERNATIONAL REVIEW OF RESIDENTIAL  
BUILDING ENERGY EFFICIENCY  
RATING SCHEMES**

**Final Report**

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**For: Department of the Environment and Energy**

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In preparing this report Edge Environment was reliant on information provided through interviews. Edge Environment has taken reasonable care and applied professional judgement to produce a balanced and objective analysis of the information.



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## CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>4</b>
<b>1. INTRODUCTION .....</b>	<b>6</b>
<b>2. OBJECTIVE.....</b>	<b>6</b>
<b>3. PROJECT BACKGROUND .....</b>	<b>6</b>
3.1 IPEEC and BEET .....	6
<b>4. SCOPE AND DEFINITIONS .....</b>	<b>7</b>
4.1 Scope .....	7
4.2 Definitions and key concepts .....	8
<b>5. METHODOLOGY .....</b>	<b>9</b>
<b>6. FINDINGS – GOVERNANCE AND ADMINISTRATION .....</b>	<b>11</b>
6.1 Objectives of the scheme .....	11
6.2 Links to other policies.....	13
6.3 Training and Accreditation .....	14
6.4 Compliance and quality assurance .....	17
6.5 Communications and marketing .....	18
6.6 Stakeholder engagement .....	19
6.7 Review and Improvement .....	20
<b>7. FINDINGS - OPERATIONAL COST-EFFECTIVENESS AND IMPACT .....</b>	<b>21</b>
<b>8. FINDINGS – BARRIERS TO IMPACT AND LESSONS LEARNED .....</b>	<b>28</b>
<b>9. CONCLUSIONS.....</b>	<b>32</b>
<b>10. BIBLIOGRAPHY.....</b>	<b>34</b>
<b>11. APPENDIX A – STAKEHOLDER BRIEFING PAPER .....</b>	<b>36</b>

## EXECUTIVE SUMMARY

This project, “International Review of Residential Building Energy Efficiency Rating Schemes”, is the fifth project in a series of work conducted through the Building Energy Efficiency Taskgroup (BEET), under the International Partnership for Energy Efficiency Cooperation (IPEEC). This project report presents key governance and administrative considerations in the design of energy efficiency rating schemes, available information on the cost-effectiveness and market impact of rating schemes, barriers to uptake of schemes and lessons learned from the implementation of schemes. The value of this report is to combine findings from the literature with findings from interviews with scheme operators, in order to highlight tacit and undocumented information. Interview responses were coded according to categories related to the project objectives. Findings from the interviews were then compared to conclusions from the literature. Key findings are:

### Governance and administration

- **Objectives of the scheme** - The objectives of a scheme should be clearly defined at the outset, set for a long time period and be subject to periodic review. The objectives should be clearly translated into specific, measurable and time bound targets. The objectives of the scheme (as publicly stated, or as understood within the implementation framework) should be reflected in the mandate and success indicators of the governing personnel and organisations.
- **Links to other policies** - The most effective schemes are linked to wider policy targets, often from other Departments, in a clear and measurable way. The targets have timelines that provide industry with certainty and sufficient time to respond to change.
- **Training and accreditation** - Training and accreditation processes generally leverage existing education structures and qualifications in the market. Where schemes require accredited assessors, ongoing training during the implementation stage is important to the reliability of the scheme and maintaining public confidence in the schemes results.
- **Compliance and quality assurance** - Best practice schemes have thorough and transparent compliance and quality assurance in place. Strong quality assurance (QA) processes are reliant on a centralised database in electronic format, preferably publicly accessible. Many schemes reported that a more rigorous QA process would be preferable, and that QA was limited due to availability of resources.
- **Communications and marketing** - A consistent theme from the interviews was the underestimation of the ongoing role for structured communication and marketing. Consistent communication that is targeted to specific stakeholders in the value chain is important to raise awareness and to maintain support for the scheme.
- **Stakeholder engagement** - Stakeholder engagement should be undertaken from the initial planning stages and throughout the implementation of the scheme and include a broad set of stakeholders. Homeowners are often overlooked as a stakeholder that should be engaged as part of consultation processes. Stakeholder interests should be analysed in advance of engagement, particularly where stakeholders may have conflicting interests.
- **Review and improvement** - Review and improvement processes are routinely under resourced in the initial planning for a scheme. Best practice is to establish a roadmap for review stages, appropriate resources for conducting reviews and implementing review findings as well as built in capacity to change the stringency of the scheme over time.

### Cost-effectiveness and market impact

- Effective data management through a central electronic database underpins any assessment of cost-effectiveness or market impact.

- The source of funding, and the distribution of costs and finance, are an important consideration of cost-effectiveness.
- Studies that examine the cost-effectiveness of schemes as a whole are very limited. However, there are some recent studies examining the impact of energy efficiency ratings on sale or lease prices. These largely point to significant and positive sale and/or lease premium for properties with higher energy efficiency ratings.
- There are many other potential measures of impact on building markets in addition to utility cost savings, sale premiums or lease premiums. These include recognition of energy efficiency in valuation processes, inclusion of energy efficiency in mortgage assessments, creation of jobs, the market reach of the scheme, use of the scheme in marketing materials by developers and numbers of assessors trained.

### **Barriers to impact and lessons learned**

Lessons spanned a variety of categories including:

- Important considerations for technical aspects of tools/schemes.
- Communication of the scheme including differentiation from other schemes, choosing easy to understand metrics for ratings and involvement of assessors in communication.
- Connection of schemes to financing mechanisms including 'green mortgages'.
- The importance of setting out long timelines for realisation of the schemes objectives and continuity over time.

Other issues raised include the relative benefits of voluntary vs. mandatory schemes, data retention, split incentives created by schemes, involvement of the whole supply chain and building demand amongst homeowners.

### **Conclusions**

Conclusions are drawn on the reports process and methodology as well as the findings themselves.

1. The methodology of stakeholder identification, briefing paper, interviews/survey, coding and comparison to literature, was well suited to the objectives of this project and could be replicated in future work. However, it should be noted that the task of finding appropriate people to interview was often difficult and time consuming.
2. In general, the findings that emerged from the interviews with scheme managers correspond with the body of literature. Notable points from the interview that are either different to the prevailing literature or received different emphasis than in the literature include:
  - The importance of establishing long term goals and objectives for the scheme and maintain consistency in these over time.
  - Consideration of the scheme as one component of a broader framework of energy efficiency activities.
  - Significant under-resourcing of quality assurance and review processes.
  - Recognition of, and engagement with, the full supply chain regarding how the scheme will affect them and the intended outcomes from the scheme.

### **Recommendations for further work**

The method of interviewing the scheme administrators and coding the interviews as per this project yields practical experience and knowledge and enables the BEET to benchmark progress of schemes in member countries. We recommend that the process is replicated and may be streamlined using a web based survey. This could build BEET presence and awareness and serve the purpose to more frequently share knowledge and experience across IPEEC members.

## 1. INTRODUCTION

This project, “International Review of Residential Building Energy Efficiency Rating Schemes”, is the fifth project in a series of work conducted through the Building Energy Efficiency Taskgroup (BEET), under the International Partnership for Energy Efficiency Cooperation (IPEEC). This project is known as BEET 5. The current project is being led by Australia through the Department of the Environment and Energy.

The residential building sector remains a significant contributor to energy use and while energy efficiency has improved for most countries in the OECD in the period 1990-2011, energy consumption per capita has increased due to larger average house sizes, lower numbers of inhabitants per household and an increase in use of small electrical appliances (International Energy Agency, 2014). Residential energy efficiency rating schemes are one way to impact homeowner, buyer or lessor decisions regarding energy efficiency.

This report presents key governance and administrative considerations in the design of energy efficiency rating schemes, available information on the cost-effectiveness and market impact of rating schemes, barriers to uptake of schemes and lessons learned from the implementation of schemes. The report builds upon the BEET 1 Report completed in 2014 that provided a framework for assessing building rating schemes, including robustness of rating tools, resources harnessed for scheme implementation and ancillary supporting programs. BEET 2-4 focused on international collaboration and supporting energy efficiency progress in major economies.

## 2. OBJECTIVE

The objective of this project is to consider the governance and administrative structures, operational cost-effectiveness, and impact on building markets, of residential building rating and disclosure schemes operating internationally.

There is considerable literature that considers aspects of the projects objectives. The value of this project is to combine findings from the literature with findings from interviews with scheme operators in order to highlight best practice, tacit knowledge and undocumented information.

The focus of this report is on providing aggregated information across all schemes surveyed rather than individual information on specific schemes<sup>1</sup>. The exception to this is specific information on cost-effectiveness which, due to different scopes and methodologies is not appropriate to present in aggregated format.

## 3. PROJECT BACKGROUND

### 3.1 IPEEC and BEET

IPEEC is an autonomous intergovernmental entity with 16 members (15 country members and the European Union). IPEEC assists its member countries to identify and share proven,

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<sup>1</sup> For information on specific schemes readers are encouraged to refer to the Building Rating website – a collaboration between the Global Buildings Performance Network (GBPN) and the Institute for Market Transformation ([www.buildingrating.org/policy-comparison-tool](http://www.buildingrating.org/policy-comparison-tool)) or the GBPNs Dynamic comparison of energy efficiency policies for new (or existing) buildings tool/s ([www.gbpn.org](http://www.gbpn.org)).

innovative practices and data on energy efficiency to better inform decision makers. IPEEC works through dedicated Task Groups to design and implement technical work programs. The BEET was established to increase multilateral cooperation in the field of building energy efficiency, specifically in relation to the development and implementation of ratings systems and building energy efficiency policy measures. BEET members include all IPEEC members as well as Indonesia, New Zealand, Saudi Arabia, Singapore, Spain and Turkey.

BEET has completed four key reports to date:

1. Building Energy Rating Schemes – Assessing Issues and Impacts (2014)
2. Building Energy Efficiency – Opportunities for International Collaboration (2014)
3. Delivering Energy Savings in Buildings – International Collaboration on Building Energy Code Implementation (2015)
4. Building Energy Performance Metrics – Supporting Energy Efficiency Progress in Major Economies (2015).

This report will be the 5<sup>th</sup> BEET report.

## **4. SCOPE AND DEFINITIONS**

### **4.1 Scope**

The focus areas of this project included the examination of building energy rating and disclosure schemes in the following three areas:

1. Governance and administrative structures
2. Operational cost-effectiveness and market impact
3. Barriers to impact and general lessons learnt

There are a number of existing studies that cover portions of this scope. The project team was tasked with adding to this existing body of knowledge, rather than repeating findings of previous projects or research studies. A key aspect of this project was to contact scheme operators directly for their insight into the objectives, characteristics and effectiveness of their schemes, rather than being solely desktop study.

The project examines residential energy efficiency rating schemes with a focus on detached and semi-detached buildings. Schemes that target multi-unit residential buildings were included where they provide information relevant to the broader residential market and where the experience of the scheme is deemed to be useful to inform the project objectives.

This project was focused on energy efficiency, even where building rating schemes include broader sustainability aspects, for example water efficiency, renewable energy inclusions or materials. The project team recognise that there may be trade-offs between different sustainability considerations, for example embodied energy vs. operational energy use, but these considerations are beyond the scope of this project.

While the technical validity of rating schemes and the format of rating labels or certificates is critical to their success and impact, the technical aspects of tools were not the primary focus of this project and were only included where they are linked to the objectives and focus areas of the project.

This project is not limited to IPEEC/BEET member countries; where schemes meet the selection criteria outlined in Section 3.3 they were included in the report.

## 4.2 Definitions and key concepts

The literature notes a considerable inconsistency in the use of key terms. This report uses the following definitions of key terms:

- **Assessment** – is the determination of performance of the house in line with the requirements of the scheme, tool or rating system.
- **Assessor** – is the person or company responsible for conducting the building energy rating and submitting required paperwork to authorities.
- **Certification** – is the provision of a rating or a label to the house in line with the requirements of the scheme, tool or rating system. This may be done by a different organisation to that assessing the buildings.
- **Cost-effectiveness** – is the balance of costs incurred to govern and implement the scheme compared with the benefits achieved by the scheme to all stakeholders. These may be expressed in monetary or non-monetary terms. A complete cost-effectiveness study will examine the effectiveness of options in relationship to each other. Cost-effectiveness studies will have different scopes depending on the scheme being investigated and its objectives and, if used in this project, are for illustrative purposes not direct comparisons.
- **Mandatory and voluntary disclosure** – Mandatory disclosure for energy efficiency of residential buildings is understood to be the government regulations and laws that define the type of information that must be disclosed, in what form, to who and at which stage in the property life cycle. In contrast, voluntary disclosure is not required by law and may be instigated by any party but most often this will be the homeowner.
- **Rating tool** – is the analytical or IT platform used for establishing a building rating or providing an energy label.
- **Rating scheme (scheme)** – rating schemes are the combination of the rating tools and their supporting programmatic elements (Building Energy Efficiency Taskgroup, 2014). Schemes are used to underpin labelling and/or disclosure programs, and as a mechanism to determine minimum energy performance standards for buildings. They are combined with other policy instruments such as financial incentives or minimum standards in order to achieve energy efficiency objectives.



## 5. METHODOLOGY

This project was undertaken in five key phases as outlined below.

### 5.1.1 Literature review and Briefing Paper

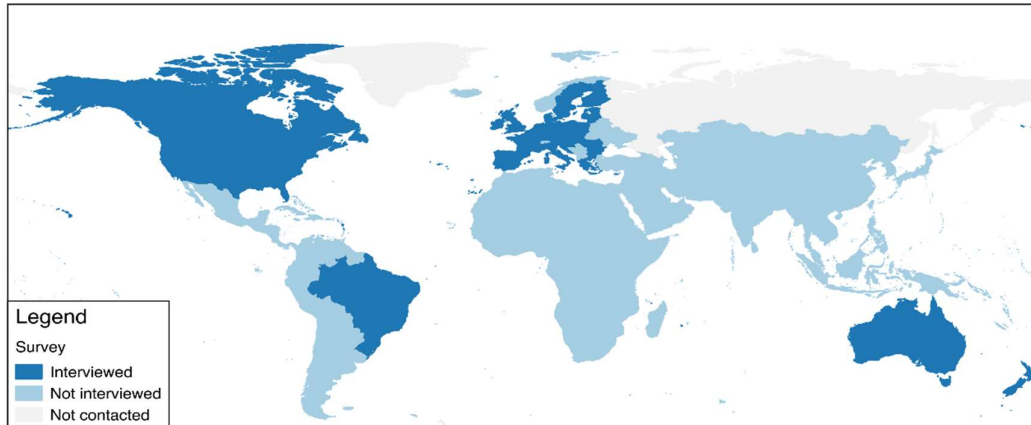
A literature review of publicly available resources and resources provide by the Project Steering Group was conducted. The aim of the literature review was to establish the current state of knowledge on international energy efficiency schemes. Based on the literature review, a Stakeholder Briefing Paper was prepared for distribution to stakeholders before interviews were conducted. The Briefing Paper set the context for the objectives of the project and detailed the specific questions under each objective. Although there were specific questions in the Briefing Paper, these were used as a guide for discussion and enquiry, and facilitated semi-structured interviews. This structure kept the interviews focused on the objectives of the project whilst allowing introduction of new issues by interviewees. The Stakeholder Briefing Paper is attached as an Appendix. Note, the categories of questions differ from the structure of the final report which was adjusted according to the coding process explained in Section 5.1.4.

### 5.1.2 Stakeholder identification

Stakeholder and scheme identification was then undertaken by Edge Environment and the International Advisory Group. Stakeholders were identified based on their knowledge of schemes being targeted by the project. The project team particularly targeted individuals who were directly responsible for managing the schemes. The primary selection criteria for including building energy efficiency rating schemes within this project was the ability to add to the current knowledge concerning the governance and administrative structures, operational cost-effectiveness, and impact of the scheme on building markets. Selection criteria therefore consisted of:

1. Quantified data on the cost-effectiveness and market impact of the scheme
2. Access to knowledgeable personnel within the project timeframe
3. Schemes implemented or significantly changed within the last two years
4. Schemes not included in previous BEET reports

Attempts were made to contact stakeholders in all regions (Figure 1). Stakeholders included experts with information across whole regions, where this is the case the whole region is marked as 'contacted'. In some instances, multiple interviewees from the same region were engaged. This was particularly the case where there was variability within a country or within a region that has the same framework for their energy efficiency scheme (i.e. the European Union).



**Figure 1. World map showing regions/countries that were contacted for interview and regions/countries where interviews were conducted.**

### 5.1.3 Interviews

The Stakeholder Briefing Paper was distributed to the selected stakeholders and interviews were then conducted with a preference for face-to-face and phone interviews. The interviews were conducted between June and August 2016. Some stakeholders chose to respond in writing. For all face-to-face or phone interviews, the notes transcribed by the interviewer during the meeting were sent to the interviewee for review and amendment before including the findings in this report. Often the interviewee added further detail to the interview notes.

### 5.1.4 Coding of interviews

Coding of the interview notes was undertaken by categorising the interview points. Categories were either pre-defined based on the literature review or were introduced during the coding process if interviewees provided information that could not be categorised according to the existing set of categories.

The coding was performed independently by two members of the project team in order to improve the reliability of the coding process. There was considerable agreement within the two separate coding processes. Where divergence occurred further analysis of the interview notes was undertaken, and/or contact with the interviewee was made, in order to clarify the point. The coding categories are aligned to the objectives of the project and are listed below:

- Governance and administration
  - Objectives of the scheme
  - Links to other policies
  - Compliance and quality assurance
  - Training and accreditation
  - Communications and marketing
  - Stakeholder engagement
  - Review and improvement
- Cost-effectiveness and market impact
  - Data management

- Funding sources and funding distribution
- Cost to homeowners
- Reviews of specific cost-effectiveness studies
- Impact on building markets
- Barriers to impact and lessons learned
  - Technical aspects of a rating tool/scheme
  - Communication
  - Financing
  - Timelines for achieving objectives
  - Voluntary vs. mandatory schemes
  - Retention of data and administration of the scheme
  - Split incentives
  - Building demand
  - Involving the whole supply chain

Each category includes a definition of the scope of the category followed by a synthesis of the key findings from the interviews.

#### **5.1.5 Connection of literature to interview findings**

Findings from interviews were compared to conclusions drawn within the literature. A discussion of any contradicting or corroborating information is included in the final subsection of each category under 'Examples and Discussions'.

The discussion of the literature is not intended to be a comprehensive review of all information on the topic, but rather a sample of key resources and important points that are linked to the findings of the interviews.

## **6. FINDINGS – GOVERNANCE AND ADMINISTRATION**

### **6.1 Objectives of the scheme**

#### **6.1.1 Definition**

The objective of the scheme is the stated or implicit aim or goal of the scheme. While energy efficiency is the primary objective of most schemes, this is not always the case and it may not be the only objective of the scheme. Additionally, even where energy efficiency is the focus of the scheme, some schemes may have energy use reduction targets as the primary objective, while others may have education regarding energy efficiency as the primary objective. As well as the objective itself, there are a number of other considerations, including how clearly the objectives are defined and communicated, who sets the objectives, how often the objectives are reviewed and updated, and how objectives flow through the design of the scheme.

#### **6.1.2 Findings**

The objectives should be clearly defined at the outset, established and set for a long time period and be subject to periodic review. The objectives should be clearly translated into specific, measurable and time bound targets. This is critical to be able to evaluate the

scheme's effectiveness over time. The objectives of the scheme should be aligned with the mandate of the governing personnel or administrative structures to ensure all components of the scheme are working toward the same end.

Most schemes' objectives are described in publicly available documentation and conversations with interviewees mirrored this documentation. Some schemes that had been running for a long time (5 years plus) had drifted from their original policy objectives and it was unclear as to what objective was currently being pursued, although the schemes had become an integral part of other policy tools. In some cases, energy efficiency was included as an objective alongside cost reduction or cost management for jurisdictions or households.

Some schemes have been criticised for 'setting the bar too low', but stressed the importance of setting achievable targets initially in order to foster change. Ultimately, those tools with the objective to reward the top end of the market as a strategy to create market change (for example, Green Star in Australia and other countries), will set higher performance requirements than those that are mandatory or intend on wide scale market penetration for the scheme.

### 6.1.3 Discussion and Examples

In the case of Energy Star in the USA, the interview process revealed that there were clear non-publicly stated objectives that sat alongside the publicised objective. The Energy Star website states that Energy Star '*designed to identify and promote energy-efficient products to reduce greenhouse gas emissions*' (EPA, no date). Interviews confirmed that informal objectives of the scheme were to target and foster innovations within the building supply chain. This approach ensured that the 'lowest hanging fruit' for improving energy efficiency was integrated within each version of the scheme as it was improved over time:

- Version 1 of the Energy Star Certified Homes targeted the following innovations starting in 1996:
  - Created a HERS infrastructure where none existed;
  - Addressed excessively leaky house construction and lack of air leakage testing;
  - Addressed excessively leaky ducts and lack of duct leakage testing; and
  - Established low-e windows on a national basis.

These changes happened at both manufacturing and trade level.

- Version 2 of the Energy Star Certified Home targeted the following innovations starting in 2006:
  - Addressed lack of comprehensive air barriers that were undermining performance of insulation; and
  - General raising of the overall energy efficiency of homes.
- Version 3 of the Energy Star Certified Homes targeted the following innovations starting in 2010:
  - Addressed lack of quality HVAC installation practices, addressed lack of comprehensive water management; addressed risk of air leakage that lead to damaging vapour flow with a prescriptive air sealing checklist, and bumped up overall energy performance.



**Figure 2. Representation of the relationship between residential energy efficiency schemes over time as improvements are integrated within the market (Image from 'A Note from Sam Rashkin: Good Government... Who Knew?')**

These informal objectives then also influenced the structure of the scheme, which included a hybrid performance and prescriptive approach to ratings.

For all schemes it is important that the objectives of the scheme (as publicly stated, or as understood within the implementation framework) are reflected in the mandate and success indicators of the governing personnel and organisations.

In the case of the Australian Nationwide House Energy Rating Scheme (NatHERS), the objectives of the scheme are to assist the public and the building industry to identify the extent to which a new or existing house has the potential, through

its design and construction, to be of high efficiency in its use of space heating and cooling energy; and to facilitate rating of the thermal efficiency of dwelling design and construction, in a manner that is nationally coordinated and consistent, and is regionally sensitive to variations in climate, housing design and other factors. However, as the scheme is also used as one method of demonstrating compliance with minimum requirements in the National Construction Code, the objectives for the scheme are often misunderstood by the public.

The objectives of a scheme should flow all the way through the scheme's implementing parties. For example, energy efficiency requirements are often included amongst other building assessment components. Interviewees cited a tendency to focus on safety requirements rather than energy related requirements, which led to unreliable ratings under the scheme.

## 6.2 Links to other policies

### 6.2.1 Definition

An energy efficiency rating scheme will not operate in a policy void. A well-designed scheme will consider the relationship between the scheme and other initiatives that influence the energy use of residential buildings, to ensure the outcome is aligned with the scheme's objectives. This section discusses the way in which connections to other policies should be considered.

### 6.2.2 Findings

The most effective schemes are linked to wider policy targets, often from other Departments, in a clear and measurable way. The targets have timelines that provide industry with certainty of the environment in which they are operating and sufficient time to respond to change. In many cases the energy efficiency schemes are connected to the wider greenhouse gas emission reduction targets, and may also be connected to other policy objectives such as reduction in peak demand or energy autonomy (through reduced demand and improved capacity to meet energy requirements within national/regional boundaries). Schemes may also be closely connected to other energy efficiency schemes or economic

incentives (e.g. upgrades to insulation or fixtures, energy bill guarantees or insulation improvements).

Unsurprisingly, these findings are mirrored in the literature. The Global Environment Facility and the United Nations Development Programme (2010) noted “the most widely used and effective policy orientations, when they are pursued in a thorough and adequate way, include implementing mandatory prescriptions such as Energy Building Codes, enrolling proactive structures to ‘market’ energy efficiency directly to consumers, and working with municipalities. The best results are reached when these instruments are combined with other information or financial activities in policy packages.”

Where links with other policies require organisations or departments to cooperate to achieve targets, it is important that the mandates are aligned with each entity’s respective objectives of the policies. There were a number of instances where cooperation across geographic areas or organisations was difficult to achieve, as the objectives of the different actors had not been aligned with the scheme’s objectives.

### **6.2.3 Discussion and Examples**

Schemes should continually leverage existing energy efficiency practice or regulatory requirements within the market to ensure efficiency and ongoing relevancy of the scheme. Voluntary schemes covered in the interviews appear to be particularly well tuned to do this. The International Finance Corporation’s (IFC) EDGE tool leverages any existing rating schemes within the countries that it operates, as soon as those schemes reach a market penetration of 50% of new buildings. Likewise, Green Star in Australia is careful not to replicate any regulatory requirements – rather incorporating these within its requirements and requiring additional levels of performance.

There are also potential challenges of integrating schemes within the wider regulatory or policy environment. If a scheme is tied to broader policies that are subsequently changed, that will in turn impact the scheme. For example, the United Kingdom had a strong commitment to energy efficiency and sustainability through the Code for Sustainable Homes and the target of Zero Carbon Homes in 2016. However, these commitments were withdrawn in 2015 in a ‘Red Tape Challenge’ when the Technical Housing Standards Review aimed to reduce regulations that were seen to be hindering construction activity. The Code for Sustainable Homes was withdrawn and the Building Research Establishment replaced it with a voluntary tool designed for developers to market the performance of their homes to potential homebuyers.

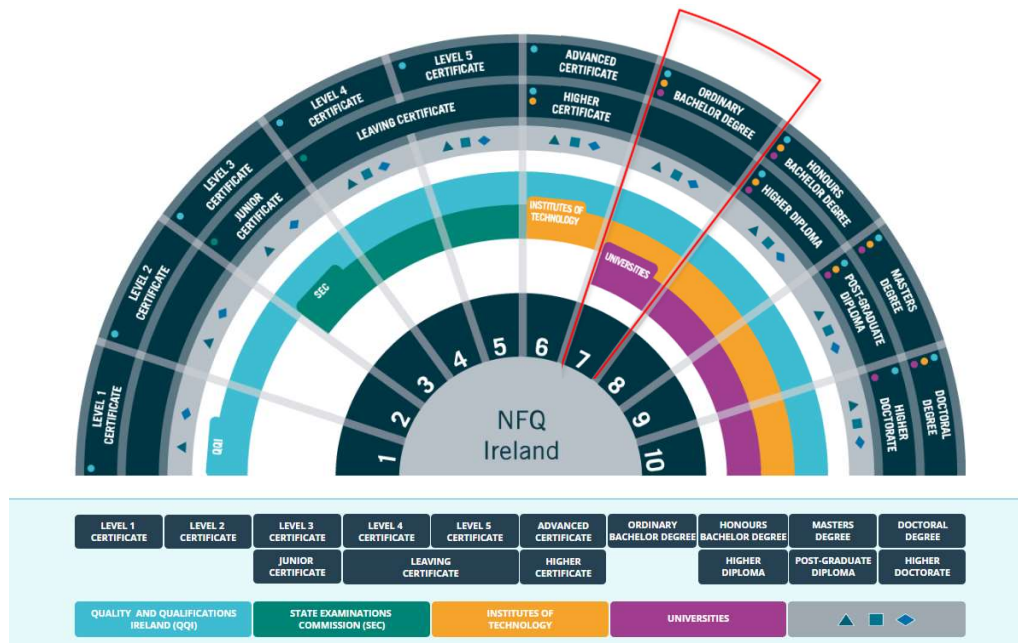
## **6.3 Training and Accreditation**

### **6.3.1 Definition**

Training and accreditation specifically refers to the requirements placed on assessors and organisations associated with the certification bodies within schemes. Figure 3 provides an overview of the relationship between Ireland’s various educational institutions and levels of qualification. This includes education requirements, examinations and management of assessors and certifiers. Quality assurance and compliance considerations are addressed in a later section.

### 6.3.2 Findings

Training and accreditation processes generally leverage existing education structures and qualifications in the market. Figure 3 shows the Irish National Framework of Qualifications, which is also aligned to the European framework. Applicants desiring to become Registered Energy Auditors, must have been awarded an appropriate related technical qualification (in a discipline such as engineering, architecture or building services), minimum Level 7 on the NFQ (SEAI, 2015). The applicant must also have 7 years or relevant professional experience and be registered with one of four professional bodies recognized by the scheme. In this way training programs will have to work closely with partners to ensure the capacity for delivery of the scheme is maintained. High demand for training occurs in the initial implementation stage and also if schemes are converted from a voluntary to mandatory requirement due to a likely increase in rating activity.



**Figure 3. Irish National Framework of Qualifications (Quality and Qualifications Ireland, 2016)**

There will be a trade-off between the amount of time and resources required to provide training and accreditation processes and the quality of accredited professionals. Experiences from Canada have indicated that robust examination processes are an important component of the training process, with a high return on invested resources. Trained assessors should also have guidance on interaction with stakeholders, as they are not merely delivery partners for the scheme, but also the ‘face’ and ambassadors for the scheme on the ground. The Irish experience was that the requirement for a high level of qualification and experience resulted in assessors valuing their accredited status and becoming important advocates for the Energy Performance Certificate (EPC) scheme.

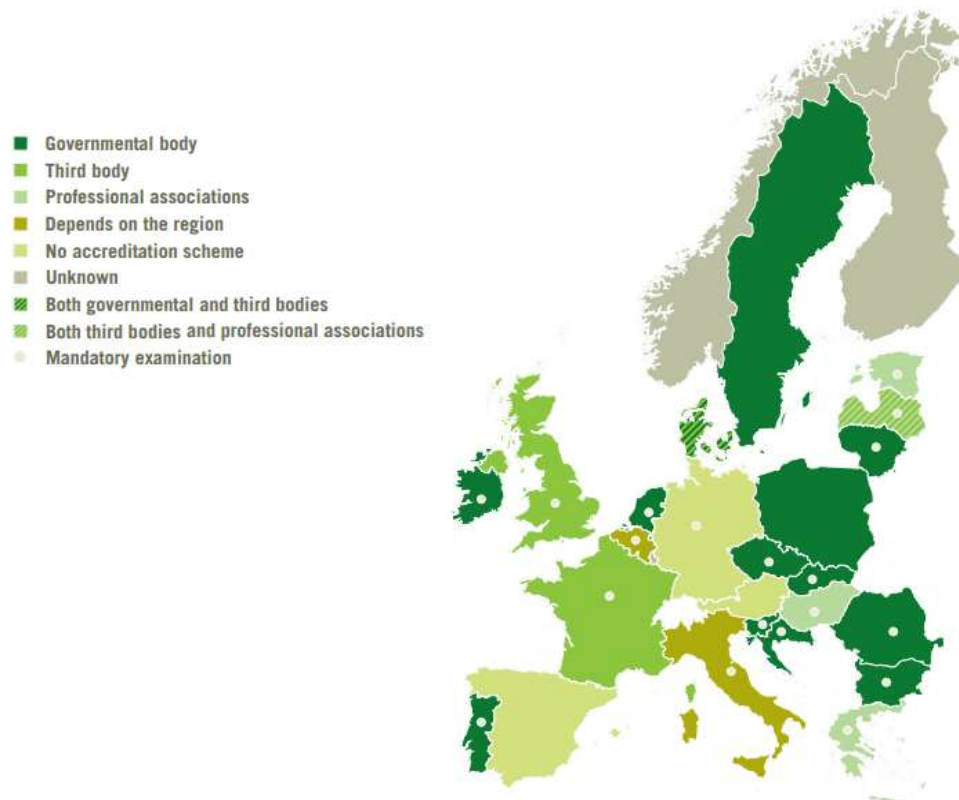
While not considered formal training or accreditation, engagement and education of the wider supply chain should be considered in partnership with the formal training processes. This is discussed in more detail in a later section.

### 6.3.3 Discussion and Examples

Across the EU states there are both minimum requirements for levels of education and for levels of professional experience. *“In most [EU] countries a technical university degree is required to be a certifier (i.e. mechanical, civil and electrical engineering, architecture) or a*

training that integrates the aspects related to energy performance in buildings. Depending on the country, relevant professional experience might be required- typically between 2 to 6 years- and depends on the type of energy certifier and his/her education level” (Arcipowska, et al., 2014, p. 18).

Although not specifically required by the Energy Performance of Buildings Directive (EPBD) accreditation is mandatory in the majority of EU countries. Figure 4 shows the different bodies in charge of accreditation procedures across the EU.



**Figure 4. Bodies in charge of qualified experts accreditation under the EU EPC scheme (Arcipowska, et al., 2014)**

Where schemes require accredited assessors, ongoing training during the implementation stage is important to the reliability of the scheme and maintaining the public’s confidence in the scheme’s results. Recommendations from the Concerted Action Energy Performance of Buildings (CA-EPB) (2016) note that continuous professional training of assessors is important. This is a growing requirement in a number of EU countries, but currently only implemented in 8 of 28 countries (Arcipowska, et al., 2014).

Where a mandatory rating is implemented, a significant amount of work may be required to up-skill existing professionals when there is an amendment to the scheme or the tools that it uses. For example, the industry in Ontario, Canada, is currently expressing concerns that there may not be the required capacity and skills to implement the proposed mandatory rating scheme, thus requiring upskilling and expanding the number of assessors.



## 6.4 Compliance and quality assurance

### 6.4.1 Definition

Compliance and quality assurance (QA) refers to the ongoing processes to maintain the required level of quality to achieve the scheme objectives. Processes may include penalties for non-compliance, regularly timed reviews and ongoing education.

### 6.4.2 Findings

Best practice schemes have thorough and transparent compliance and quality assurance in place. While the setting of QA standards is most often centralized with the institution in charge of operating the scheme, some parts of the process may be outsourced. For example, auditing of specific components of the scheme.

Good QA processes are reliant on a centralised database in electronic format. The scheme should ensure that data is kept in a central repository from the first days of operation. Further discussion of the importance of a reliable database is in Section 7.

At a minimum pre-occupancy phase compliance checking should be undertaken. That is, the consistency of the energy efficiency assessment with the rules of the scheme. Some schemes are also experimenting with outcome based adjustment to assessments, which involves post-occupancy assessment of performance and reassessment of the energy efficiency based on performance in operation. It is also widely recognised that post-occupancy checks of ratings or certifications are complicated by the broad range of user behaviour in dwellings.

In regards to assessors, a code of practice and a robust response by administrators for malpractice were identified as important. This is particularly the case where the scheme is connected to economic incentives for the homeowner or assessor. A number of schemes have identified poor practice by assessors due to incentives that were not aligned with the program's incentives, conflict of interest or lack of training. While some of these issues are documented, the interviews highlighted this may also be undocumented and therefore only discoverable through conversations with scheme operators or stakeholders.

### 6.4.3 Discussion and Examples

According to interviewees, quality assurance of schemes is closely related to the resources that were available to the governing bodies. Many schemes reported that a more rigorous QA process would be preferable, and that QA was limited due to availability of resources.

Publicly releasing assessment data is seen as good practice to improve reliability of ratings and also to improve public confidence in the scheme. However, anecdotally this may also present a risk to the scheme. Publicly available data can be analysed by other organisations with particular agendas that are contrary to the scheme's objectives. This risk may be mitigated by providing clear guidance to data users about how the data should be used and appropriate timelines for analysis (in order to allow the scheme sufficient time to achieve progress against objectives).

A number of interviewees discussed the balance between maintaining market confidence in the rating as a reliable signal of good energy efficiency performance and implementing a scheme that was wide reaching enough to encourage the market on a pathway toward energy efficiency over time. In this respect 'as-built' quality assurance processes are very effective, but significantly more resource intensive than assessing compliance based on

building plans. Running checks of a random sample of buildings is one way to limit resource use while improving the quality assurance processes and is most effective when combined with both good training processes and basic checks of the initial rating process (George Wilkenfeld and Associates and Winton Sustainable Research Strategies, 2012).

## **6.5 Communications and marketing**

### **6.5.1 Definition**

Communication and marketing is the process of imparting information through various mediums to stakeholders of the scheme. It is distinguished from stakeholder engagement in this report by the fact it is based on informing stakeholders rather than involving and collaborating as with stakeholder engagement. Communication and marketing can include display formats for the results of the schemes assessments (certificates or ratings), websites, hotlines, newsletters and presentations.

Communication and outreach activities should consider the clarity and intuitiveness of the label, accessibility of action-oriented recommendations to consumers, explanation of linkage to other programs (including financial incentives and addressing potential confusion with other schemes), websites and hotlines.

### **6.5.2 Findings**

A consistent theme from the interviews was the underestimation of the important and ongoing role for communication and marketing to support a successful scheme. Many schemes identified gaps in their communications activities and believed a more structured approach to communication and marketing would have improved the schemes ability to meet its objectives.

Consistent communication that is targeted to specific stakeholders in the value chain is important to raise awareness and to maintain support for the scheme. The messages will be different depending on the audience. The public should be provided with information on the schemes purpose, structure and outputs. A number of interviewee's highlighted the usefulness of case studies for the public, either virtual or physical, that showed what different levels of performance looked like. Particular challenges with communication included the difficulty in easily interpreting the schemes outputs (e.g. ratings or scores that were not 'intuitive' to homeowners).

Communication requirements to the supply chain will vary depending on existing capacity and are particularly likely to be overlooked by scheme operators. The lower the existing capability and the more focus the scheme has on innovation or transformation, the greater focus on supply chain communications will be required.

### **6.5.3 Discussion and Examples**

Communication schemes may be particularly important where the scheme goes through versions and performance requirements are improved over time, as with Energy Star in the USA. If ratings are not required to be renewed at points of sale and point of lease, then new housing stock will have different performance requirements than existing housing stock even when both are accredited under the same scheme. For the market to recognise these improvements in the scheme, whilst maintaining clear continuity with previous versions of the scheme, communications campaigns would be required.

The IFC has taken an innovative approach to encourage communication of the EDGE scheme through building markets. Awareness raising is required to be undertaken by licensed assessment providers and minimum levels of market penetration are written in to the service providers contracts.

Whilst not mentioned in interviews, recent literature has re-analysed the impact of EPC on property sales prices (Jensen, et al., 2016). Whereas previous analysis pointed to limited impact of EPCs on sales price, this more latest analysis was more nuanced. It showed that *'energy performance rating of properties not play a significant role in relation to sales, and it further suggests that the role of the EPC resulting in an energy performance rating was significantly improved due to the 2010 requirement to the display of the rating in connection with sales'* (p. 234). That is, the communication of the rating through public display of the energy performance is fundamental to the market impact of the scheme.

## 6.6 Stakeholder engagement

### 6.6.1 Definition

Stakeholder engagement is closely connected to other communication activities but is distinguished by the fact it is a two-way sharing of information. Feedback from stakeholder engagement processes is used to make changes to the scheme over time, often in a collaborative relationship between scheme operators and those affected by the scheme. Stakeholders affected by the scheme may include the real estate community, workforce (assessors and certifiers), energy suppliers and energy efficiency service companies, homeowners, buyers, renters, policy makers and scheme administrators.

### 6.6.2 Findings

Stakeholder engagement should be undertaken from the initial planning stages through the implementation of the scheme and include a broad set of stakeholders. The type of engagement and timing of the engagement should be tailored to each stakeholder group. This includes considering the timing of the engagement as well as the delivery mode (face to face engagements may not be feasible for some stakeholder groups).

Homeowners are often overlooked as a stakeholder that should be engaged as part of consultation processes. Engagement of homeowners should include what they would like to see disclosed and the process that will be involved in disclosure.

Experience of interviewees has shown that stakeholder interests should be analysed in advance of engagement. This is particularly important where stakeholders may have conflicting interests.

### 6.6.3 Discussion and Examples

The BEET 1 Report (Building Energy Efficiency Taskgroup, 2014) notes that there are three main categories of stakeholders that are crucial to the success of a scheme:

1. Real estate community;
2. Workforce (assessors and administrators); and
3. Energy suppliers and energy efficiency service companies.

However, contrary to the discussions with interviewees, the BEET 1 Report does not prioritise engagement with homeowners (or other end users in the case of other building sectors).

The EnergyFit Homes Project (Adams, et al., 2016) in Australia is an example of extensive consultation with homeowners to determine the most appropriate voluntary disclosure mechanism for energy efficiency as well as broader sustainability attributes. The project took: *“a consumer-facing, end-user perspective to understand the most effective content, format, source and delivery of tools and other resources to engage the new and existing homebuyer and lessee market and drive a new value proposition in residential real estate”*. The project resulted in detailed recommendations that can be used to shape a national voluntary disclosure scheme.

## 6.7 Review and Improvement

### 6.7.1 Definition

Review and improvement is the continual monitoring of progress against objectives, recording of observations and analysing results in order to identify changes that should be made to the scheme. While compliance and quality assurance (Section 6.4) may form part of review and improvement processes they are more narrowly focused. Review and improvement processes covered in this section include broad assessment of whether the scheme is meeting its objectives and what changes could better facilitate the objectives being met.

### 6.7.2 Findings

Review and improvements processes are routinely under resourced in the initial planning for a scheme. Best practice is to establish a roadmap for review stages, appropriate resources for conducting reviews and implementing review findings as well as built in capacity to change the stringency of the scheme over time. Regulated schemes often have more difficulty incorporating innovations or improved practice that has developed in the market. It is therefore particularly important to plan for incorporating these changes in the schemes initial design or the scheme risks becoming obsolete.

Best practice review processes should incorporate a wide range of stakeholders to ensure that all aspects of the schemes operations are considered.

### 6.7.3 Discussion and Examples

Ongoing review has previously been highlighted as important to inform new schemes and improve existing schemes (Building Energy Efficiency Taskgroup, 2014). The Energy Performance of Buildings Directive Concerted Action Group (CA EPBD) is a component of the review and improvement processes of the European EPC scheme. The CA EPBD regularly brings together participants from EU countries with the objective of *enhancing the sharing of information and experiences from national adoption and implementation*” (CA-EPBD, 2016) of the EU legislation.

## 7. FINDINGS - OPERATIONAL COST-EFFECTIVENESS AND IMPACT

### 7.1.1 Definition

The quantified cost-effectiveness of the scheme is the balance of the resources required to implement and administer the scheme in order to achieve certain outcomes aligned with the scheme objective. In this section we have included information on both cost-effectiveness and on cost-benefit where a monetary value has been assigned to the measure of effect.

As most schemes have energy efficiency objectives at their core, most measured outcomes will be related energy savings that result from the scheme. Costs and benefits may be borne by various stakeholders and may include the following:

- Assessor training, insurance and administration associated with ongoing licencing/registration;
- Assessment and/or certification cost;
- Financial incentives or rebates associated with the scheme;
- Householder or real estate agents time;
- Compliance and enforcement costs;
- Communication, enquiries and engagement with stakeholders; and
- Reporting obligations.

Objectives may also not be entirely focused on energy efficiency. Other objectives such as innovation in technologies or raising awareness will necessitate different measures of effectiveness in achieving these objectives.

The range of different objectives and scope of costs included means that comparison between different cost-effectiveness analysis are often not meaningful. For this reason, this section limits findings to methodological issues and presents summaries of individual studies (rather than aggregated or comparative information) in the examples and discussion section. The findings of these various analyses should not be compared but common points and interesting learnings are highlighted below.

### 7.1.2 Findings

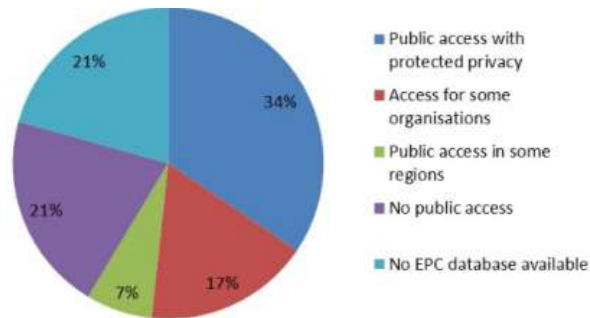
The findings provided below are on methodological aspects of cost-effectiveness. These categories emerged from discussion with stakeholders as important considerations in the review of cost-effectiveness of schemes:

- Data Management;
- Funding sources and funding distribution; and
- Costs to homeowners.

## Data Management

Ultimately, calculating cost-effectiveness requires access to robust data that mirrors the objectives of the scheme. As mentioned in Section 6, a central electronic database that is in place from the schemes inception is best practice. This is also an important finding from a review of EPBD Schemes that recommended the central database should be at least partially accessible to the public.

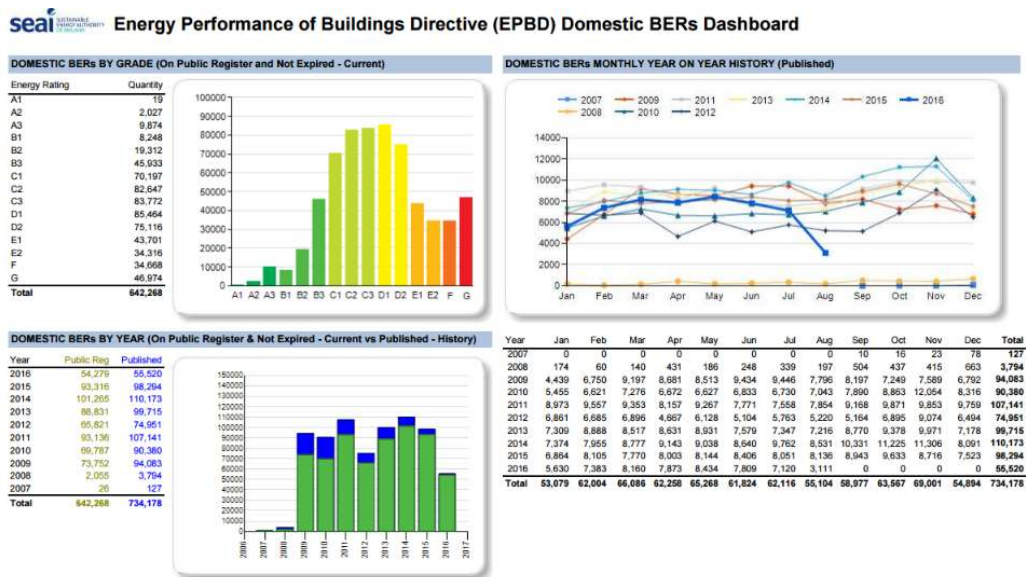
Figure 5 depicts current accessibility of EPC data across Europe. Public access to data should be accompanied by education materials that provide data users with information about any limitations. While access to data can leave the scheme open to criticism from detractors the benefits of the transparency are seen to outweigh the potential costs.



**Figure 5. Public access to EPC databases, based on results from the IEE project REQUEST2ACTION (2015) (Concerted Action Energy Performance of Buildings, 2015)**

Central registration has also been noted in a previous literature (Building Energy Efficiency Taskgroup, 2014; George Wilkenfeld and Associates and Winton Sustainable Research Strategies, 2012). Central databases have numerous benefits:

- Quality checking at time of registration of the certification;
- Facilitation of research for buyers, sellers and estate agents;
- Motivating assessors to monitor the quality of their own work;
- Facilitation of central quality assurance processes; and
- Provision of data to inform policy (allowing analysis by region, performance, etc.).



**Figure 6. Sustainable Energy Authority of Ireland EPBD Domestic Building Energy Rating statistics dashboard (updated monthly) (SEAI, 2016)**

### **Funding sources and funding distribution**

Funding structures for the scheme will differ depending on the governing body, objectives of the scheme and whether the scheme is voluntary or mandatory. Consideration of adequate funding, and allocating adequate resources is critical to supporting the schemes initial set up and ongoing operation. Initial set up often requires significant investment in a shorter period of time and funding for ongoing operation will need to be proportionate to the size a geographic reach of the scheme.

The majority of schemes were initially funded by their governing body in their development stage. Many schemes were self-funding on an ongoing basis through certification fees and/or accreditation fees. Self-funding mechanisms ensure that the scheme has an ongoing flow of funding for continual improvement of the scheme. However, it should be noted that funding through certification fees ties flow of money to building activity which means that more funds are generated in periods with higher building activity. In many cases ongoing funding was not considered sufficient for the investments required to review and improve the scheme.

Funding requirements that were often overlooked in the initial budgeting processes include:

- Training costs (training material, trainers, facilities, and advertisement);
- Cost of software (including a roadmap for the development of software and IT overtime);
- Data review and quality assurance (including interrogation of data that is input in to centralised databases);
- Costs required to implement improvements or changes identified in review processes; and
- Regular evaluation and assessment of the schemes progress against objectives.

### **Costs to homeowners**

Interviewees indicated that in order for voluntary ratings to be attractive the cost of to homeowners needed to be in the vicinity of US\$100-200. Similar numbers are quoted in the literature (Earth Advantage Institute and Conservation Services Group, 2009)

The distribution of costs will vary depending on whether the scheme is calculation based or prescriptive in nature. A scheme that allows full flexibility to meet the requirements will allow the user to select the lowest cost method for the situation, however, common least cost 'pathways' often emerge overtime. A prescriptive scheme (one that dictates certain technologies) may increase costs to individuals but has the added benefit of encouraging fast uptake of new technologies or innovations. Research from the implementation of the European EPBD found that a combination of component (prescriptive) and whole-building requirements (calculation based) *'may prove to be the best solution to implement the most energy saving measures'* (Concerted Action Energy Performance of Buildings).

### **7.1.3 Discussion and Examples**

Building rating schemes can influence markets in a number of ways but the most significant of these are transaction prices, market valuation and rental yield as these are relatively much greater compared with operational expenses (Building Energy Efficiency Taskgroup, 2014). In 2014 BEET 1 concluded that while numerous studies showed a positive relationship between good performance within energy rating schemes and asset valuations, many experts remained sceptical about the magnitude of these effects.

The majority of the studies below are not covered in the BEET 1 report, many having been published in the last 2-3 years. As discussed in the methodology section, each study is presented separately as drawing meaningful comparisons between studies is limited by the different objectives of schemes, the different scopes of studies and the different methodologies for analysis. Additionally, many studies do not assess the cost-effectiveness of the scheme as a whole but do examine magnitude of key impacts (e.g. the schemes impact on asset/sale prices). Reviewing or commenting on the methodologies of the studies is beyond the scope of the report and the general methodological challenges of cost-effectiveness analysis for energy efficiency schemes has been extensively covered elsewhere (Building Energy Efficiency Taskgroup, 2014), (Institute for European Environmental Policy, 2013).

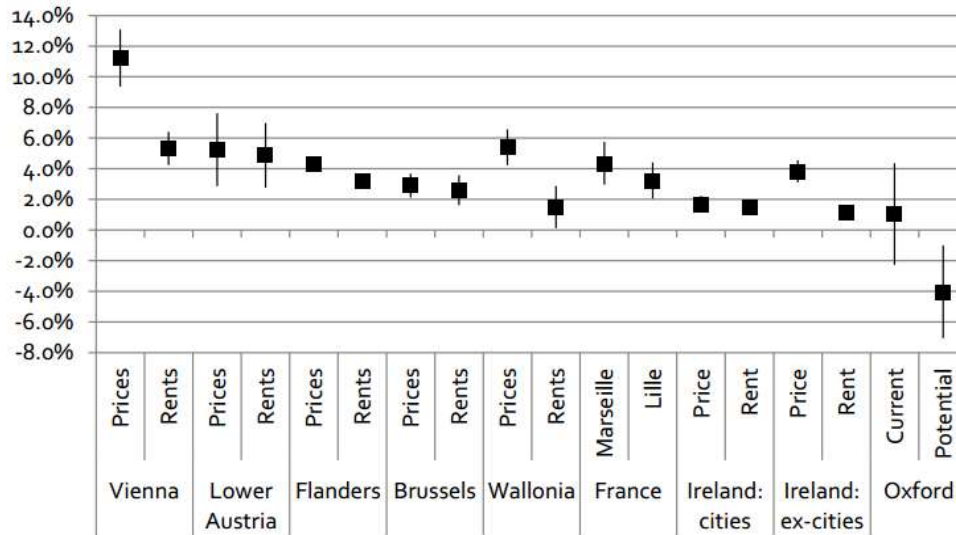
**Table 1. Summary of studies reviewed and key findings.**

Scheme	Country / Region	Study Date and Author	Key findings
EPBD – EPC	Europe (various countries)	(Bio Intelligence Service, Ronan Lyons and IEEP, 2013)	In all but one study region effects of energy efficiency were clear and positive on rental premium and sale price.
EPBD – EPC	Denmark	(Jensen, et al., 2016)	Sales price of properties show that home buyers value energy performance of residential buildings. This affect relies on the clear and open presentation of the ratings and is therefore not.
Various	California, USA	(Kok & Kahn, 2012)	California homes labelled by Energy Star, LEED for Homes and GreenPoint Rated sell for 9% more ( $\pm 4\%$ ) than comparable, non-labelled homes.
Various	Various	(Walls, et al., 2013)	Homes built within the first 10 years of the Energy Star certification scheme had a sales price increase when Energy Star rated, properties built after the first 10 years of the program (post-2006) did not receive a sales price premium. The authors hypothesise that the lack of sales price premium in more recent years may be due to more stringent building codes.
BASIX	NSW, Australia	(BASIX, n.d.)	Cost benefit analysis has estimated that BASIX certified dwellings will generate a positive benefit to NSW of between \$1.20 and \$1.60 for every dollar spend complying with the scheme to 2050.
Various	Europe (various)	(Institute for European Environmental Policy, 2013)	IEEP reviewed a number of ex-post evaluations that examined the public investment compared with the return for various energy efficiency schemes. Measured impacts included energy saved, jobs created and investments in energy efficiency resulting from schemes.

### European Union - European Energy Performance Certificates

An analysis was completed in 2013 (Bio Intelligence Service, Ronan Lyons and IEEP, 2013) using data from Austria, Belgium (Flanders, Wallonia, Brussels-Capital), France (Lille, Marseille), and the UK (Oxford, South East). The study found that in all but one region (Oxford, UK) the effects of energy efficiency were clear and positive. The study also found that the estimated rental premium for energy efficiency was smaller than the estimated sales price premium which “*suggests that owners reap a benefit that is additional to the ongoing monthly benefits, i.e. reduced energy bills, which accrue to all occupiers including tenants*”. Figure 7 describes the sale and rent price effect across various regions.





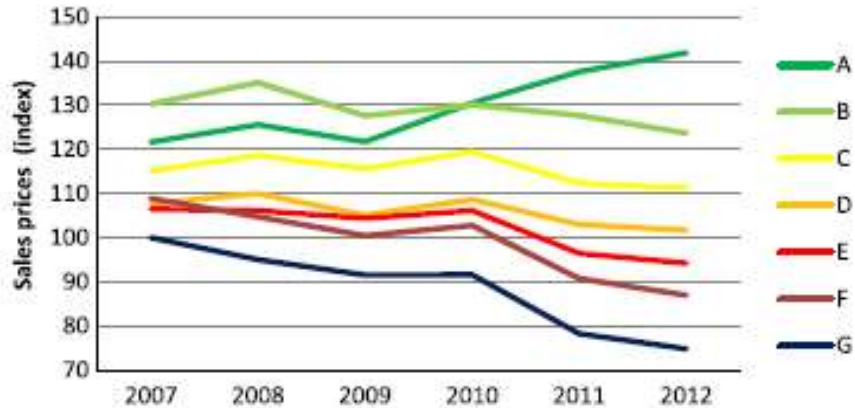
**Figure 7. Effect of one-letter or equivalent improvement in EPC rating across European property markets (95% confidence interval shown) (Bio Intelligence Service, Ronan Lyons and IEEP, 2013, p. 117)**

#### Denmark – Energy Performance Certificates

Statistical examination of data on energy performance ratings and property sales from 2007 to 2012 was undertaken on behalf of the Danish Energy Agency. The analysis strongly countered previous studies that had not shown an influence of EPCs on sales price in Denmark. The authors concluded that:

- Market adoption of energy efficiency ratings was significantly slower than for white goods and cars that had similar ratings schemes;
- The impact on real estate prices was linked to the clear and open presentation of the rating at point of sale (i.e. through real estate advertisements) which occurred post 2010; and
- The findings show that energy upgrading or other energy efficiency measures are recognised and valued by the market.

Figure 8 shows average sales prices of property with various energy performance ratings from the period 2007-2012.



**Figure 8. Sales prices for single-family houses in the years 2007-2012. The average sales price of property with energy performance rating G with 2007 set to index 100 (Jensen, et al., 2016, p. 233).**

#### **United State of America – California (various schemes)**

Although not a national scheme, California has been a leader in energy efficiency schemes on residential buildings. A study completed in 2012 (Kok & Kahn, 2012) and focusing on the sale price of homes found that California homes labelled by Energy Star, LEED for Homes and GreenPoint Rated sell for 9% more ( $\pm 4\%$ ) than comparable, non-labelled homes (US\$34,800 premium on the average US\$400,000 home). It should be noted that some of these ratings encompass sustainability aspects beyond energy efficiency. The study controlled for variables that influence home prices including location, size, vintage, and the presence of major amenities such as swimming pools, views and air conditioning. Higher premium for ‘green’ rated homes was positively correlated with regions with hotter climate and measurements of environmental ideology.

#### **United States of America – North Carolina, Texas and Oregon**

A similar study to the Kok and Kahn (2012) was undertaken for an area in North Carolina, Austin Texas and Portland Oregon. The study found that single-family homes built within the first 10 years of the Energy Star certification scheme had a sales price increase (Walls, et al., 2013). Properties built after the first 10 years of the program (post-2006) did not receive a sales price premium suggesting that *“as energy efficiency of new homes has improved and building codes of tightened over time the value of Energy Star certification has decreased”*.

#### **Australia – New South Wales – BASIX**

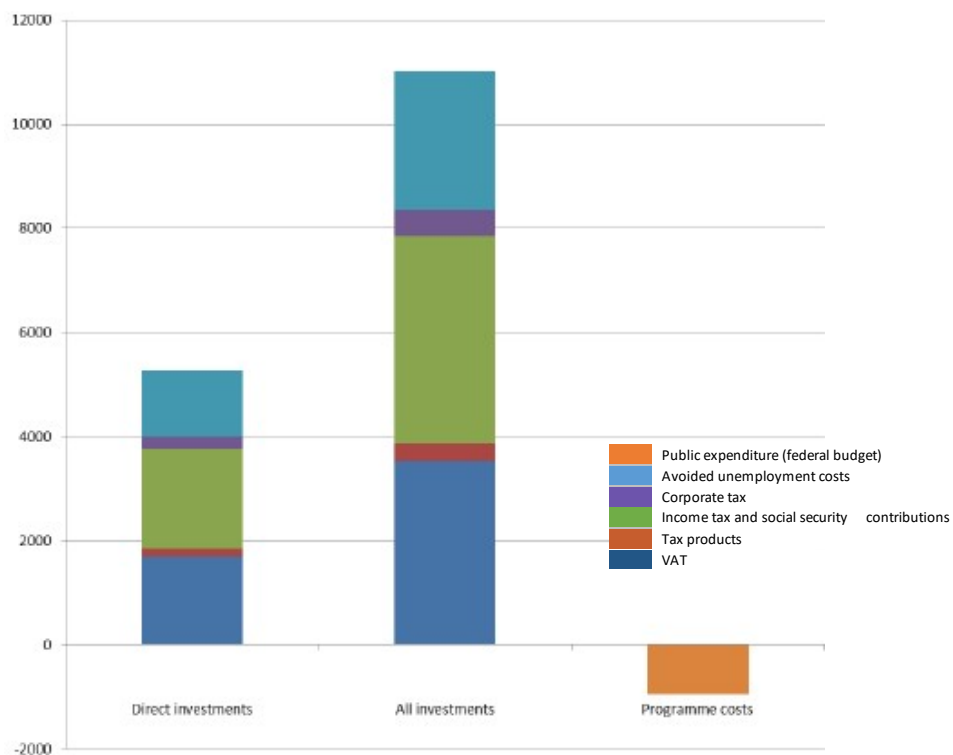
BASIX has been in operation in New South Wales (NSW) since 2004 and has influenced the design and construction of over 150,000 new dwellings (BASIX, n.d.). While BASIX ratings are not required to be disclosed it nevertheless has had thorough analysis of its overall cost-effectiveness as a scheme.

Cost benefits analysis has estimated that BASIX certified dwellings will generate a positive benefit to NSW of between \$1.20 and \$1.60 for every dollar spend complying with the scheme. The benefits were calculated until 2050 and accrue mainly to individual householders through lower energy and water bills. Costs of compliance are greater for single dwellings and locations without access to reticulated gas. The scheme has also been shown to be successful promoting innovation in the design of energy (and water) efficient technologies and practices.

### Various Countries - Europe – Various Schemes

A review by the Institute for European Environmental Policy (IEEP) (2013) of ex-post evaluations available provided the general finding that *'relevant information strongly suggests that the benefits outweigh the costs of energy efficiency measures both from the perspective of the beneficiaries and the public authorities providing financing for the relevant measures and/or programmes'* (2013, p. 22).

The review included studies of energy efficiency programmes connected to energy efficiency rating schemes. For example, the German KfW is a renovation financing programme that provides grants and loan financing. The report concluded that the net benefits of the programme could be as high as EUR 10 billion for various government agencies. The study does not include benefits accruing directly to homeowners.



**Figure 9. KfW energy efficiency programmes 2011: costs and benefits (from IEEP (2013, p22) based on data from Kuckshinrichs et al. (2012, p10).**

The review also included studies examining impacts on employment.

### Other Evidence of Market Impact

In addition to monetised impact on markets there are other measures that can be used to assess the impact of schemes. These include:

- Real estate agents recognising the energy efficiency credentials as part of the marketable qualities of homes. Two programmes are being currently being progressed by a coalition of European organisations including the Royal Institution of Chartered Surveyors (RICS); Renovalue and Revalue. Renovalue is a training package for valuers to improve their awareness of energy efficiency in valuation methods. Revalue has the objective of establishing a link between investing in energy efficiency and long term investment value of residential real estate (RICS, 2016). The three-year project anticipates that the updated guidance will use risk

reduction, enhanced of long-term value and easier access to capital as the basis for the valuation guidance (Revalue, 2016).

- Inclusion of energy efficiency credentials in the valuation process. The European Mortgage Federation – European Covered Bond Council (EMF-ECBC) has held an Energy Efficiency Roundtable in 2016 including banks, banking associations, built environment associations, government bodies and chartered surveyors. The group has a green mortgages roadmap with a key decision point toward the end of 2016. This initiative may lead to recognition of increased loss mitigation capacity, enhanced loan to valuation ratio and potential reduction of borrower’s probability of default with reduced capital charges (EMF-ECBC, 2016)
- Jobs created. Studies have looked at the impact of investment in energy efficiency on jobs created. It is important to note that the employment impacts studied are not directly from energy efficiency rating schemes but from energy efficient investments. A review of two separate studies found that per one million euros invested 12-17 jobs are created making these interventions some of the most employment intensive interventions available to governments (Institute for European Environmental Policy, 2013).
- The market reach of the scheme (that is, percentage of the stock covered by the scheme as a ratio of the total housing stock). This can be particularly useful impact measure when a scheme is voluntary.
- Developers marketing and seeking to improve the performance of their standard offerings.
- Number of assessors trained.

## **8. FINDINGS – BARRIERS TO IMPACT AND LESSONS LEARNED**

### **8.1.1 Definition**

Barriers to impact and lessons learned include unexpected or poorly anticipated variables that influenced the ability of the scheme to achieve its objectives. As with other areas of the report, this list of barriers is not intended to be exhaustive but is instead driven by the findings from interviews.

Lessons learnt include unintended consequences of policies, cooperation or coordination issues, timelines for implementation, problems encountered during implementation or operation of the program.

This project requested that interviewees be frank about the effectiveness, or otherwise, of the various elements of their scheme in order that common features or approaches that contribute to achieving successful rating schemes could be identified.

### **8.1.2 Findings and Discussion**

#### **Technical aspects of a rating tool/scheme**

The technical component of a scheme (i.e. the calculator or tool behind the scheme) must be significantly robust to provide valid results whilst also being transparent to a user. The scheme should also consider how evolving technology, such as smart meters, can be incorporated in ratings.

It was noted that the technical calculations are likely to bias certain pathways for energy reduction. To a certain degree this is inevitable in modelling but is difficult to rectify once a scheme is in place and should be accompanied by careful communication strategies.

Variation between the expected and actual energy is a common challenge of energy efficiency schemes and can undermine confidence in a scheme.

Other barriers relating to the technical components of ratings schemes raise by interviewees include:

- Limited information on existing housing types and performance of homes with which to benchmark rating tools
- Limits to the technical robustness of tools for houses of different sizes including perverse outcomes (e.g. biases to larger sized houses)
- Limited transparency of results. This was of particular concern where financial incentives are based on the results of performance under a scheme
- There is increasing possibility to link rating tools to digital design tools to allow efficient and accurate testing of prototypes. While this is not a barrier for current schemes it presents a significant opportunity for improvement in the near future.

#### **Communication**

Another consideration for the communication surrounding a scheme is the market recognition of both the rating and the schemes objectives. This has been touched in on Section 6.5, but additional barriers and lessons learned include:

- Ensuring the scheme is appropriately differentiated from similar schemes (e.g. multiple schemes using 'stars' to recognise performance has been met with confusion from consumers).
- Similar to the point above is the need to choose a metric for the schemes assessments that is easily recognisable and understandable for non-experts. For example, Greenhouse Gas Emissions may be difficult for homeowners to relate to.
- Communication of the actual rating achieved and what this means for users of a home has been limited. It has been suggested that a document similar to an 'operational manual' for appliances could assist homeowners to understand the performance of the house as a whole and how they can minimise operational energy use.
- Attendance by the energy assessor on site to provide advice with implementing actions identified by a scheme will greatly improve the energy outcomes. This is consistent with findings from a recent consumer focused research project that found homeowners valued facilitated explanation of benefits and actions (Adams, et al., 2016).
- Communication activities should include information about technical updates to rating tools embedded within schemes.
- Early movers under the scheme should be supported and championed by communication materials to help demonstrate early success and build momentum.
- In some countries there are several unrelated initiatives and tools in operation that address the same aspects of buildings. This can lead to confusion and energy

efficiency fatigue by the target audience (homeowner) and other stakeholders, particularly the building industry.

### **Financing**

Another important aspect of building demand is connecting energy efficiency schemes to financing mechanisms. The USA ran a 'Green Mortgage' program prior to the Global Financial Crisis that provided preferential rates to homes that had energy efficient features. It is argued that more energy efficient homes should have a lower lifetime cost of ownership, provide for improved health incomes for occupants (due better moisture management and temperature control), less moisture damage to the structure and potentially high future value of the asset. Unfortunately, due to easy access to finance at this time, there was not wide take up of the schemes.

Where a scheme can align with access to home finance, or can demonstrate a market advantage for disclosure of a relatively higher rating, there is higher uptake of the scheme.

Other financial barriers to action have been well documented (The Building Performance Institute Europe, 2010) and include:

- Access to capital for initial energy efficiency investment;
- Exposure to risk through inaccurate ROI (and associated high discount rate to account for the difficulty in calculating return on the investment);
- Lack of financier awareness; and
- Lack of standardised measurement and verification practice.

Likewise, a review of stakeholders' opinions regarding financing mechanisms for energy efficiency improvements under the EPBD scheme confirmed that lack of financing and split incentives that are not properly addressed in the complexity of financing tools are considerable concerns (ECOFYS, 2015).

Different programs across a region (e.g. across the EU or across states within a federated region) limit the ability for financial institutions to provide financial products to homes because they cannot aggregate their products to a sufficient scale.

### **Timelines for achieving objectives**

A number of interviewees stressed the importance of charting a long timeline for schemes in order to ensure that markets have time to adapt and respond to the schemes influence. Schemes that had received criticism for not aiming high enough in initial versions of the tools considered these versions to be smaller stepping stones on a larger energy efficient pathway. However, even while being part of a longer timeline of development, schemes must be able to rapidly integrate innovations in order to stay relevant and meet objectives of improved energy efficiency. Here a tension was identified with institutionalising and mandating certain requirements while still being adaptable enough to absorb new technologies.

Related to the above point is the significant barrier of lack of consistency and continuity across the implementation of the scheme. Governance and administrative structures should be given mandates for operation that are in line with the timelines to meet the schemes objectives. Systems to manage and maintain institutional knowledge should also be in place as change of personnel within schemes was a recurring theme in interviews.

### **Voluntary vs. mandatory schemes**

Examples of schemes, such as Green Star and Energy Star, were used to describe where it might be appropriate that voluntary initiatives (either instigated by government or by industry) be used to push innovations through markets to create broader market transformation.

Mass take up of voluntary schemes requires them to be very low cost (or free) and easily accessible (e.g. online). This mirrors findings from the EnergyFit Homes project (Adams, et al., 2016) that low cost schemes should be favoured, even when there is a recognised trade off with accuracy.

Support from government for voluntary schemes greatly increased market uptake.

### **Retention of data and administration of the scheme**

Generally, there is a low incidence of schemes that retain data about the ratings, either number of ratings/certificates, or the performance of each individual house. This makes it incredibly difficult to measure the overall impact of the scheme against its stated objective and weakens the scheme by disabling a meaningful measure of the scheme's progress.

### **Split incentives**

As widely documented in energy efficiency literature there are split incentive between developers/builders and owner occupiers. Developers and builders are incentivized to deliver a product which achieves greatest financial margins, whereas the homeowner has an incentive to reduce the operational costs.

### **Building demand**

Developing demand within the residential housing market for energy efficiency is seen as a key barrier. Many schemes are still not highly valued by homeowners due to uncertainty in return on investment through either operational costs or increased asset value. The project team see an important connection here between the lack of engagement with homeowners in the schemes development and users not putting a value on the scheme in operation. A significant exception to the limited engagement with homeowners is the recently completed EnergyFit project conducted through the Cooperative Research Centre for Low Carbon Living (based in NSW, Australia).

### **Involving the whole supply chain**

A common barrier identified by many interviewees was the failure to consider the whole supply chain within the schemes design. This is linked to the previous consideration of engaging householders to build demand but also extends 'upstream' in the supply chain to the building products supply chain and building trades. The various stakeholders affected by the scheme should be supported in the change and given clear and advance warning of the schemes objectives and intended impacts in order to ensure the supply chain do not become a barrier to the effectiveness of the scheme.

## 9. CONCLUSIONS

The objective of the project is to consider the governance and administrative structures, operational cost-effectiveness, and impact on building markets, of residential building rating and disclosure schemes operating internationally, and report on them for best practice.

In drawing conclusions, we have split them into two parts. Firstly, we make conclusions about the process and methodology and how this has served the project and how they may be improved upon for future BEET work. Secondly, we draw conclusions and make recommendations based on the interviews themselves.

### Process and Methodology

The project methodology was conceived in partnership with the Department of the Environment and Energy building upon the concepts developed in the BEET 1 report. This set of conclusions is drawn following the completion of the project and is intended to inform future BEET projects or similar stakeholder engagement reviews.

- **Background** - IPEEC and BEET is generally not well known. BEET has the potential to be a strong international initiative that could promote collaboration and shared learning across government and industry; particularly where governments are looking for precedent and best practice to inform the early stages of building energy efficiency schemes.
- **Scope** - The scope of the project has been broad enough to capture best practice and lessons learned, but not too detailed to become caught in technical detail. The benefit of taking an international approach and auditing progress (taking a snapshot of progress/lessons learned) offers BEET members a means to benchmark progress against other international schemes and benefit from lessons learned.
- **Methodology** – The method of stakeholder identification, briefing paper, interviews/survey, coding and comparison to literature was robust and established a solid framework from which to implement the project. It could be replicated to further develop knowledge about the international experience from the perspective of individuals managing and administering the schemes at another point in time.
- **Methodology** - The task of finding the most appropriate person to interview was difficult and time consuming. Generally, it was found that there is significant churn in the management roles for rating schemes which leads to issues such as corporate continuity. This could be a role that BEET could practically address through the development of a dynamic database.

### Findings

The following list of conclusions is drawn from the findings of the project.

- In general, the findings that emerged from the interviews with scheme managers correspond with the body of literature. Notable points from the interview that are either different to the prevailing literature or received different emphasis than in the literature include:
  - The importance of establishing long term goals and objectives for the scheme and maintain consistency in these over time
  - Consideration of the scheme as one component of a broader framework of energy efficiency activities



- Significant under-resourcing of quality assurance and review processes.
- Recognition of, and engagement with, the full supply chain regarding how the scheme will affect them and the intended outcomes from the scheme
- The literature notes a considerable inconsistency in the use of key terms. It would be valuable to harmonise definitions across all IPEEC member states; this could be easily achieved by adding a glossary to the BEET website for reference by all policy makers, researchers and other stakeholders.
- The CA-EPBD promotes the sharing of information and experience from national implementation as well as good practice to improve and strengthen Member State implementation of the EPBD. This is an effective mechanism to drive efficiency and converge practice across the member nations. It works well in the European Union where all member states are bound by the same legislation.
- The Global Building Performance Network (GBPN) maintains information about good practice and current status of energy efficiency rating schemes globally. The GBPN provides databases, tools and reports that can assist governments and industry policy makers.
- Every scheme and jurisdiction has their operational issues and political context to navigate. A scheme with a long term vision, and robust governance and administration, that is connected to other policies has greater changes of success.

#### **Recommendations for further work**

- **Methodology** – The method of interviewing the scheme administrators and coding the interviews as per this project yields practical experience and knowledge and enables the BEET to benchmark progress of schemes in member countries. We recommend that the process is replicated and may be streamlined using a web based survey. This could build BEET presence and awareness and serve the purpose to more frequently share knowledge and experience across IPEEC members.

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## 11. APPENDIX A – STAKEHOLDER BRIEFING PAPER



# INTERNATIONAL REVIEW OF RESIDENTIAL BUILDING ENERGY EFFICIENCY RATING SCHEMES

## Briefing Paper

May 2016



edge environment

## **1. INTRODUCTION**

This project, “International Review of Residential Building Energy Efficiency Rating Schemes”, is the fifth project in a series of work conducted through the Building Energy Efficiency Taskgroup (BEET), under the International Partnership for Energy Efficiency Cooperation (IPEEC). This project is known as BEET 5. The current project is being led by Australia through the Department of the Environment and Energy.

## **2. OBJECTIVE**

The objective of the project is to consider the governance and administrative structures, operational cost-effectiveness, and impact on building markets, of residential building rating and disclosure schemes operating internationally.

The objective of this Briefing Paper is to provide background information to stakeholders in order that they are aware of the project context prior to being engaged for structured interviews.

## **3. PROJECT BACKGROUND**

An overview of the IPEEC and BEET, and the scope of the current project and the processes of identifying and prioritising building energy efficiency schemes is important background and context for the participant to consider when making contributions to the project.

### **3.1 IPEEC and BEET**

IPEEC is an autonomous intergovernmental entity with 16 member countries/regions. IPEEC assists its member countries to identify and share proven, innovative practices and data on energy efficiency to better inform decision makers. IPEEC works through dedicated Task Groups to design and implement technical work programs. The BEET was established to increase multilateral cooperation in the field of building energy efficiency, specifically in relation to the development and implementation of ratings systems and building energy efficiency policy measures.

BEET has completed four projects to date:

1. Building Energy Rating Schemes – Assessing Issues and Impacts (2014)
2. Building Energy Efficiency – Opportunities for International Collaboration (2014)
3. Delivering Energy Savings in Buildings – International Collaboration on Building Energy Code Implementation (2015)
4. Building Energy Performance Metrics – Supporting Energy Efficiency Progress in Major Economies (2015).

### **3.2 Scope**

The focus areas of the project include the examination of building energy rating and disclosure schemes in the following four areas:

1. Governance and administrative structures
2. Operational cost-effectiveness

3. Impact on building markets
4. General lessons learnt

There are a number of existing studies that cover portions of this scope. The project team has been tasked with adding to this existing body of knowledge, rather than repeating findings of previous projects or research studies. A key aspect of the current study is to contact scheme operators directly for their insight into the objectives, characteristics and effectiveness of their schemes, rather than being a desktop study.

The project will examine residential energy efficiency rating schemes with a focus on detached and semi-detached buildings. Schemes that target multi-unit residential buildings are included where they may provide information relevant to the broader residential market.

The project is focused on energy efficiency, even where building rating schemes include broader sustainability issues. The project team recognises that there may be a trade-off between broader sustainability issues and energy efficiency and will address these trade-offs at a high level.

While the technical validity of rating schemes and the format of rating labels or certificates is critical to their success and impact, the technical aspects of tools are not the primary focus of this study and will only be included where they are linked to the objectives and focus areas of this project.

This project is not limited to IPEEC/BEET member countries, where schemes meet the selection criteria outlined in Section 3.3 they will be included in the report.

### **3.3 Scheme Selection**

Primary selection criteria for including building energy efficiency rating schemes within this project was the ability to add to the current knowledge concerning the governance and administrative structures, operational cost-effectiveness, and impact of the scheme on building markets. Selection criteria therefore included:

- Quantified data on the cost-effectiveness and market impact of the scheme
- Access to knowledgeable personnel within the project timeframe
- Schemes implemented or significantly changed within the last two years
- Schemes not included in previous BEET reports

## **4. PROJECT FOCUS AREAS**

The following section provides more information about the focus areas of this project. The focus areas, and resulting interview questions, build upon the recommendations of the BEET 1 report. They have been tailored for the objectives of this project and particularly for the purpose of uncovering new and additional information.

### **4.1 Governance and administrative structures**

The International Energy Agency (2010) notes that providing information on energy efficiency is often not sufficient to prompt action by building owners to improve performance of the

building. The supporting governance and administrative structures are critical to the impact of a scheme. There are many components to these supporting structures.

Firstly, the objective of the scheme must be clearly defined at the outset as well as being periodically reviewed. This is critical to be able to evaluate the scheme's effectiveness later. Clear definition of the objective will also help to clarify how the building rating scheme fits in to the broader policy environment.

Another component of a scheme is the makeup and governance structure of the administrative body that is responsible for the tool. This includes decision making processes, information gathering and analysis systems, authority over and access to data, representativeness of the jurisdiction, and stakeholders affected by the scheme.

Ongoing verification and quality assurance may include accreditation of assessors, education programs and penalties for non-compliance.

Supporting programs may include broader stakeholder engagement, communication and financial incentives. Stakeholders affected by the scheme may include the real estate community, workforce (assessors and certifiers), energy suppliers and energy efficiency service companies, homeowners, buyers, renters, policy makers and scheme administrators. Communication and outreach activities should consider the clarity and intuitiveness of the label, accessibility of action-oriented recommendations to consumers, explanation of linkage to other programs (including financial incentives and addressing potential confusion with other schemes), websites and hotlines.

***Objective: Understand the governance and administrative structures that support the functioning of the scheme.***

**Interview Questions:**

- Describe the operating and governance model of the scheme. How has this evolved over time and what was the driver for this evolution?
- What level of government involvement or support is provided to the scheme?
- How does the scheme work with other policies to achieve its objective? Is the scheme linked to financial incentives?
- Are there assessor training and accreditation programs in place?
- What stakeholder engagement was undertaken during the implementation phase and over how long?
- How is the scheme communicated to stakeholders in operation?
- How is the scheme enforced and compliance encouraged? Is there external verification of the schemes results?
- How is the program funded on an ongoing basis?

**Figure 10. Interview objectives and questions**

## **4.2 Operational cost-effectiveness**

The quantified cost-effectiveness of the scheme is the balance of the resources required to implement and administer the scheme and the savings that result from the energy efficiency measures. Costs may be borne by various stakeholders within the scheme and may include the following:



- Assessor training, insurance and administration associated with ongoing licensing/registration
- Certification/assessment cost
- Financial incentives or rebates associated with the scheme
- Householder or real estate agents time
- Compliance and enforcement costs
- Communication, enquiries and engagement with stakeholders
- Reporting obligations.

Savings from the scheme are most likely to include utility bill savings (lower gas, electricity or other fuel bills). If actions are taken by homeowners to improve the ratings of their home, and potentially increased sale and rental returns for higher rated houses It may also be possible to quantify the social value of greenhouse gas savings by using an indicative price on carbon.

***Objective: Understand what information is available regarding the quantified cost-effectiveness of the scheme.***

**Interview Questions**

- Have the costs associated with the implementation of the scheme been costed?
- Have the benefits of the scheme been costed?
- If not, have other aspects of the scheme been quantified (labour required, organisational requirements)?
- How are these costs funded? What are implications for the cost-effectiveness from the user perspective?
- What are the trade-offs between the expense of the scheme and its validity?
- If quantified data is limited, are other indicators used to assess the effectiveness of the scheme?

**Figure 11. Interview objective and questions**

### 4.3 Impact on building markets

The impact of energy efficiency building rating schemes can be felt in a number of ways. The first indication of impact could be deemed to be acceptance and uptake (if voluntary) or the number of buildings compliant with the scheme (if mandatory). However, this will not provide data on the ultimate objective (usually the reduction in energy use).

Determining the extent to which the actual objective has been achieved will require quantification of the change in operational costs or asset valuations. Changing asset valuations are seen as a much more impactful pathway as the capital cost is the large majority of the housing cost (Building Energy Efficiency Taskgroup, 2014).

In the case of operational costs, verification of the change in energy use achieved through the scheme requires confirmation that results of the scheme are replicable.

In the case of capital costs, verification of impact can be achieved through comparing similar valuations of housing stock subject to the scheme and stock not subject to the scheme, or by comparing stock performing well on energy efficiency to poor performing stock. Comparisons



require disaggregation of other influences on the housing market such as trends in housing prices, economic conditions and other policy changes.

Other indications of impact are awareness from consumers, trust in the scheme, support for the scheme's usefulness, and reported action based on the scheme.

***Objective: Understand the impact on the property market (including non-energy efficiency impacts) that can be attributed to the scheme***

**Interview Questions:**

- Is the scheme contributing effectively to the stated objectives?
- Is the scheme output independently verified such that there is a strong comfort that it is accurate and replicable?
- Is the scheme accepted, trusted, understood and used by relevant industry stakeholders? What evidence of this is there?
- What is the participation or compliance rates associated with the scheme?
- What actions or behaviours have resulted from the implementation of the scheme?

**Figure 12. Interview objective and questions**

#### **4.4 Lessons learned**

In addition to focus areas and questions above this project will attempt to uncover general lessons learnt.

These lessons may not fit neatly in to the questions above but could be important to the functioning and impact of the scheme. Lessons learnt could include unintended consequences of policies, cooperation or coordination required, timelines for implementation, problems encountered during implementation or operation of the program.

For this review to be most effective, it is desirable for interviewees to be frank about the effectiveness or otherwise of the various elements of their scheme. This study is not intended to be a critique of individual schemes but to identify common features or approaches that contribute to achieving successful rating schemes. Detailed information provided by interviewees will only be included in the report with their permission, and information can be de-identified or generalised if necessary.

***Objective: Gather any additional knowledge on lessons learnt during the development, implementation, refinement and assessment of the impact of the scheme.***

**Figure 13. Interview objective**