

Pilot Electronic Building Passport – Final Report

Project 2 – National Energy Efficient Building Project Phase 2

transport | community | mining | industrial | food & beverage | carbon & energy



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Appendix A Sources of Information for Documentation Review Process

Executive Summary

The National Energy Efficient Building Project (NEEBP) Phase One report, published in December 2014¹, investigated “process issues and systemic failures” in the administration of the energy performance requirements in the National Construction Code. It found that most stakeholders believed that under-compliance with these requirements is widespread across Australia, with similar issues being reported in all states and territories. The report found that many different factors were contributing to this outcome and, as a result, many recommendations were offered that together would be expected to remedy the systemic issues reported.

To follow up on this Phase 1 report, three additional projects were commissioned as part of Phase 2 of the overall NEEBP project. This Report deals with the development and piloting of an Electronic Building Passport (EBP) tool – a project undertaken jointly by **pitt&sherry** and a team at the Queensland University of Technology (QUT) led by Dr Wendy Miller. The other Phase 2 projects cover audits of Class 1 buildings and issues relating to building alterations and additions.

The passport concept aims to provide all stakeholders with (controlled) access to the key documentation and information that they need to verify the energy performance of buildings. This trial project deals with residential buildings but in principle could apply to any building type. Nine councils were recruited to help develop and test a pilot electronic building passport tool.

The participation of these councils – across all states – enabled an assessment of the extent to which these councils are currently utilising documentation; to track the compliance of residential buildings with the energy performance requirements in the National Construction Code (NCC). Overall we found that none of the participating councils are currently compiling all of the energy performance-related documentation that would demonstrate code compliance. The key reasons for this include: a major lack of clarity on precisely what documentation should be collected; cost and budget pressures; low public/stakeholder demand for the documentation; and a pragmatic judgement that non-compliance with any regulated documentation requirements represents a relatively low risk for them. Some councils reported producing documentation, such as certificates of final completion, only on demand, for example. Only three of the nine council participants reported regularly conducting compliance assessments or audits utilising this documentation and/or inspections.

Overall we formed the view that documentation and information tracking processes operating within the building standards and compliance system are not working to assure compliance with the Code’s energy performance requirements. In other words the Code, and its implementation under state and territory regulatory processes, is falling short as a ‘quality assurance’ system for consumers. As a result it is likely that the new housing stock is under-performing relative to policy expectations, consuming unnecessary amounts of energy, imposing unnecessarily high energy bills on occupants, and generating unnecessary greenhouse gas emissions.

At the same time, Councils noted that the demand for documentation relating to building energy performance was low. All the participant councils in the EBP pilot agreed that documentation and information processes need to work more effectively if the potential regulatory and market drivers towards energy efficient homes are to be harnessed.

These findings are fully consistent with the Phase 1 NEEBP report.

¹ <https://www.sa.gov.au/topics/water-energy-and-environment/energy/government-energy-efficiency-initiatives/national-energy-efficient-building-project>

It was also agreed that an EBP system could potentially play an important role in improving documentation and information processes. However, only one of the participant councils indicated that they might adopt such a system on a voluntary basis. The majority felt that such a system would only be taken up if it were:

- A nationally agreed system, imposed as a mandatory requirement under state or national regulation;
- Capable of being used by multiple parties including councils, private certifiers, building regulators, builders and energy assessors in particular; and
- Fully integrated into their existing document management systems, or at least seamlessly compatible rather than a separate, unlinked tool.

Further, we note that the value of an EBP in capturing statistical information relating to the energy performance of buildings would be much greater if an EBP were adopted on a nationally consistent basis.

Councils were clear that a key impediment to the take up of an EBP system is that they are facing very considerable budget and staffing challenges. They report that they are often unable to meet all community demands from the resources available to them. Therefore they are unlikely to provide resources to support the roll out of an EBP system on a voluntary basis.

Overall, we conclude from this pilot that the public good would be well served if the Australian, state and territory governments continued to develop and implement an Electronic Building Passport system in a cost-efficient and effective manner. This development should occur with detailed input from building regulators, the Australian Building Codes Board (ABCB), councils and private certifiers in the first instance.

This report provides a suite of recommendations (Section 7.2) designed to advance the development and guide the implementation of a national EBP system.

1. Introduction

The Government of South Australia on behalf of the Australian, state and territory governments is leading the pilot project to develop and test an Electronic Building Passport (EBP) in the form of a web based tool.

The passport, in its pilot form, has a focus on capturing energy efficiency information on residential buildings in the design to hand-over phases of their development and construction. The information would stay with the building for its entire life, with further documents being added during renovations, subsequent ratings, etc. – hence the ‘passport’ analogy.

South Australia’s Department of State Development (DSD) engaged **pitt&sherry**, together with the Queensland University of Technology (QUT), to undertake the pilot and to jointly author this report.

The remainder of section 1 provides background and summary information on the electronic building passport. The subsequent sections explain the approach taken by the pilot project, outline key findings, and discuss important issues impacting the ongoing utility and development of the EBP.

The essence of the project findings is that the electronic building passport could play a valuable role in boosting the availability of information to a wide range of building industry participants. Better information flows are a necessary part of improving the *quality assurance* system for buildings and the construction industry market overall. However, there are important barriers to the uptake of an electronic building passport. The report’s recommendations focus on lowering these barriers.

1.1 Background

The pilot electronic building passport is an element of Phase 2 of the National Energy Efficient Building Project (NEEBP), a joint state and territory government project, led by South Australia. This project will contribute to the COAG Energy Council’s National Energy Productivity Plan.

The NEEBP aims to address key systemic, or process, weaknesses and points of non-compliance with the energy efficiency requirements in the National Construction Code (NCC).

This project aim serves the overarching objective of the National Energy Productivity Plan – to increase energy productivity in order to: reduce costs faced by energy consumers; maintain competitiveness; increase economic growth; reduce carbon emissions and improve sustainability (COAG Energy Council, July 2015).

The 2015 Energy White Paper notes that the standards in the NCC are a key lever to lift the quality and energy productivity of new and renovated buildings. It notes that improvements can be achieved by raising standards – and simply by improving compliance with current standards. The Paper also notes that energy productivity of buildings can be generally defined as “the amenity provided for the amount of energy used” (pp 36, 37).

Phase 1 of NEEBP found that checking and enforcement of the National Construction Code’s (NCC) energy efficiency requirements is very limited, that compliance is likely to be patchy, and that consumers/building occupants know little about the likely, then actual, energy productivity of a building. As a result, most consumers are neither aware of nor able to effectively manage the large financial risks that are associated with that energy productivity.

One of the recommendations of the NEEBP report, aimed broadly at improving accessibility and usefulness of information, and particularly at improving the process and quality control of documentation relating the energy performance of buildings was

that one or more trials of an ‘electronic building passport’, or document management system, be conducted with a view, over the longer term, that the system be demonstrated as effective, potentially leading to national adoption. Opportunities presented by BIMs should be explored in these trials where feasible.

For further information on NEEBP, and to read the Phase 1 report, go to

<https://www.sa.gov.au/topics/water-energy-and-environment/energy/government-energy-efficiency-initiatives/national-energy-efficient-building-project>

1.2 About the Electronic Building Passport Project

The Government of South Australia, acting on the NEEBP recommendation, commissioned **pitt&sherry** and QUT to develop and test a pilot version of an Electronic Building Passport (EBP), with the active participation of around ten councils.

An important premise of the EBP project is that the quality assurance system for buildings relies heavily on documentation processes that are often not sufficiently robust to support this heavy reliance.

The second key premise behind the EBP project is that there are information barriers preventing the building market from consistently sending clear signals to build homes of high energy productivity. Information about a building’s quality and energy productivity must be comprehensive, accurate, easily understood and widely accessible if the building market is to work effectively. That is, markets can only guide the construction process through to the delivery of high quality and energy productive homes when all the players in those phases have good information.

The EBP Project brief states that:

Discrepancies between the “as designed” intent and “as built” performance of homes can reflect negatively on the building regulatory system and the design, construction and material-manufacture industries. It can mean higher running costs for the residents of the dwellings and higher greenhouse gas emissions from energy use.

With limited resources and a more complex construction market, regulators are relying more heavily on remotely obtained data and documentation than site audits; builders are relying on product specifications and standards rather than a personal knowledge of systems; suppliers are relying on well informed trades able to install their products as specified; and home purchasers are relying on “the system” to deliver a home at the very least, compliant with the energy efficiency provisions of the NCC.

Reliance on good document management is implicit in each of these steps, however:

- *The information is not readily available in a single place.*
- *There are many disparate owners of the data affecting a home’s energy performance.*
- *Each of these “invisible” data streams will significantly impact home performance and operational costs.*
- *Accessing information is difficult and time consuming for regulators and future home buyers.*
- *Without accessible data, it is difficult to distinguish a quality home, with good energy performance built into the design and construction from any other.*

- *Without easy access to building energy performance data it is difficult for government to develop effective policy and evaluate the performance of existing policy.*

As a step towards addressing these matters, the Department of State Development is seeking Request for Quotations for a local government based pilot project designed to investigate the effectiveness of an “Electronic Building Passport” documentation system for building regulators and industry. This will enable long-term controlled access to management and building documentation.

Ultimately, such a Building Passport could include a comprehensive range of data from planning, design and assessment to building specification, construction and major appliance operation at hand over. This project will focus on data relating to the energy performance of residential buildings and specifically include all energy efficiency provisions identified in the National Construction Code 2014 Volume 2.

The regulatory system and related market weaknesses that EBP seeks to partially address have national significance. From the perspective of energy efficiency policy makers, the achievement or non-achievement of national policy goals under the National Productivity Plan is clearly at stake. More fundamentally, for all interested in economy wide well-being, these weaknesses result in consumers purchasing and occupying homes of lower quality than they anticipate – at least in terms of energy productivity. Owners and occupiers alike will therefore be suffering direct and potentially significant financial losses in the form of higher than anticipated energy bills throughout the life of the building.

An EBP cannot solve all these issues in isolation. However, by ensuring greater (but controlled) access to relevant building documentation, an EBP would create a greater opportunity for accountability throughout the building supply chain, and for all parties. It would also improve market function by addressing chronic information asymmetry. From a functional viewpoint there may also be opportunities for streamlining compliance costs and practices.

With these big picture problems in mind, the broad project objectives for the EBP pilot were to:

- Examine the potential for an electronic building passport to improve the availability of energy efficiency related information to the building industry and market; and to identify international or domestic practices that demonstrate the working mechanism of an EBP or similar
- Identify building approval processes, documentary requirements, and some council practices relating to the energy efficiency provisions of the National Construction Code – in order to guide the functional requirements of the EBP tool
- Design and develop a web based EBP tool to enable long-term controlled access, management, and use, of residential building energy efficiency related documentation and information from planning, design, and assessment to building and initial occupancy
- Involve councils in the conceptual development, and hands-on testing of the EBP tool
- Plot and recommend a course for continued development of the electronic building passport concept and practice.

The intended functionality of the tool itself included the ability to:

- Store all documents related to compliance with the NCC, state regulations and council requirements on energy efficiency
- Permit controlled access to documents for individual properties
- Allow updates of datasets for specific buildings– for instance when the building undergoes renovation, or a new approval point is reached
- Allow users to select particular information and files/documents (for instance where documents for an audit process are wanted) by property.

2. Project Methodology

This section provides a short overview of our project approach and key activities.

2.1 Project team

Client Project Lead: Sabina Douglas Hill, Department of State Development, Government of South Australia

pitt&sherry team members:

Phil Harrington, Principal Consultant – Carbon & Energy

Mark Johnston, Consultant – Economics and Policy

Trent Dixon, Software Engineer

Queensland University of Technology

Dr Wendy Miller, Senior Research Fellow (Sustainable Energy / Energy Efficiency), School of Chemistry, Physics and Mechanical Engineering

Dr Connie Susilawati (Property and Planning), School of Civil Engineering and the Built Environment

Final year undergraduate students: Ms Jahni Glasby (Urban Planning) and Mr Shane Lubbe (Civil Engineering)

2.2 Approach and activities

pitt&sherry, in partnership with the Queensland University of Technology (QUT) managed this project.

The project team developed a pilot, internet based Electronic Building Passport (EBP) tool to record, manage and enable perpetual, controlled access to key energy productivity data generated in all phases from design to hand-over stages of residential building development.

We then tested the EBP tool for practicality and effectiveness in real-world situations, with the help of local governments.

Ultimately, an EBP system could include a comprehensive range of data on all aspects of building quality from planning, design, and assessment to building specification, construction, and major appliance operation at hand over. It could also potentially apply to non-residential as well as residential buildings. This project, however, focused on building and testing a tool capable of handling data relating to the energy productivity of residential buildings. Specifically, the EBP was developed to include all energy efficiency provisions identified in the National Construction Code 2014 Volume 2.

The Electronic Building Passport project is the second of three NEEBP Phase 2 projects. The other projects are:

- Project 1 – Pilot National Construction Code energy efficiency compliance audits for residential buildings under construction (Audits). (Project 1 may present this project with suitable host Councils to pilot an EBP.)
- Project 3 – Improving compliance and consistency in the application of the National Construction Code energy performance requirements to alterations and additions.

The EBP project and Audit projects had particular points of crossover, so the project teams worked together as required.

Both projects recruited councils for testing of the pilot EBP and Audit processes. Three councils participated in both projects – Cairns in Queensland, Playford in South Australia, and Launceston in Tasmania.

The key area of cross-over for the Audit and EBP projects is with the handling and access of documentation required under the trial audit process. The EBP tool was built to allow the upload, storage and access to all documents specified under the audit process.

Figure 1 outlines the project approach and main activities. Further detail follows below.

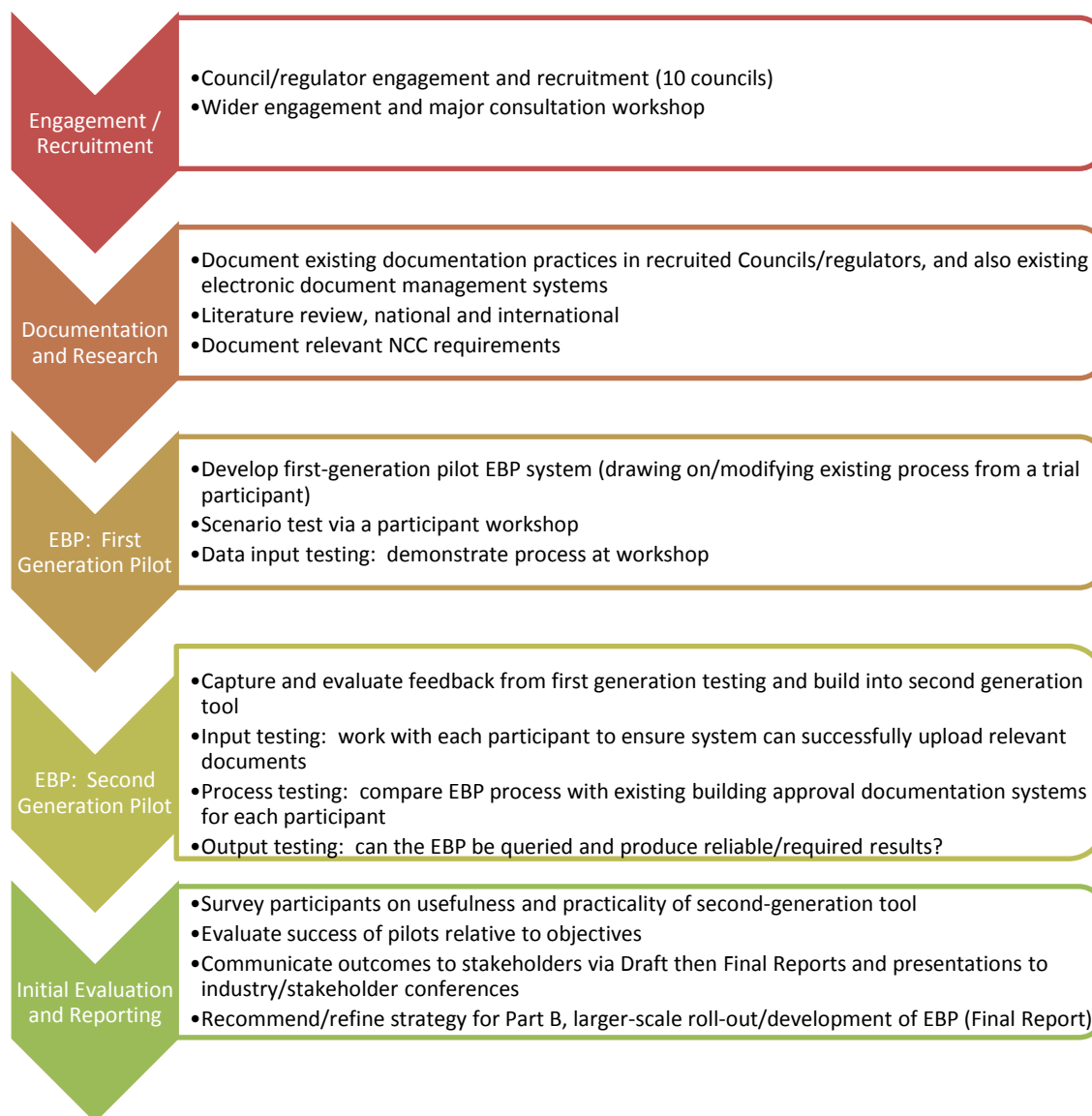


Figure 1: EBP Pilot Activities

2.2.1 Recruitment and engagement

The participation of local council officers in the process of developing and testing the EBP tool was a critical part of the project. Accordingly, recruiting councils together with the related tasks of raising awareness and gaining wider engagement were vital project tasks.

General engagement and awareness activities included notification and calls for interest via various communication channels, including the ALGA Newsletter. Both Phil Harrington and Wendy Miller presented on the NEEBP and the Electronic Building Passport at CASBE (Council Alliance for a Sustainable Built Environment, Melbourne, 25 February 2015).

Wendy Miller of QUT also provided media interviews, resulting in articles drawing the attention of the wider industry to NEEBP Phase 2 and the Electronic Building Passport. See for example <http://www.thefifthestate.com.au/products-services/innovations/building-passports-could-help-repair-australias-energy-efficiency-bane/71221> and <https://sourceable.net/will-building-passports-improve-australias-dismal-efficiency/>

Researcher and expert practitioner engagement was also led by QUT, particularly via the seminar featuring an international building information specialist, Professor Thomas Lutzendorf.

Australian and state government engagement was facilitated by the overall project manager, Sabina Douglas-Hill, with the establishment of a Project Reference Group (PRG) with members representing policy and regular interests from the jurisdictions.

11 councils were recruited to undertake EBP tool development and testing activities. However, 2 of these were unable to make a significant contribution due to changes in resourcing and personnel availability. More information on council recruitment is provided below in section 2.3

2.2.2 Documentation and Research

QUT led this area of activity with input from **pitt&sherry**. The results are provided in Sections 3 and 4. Tasks included:

- a) **Identify the existing practices of selected Participants.** This included documenting practices relating to building documentation (processes, systems and formats for collection, data management and accessibility; chain of responsibility; content – what information is / isn't collected in relation to energy efficiency);
- b) **Undertake a literature review.** The identification and description of international and national examples of building energy certificates, building passports, and building documentation systems and related trends; and
- c) **Identify National Construction Code energy performance requirements and document types that provide evidence of compliance.** The identification of all energy efficiency requirements of NCC and specific state requirements – building on the Phase 1 Report by **pitt&sherry**. Then the identification of information and document types that are required under council practices and state regulations – and other documents that would be necessary to demonstrate likely compliance.

2.2.3 Pilot Development and Initial Testing – First Generation EBP

pitt&sherry led the development of an internet based EBP. The details are provided in Section 5.

The first stage of development involved the identification of a suitable internet platform. Draft functionality and document management architecture was then developed for comment by participating councils and the PRG.

Participant/Stakeholder Workshop

The principal means of gaining input into the 1st (version 1.0) generation design of the pilot tool was a workshop, held in Brisbane on 5 May. This process generated substantial discussion and critical feedback. Workshop findings informed the development of the 2nd generation EBP pilot system

Given the challenges of bringing council participants to a central point, the Government of South Australia funded travel expenses of attendees, with administration support supplied by **pitt&sherry**.

2.2.4 Pilot Development and Testing – Second Generation EBP

Immediately after the Workshop work began on the 2nd generation pilot tool for testing – still available at <https://ebp.pittsh.com.au/>

The Version 1.1 tool allowed testing with council participants. This was to verify that the EBP pilot tool can support entry of energy efficiency related documents and data. Training in the tool was provided by **pitt&sherry** to each participant.

2.2.5 Initial Evaluation and Reporting

Following completion of the 2nd generation pilot tool testing, we sought formal feedback from Participants via a brief survey instrument. Overall findings together with our own insights and recommendations from the project are provided in this Draft Report. This discussion and conclusion is provided in Sections 6 and 7.

2.3 Council participation

Councils play a critical, yet difficult, role in the planning and building development process. They (to an extent that varies by jurisdiction and individual council interpretation) are deeply involved in the tasks of processing and providing permission and approvals for planning and building activity. Therefore the EBP pilot set out to design and test the tool with the assistance of volunteer councils.

2.3.1 Recruitment

The project aim was to recruit 10 councils across a range of jurisdictions and climate zones, in both metropolitan and regional locations.

We contacted over 30 councils across Australia with an invitation to join the EBP pilot.

11 councils agreed to actively participate. A further 14 councils joined the EBP community of interest. These councils lacked the time and resources to actively participate in the pilot, however they supported the EBP concept and wished to be kept updated on project progress. Only a handful of councils expressed little interest in the project. This lack of interest cannot be seen as reflective of deliberate council policy. Most likely it is a consequence of the project team not having the ‘right’ contact within the targeted council – ‘cold calling’ did not lead to the recruitment of any active participants – however it did add to the community of interest.

Our success rate with councils where the collective project team had existing contacts was good. Recruitment also resulted where an introduction was provided. The WA Building Commission for instance actively assisted in the recruitment process in Western Australia – for which the project team is very grateful.

Table 1 below shows the active pilot participants. It also shows Councils that belong to the wider electronic building passport community of interest.

Table 1: Electronic Building Passport Pilot: Council participation and interest

Council	Pilot Participant	Community of Interest
Ballina - NSW		X
Busselton - WA	X	
Cairns - QLD	X	
Clarence Valley - NSW		X
Cockburn – WA		X
Coffs Harbour – NSW		X
Fremantle – WA		X
Joondalup - WA		X
Lake Macquarie, NSW		
Launceston – TAS	X	
Mandurah, WA		X
Mildura, VIC		X
Mount Barker, SA		X
Moreland – VIC	X	
Noosa, QLD		X
Parramatta, NSW		X
Playford - SA	X	
Port Philip – VIC		X
Sunshine Coast – QLD		
Sydney – NSW	X	
Townsville – QLD	X	
Tweed – NSW	X	
Wagga Wagga – NSW		X
Whyalla, SA		X
Yarra - VIC	X	X

2.3.2 EBP Tool Development Workshop

The main activity designed to gain council feedback on the early version of the tool was a workshop, hosted by QUT in Brisbane on Tuesday 5 May.

Figure 2 below shows the workshop program.

Figure 2: EBP Brisbane Workshop - Run Sheet

Time	Activity	lead
10.00am	Coffee & tea	
10.15am	Welcome, introductions	QUT
10.20am	Background to the Electronic Building Passport – why and what?	P&S
10.45am	Confirming the Building Approval Process – documents required under regulations A) Presentation of the draft certification processes and document flow map B) Discussion	QUT
11.45am	What non-mandatory compliance related documents should also be included in the EBP? A) Examples, suggestions B) Discussion	QUT
12.30pm	Lunch	
1.00 pm	The tool A) Examples of similar systems B) Key functionality – document and data access and management, access to compliance information, access to energy performance information C) Key requirements – national, compatible, dynamic	QUT P&S P&S
1.20 pm	What might the tool look like? A) Present mock-up / draft proto-type	P&S
1.50 pm	What should the tool do? A) Meta Data fields – essential and desirable fields B) Search functions C) Document management method / framework	P&S
2.30 pm	Discussing the applicability of the tool A) Benefits for councils – how will it integrate with other systems / activities? Improve coordination and decision making B) Benefits - linking councils, regulators, policy makers, builders and users	QUT
3.00 pm	Next steps and concluding discussion	P&S and QUT
3.30 pm	End – thanks for participation	QUT

2.3.3 Testing and evaluation

The workshop allowed the project team to develop version 1.1 of the EBP tool. This working tool was then tested by the participating councils.

pitt&sherry set up a series of phone-calls with each of the councils to explain the tool set up and functionality. This training process took between 30 and 50 minutes. The testing process consisted of actual use of the tool. Councils lodged information individual homes within the EBP tool – with up to 10 homes being lodged per council.

The evaluation process started at the workshop, with discussions evaluating the potential for the EBP tool to assist councils with their tasks – and potential to further broaden aims of improved compliance rates and higher building energy productivity.

A written survey was also provided to each council following the completion of testing. The survey asked councils for their views on how the tool itself could be improved and asked for feedback on broader issues of the tools role within the building quality assurance process.

Outcomes of the workshop, tool development, testing, and evaluation activities are provided in sections 5, 6 and 7.

2.3.4 Acknowledgement and thanks to participating councils

The project team is indebted to all councils and council officers who gave up their time and passed on their insights, wisdom, and experience to the project team. The different participants had a very wide range of perspectives on the role and practice of councils within the building control chain. These variations strengthen the value of the project – and reinforce the need for a nationally adopted EBP system.

All council representatives approached their professional duties and responsibilities to local communities with genuine commitment. We are very grateful for their help.

3. Literature review

This section examines the reasons for pursuing an electronic building passport and the status of relevant systems with reference to international examples.

3.1 The rationale for electronic building passports

How can an Australian family, in looking at buying or renting a new or existing home, determine whether the houses they are considering will provide for their thermal comfort and other functional needs whilst also limiting carbon emissions and energy costs? According to Karl and Orwat, there are three 'reference points' that consumers can use to gather information to support their purchase decisions (in this case, dwellings)²:

- *Search attributes*: attributes that are easily detected by buyers / renters through a simple inspection of the dwelling, that requires little effort (from an energy efficiency perspective, attributes such as good insulation and air tightness cannot be easily discernible);
- *Experience attributes*: attributes that can only be perceived by the buyer / renter based on previous experience of the attribute (e.g. a solar hot water system); and
- *Credence attributes*: attributes that the buyer/renter cannot identify personally but rely on information from suppliers. This requires trust and faith on the part of the end-user and the communication of reliable and honest information from the supplier to the end-user. Independent certified eco labels and certificates (as per ISO14024) are one means of providing this level of credence.



Information asymmetry (where information quantity and quality is not equally available to all parties involved in a transaction) is common in general construction, even without considering environmental and energy performance aspects of buildings.

...the problem in making an environmentally oriented decision for a product is that from the point of view of the consumer environmental properties of products predominantly are 'credence' properties. In the case of a building as a very complex commodity, this is also true for many general characteristics of quality. The result is a structural imbalance in the information that the suppliers and the consumers have on a large number of the essential qualities of a building. This in turn enables suppliers of relatively low quality to pass this off as higher quality whilst on the other hand little trust is shown in those earnestly offering high quality. A continuous process of 'adverse selection' results, in which higher-quality products ... cannot successfully compete in the market to the degree desired.³

² Karl, H; Orwat, C. (1999) Environmental labelling in Europe: European and National Tasks. European Environment 1999; 9:212-220

³ Blum, A. (2001) "Building-Passport" - a Tool for Quality, Environmental Awareness and Performance in the Building Sector. In "OECD/IEA Joint Workshop on the Design of Sustainable Building Policies -0 Summary and Conclusions and Contributed Papers. Part 2." Page 3. Retrieved from www.ioer.de.

A ‘building passport’ could be seen as a key tool to help overcome this information imbalance. A ‘building passport’ aims to provide guidance to all stakeholders to support informed decision making and to strengthen the competitiveness of environmental performance in the building industry⁴. For the purposes of this report, *building labels* and *certificates*, *building passports*, and *building logbooks or files*, are considered essential elements of a building documentation system or toolbox that collates and communicates information about the quality and sustainability of residential buildings (Figure 3). Such a building documentation system addresses the issue of information asymmetry by making key building information available to all stakeholders (from both supply and demand sides) to inform their decision making, act as guidance to what characteristics could be implemented, and enhance the competitiveness of the housing construction industry.

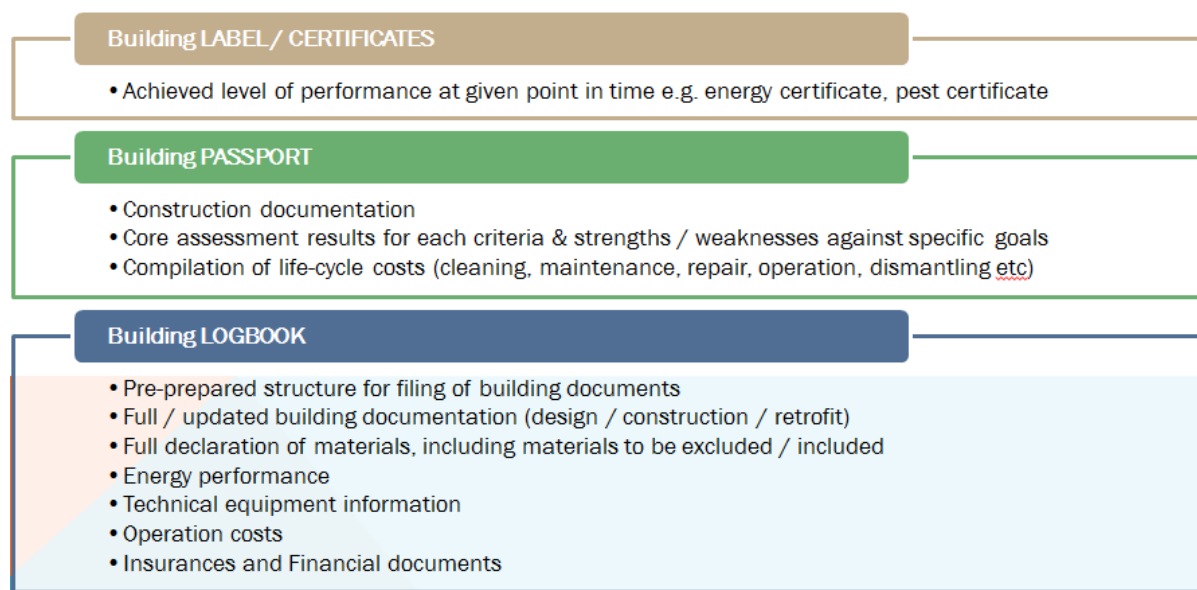


Figure 3: Three levels of information that can comprise a building documentation system (Longlife project)

The purpose of this section is to review a number of international and national systems that exhibit some components of ‘building passports’ as defined previously. The main features of these systems are described below, followed by a brief analysis of their commonalities. As ‘energy passports’ are required in the EU under the EPBD (Energy Performance Building Directive), the best examples of building passports come from Europe.

3.2 Case Studies – Electronic Building Passports and Related Systems

3.2.1 Finnish Building Passport

The Finnish Green Building Council (FIGBC)⁵ was established in 2010 and ‘functions as a platform for dialogue and the sharing of information and know-how. It strives to make the aspect of sustainable development a natural part of both the real estate and construction industry.’ FIGBC’s Building Passport, for pre-design and occupancy phases, aims to be:

- “an accessible, visual tool that presents the **key indicators in environmental efficiency**, along with **images** and the **basic facts of the property**”
- “a convenient information package that can be used to support decision-making in sustainable development projects” (owners, investors, users, builders, developers)

⁴ Blum, A. (2001)

⁵ www.figbc.fi

Sample reports are shown in Figure 4. At the design phase, the focus is on expected carbon footprint, life cycle cost, imported energy and indoor air quality. In the operation phase, key building information reported (per year) includes imported energy, carbon emissions, baseload power and percentage of satisfied users (in terms of thermal conditions for summer and winter; quality of indoor air, lighting conditions and acoustic conditions)⁶.

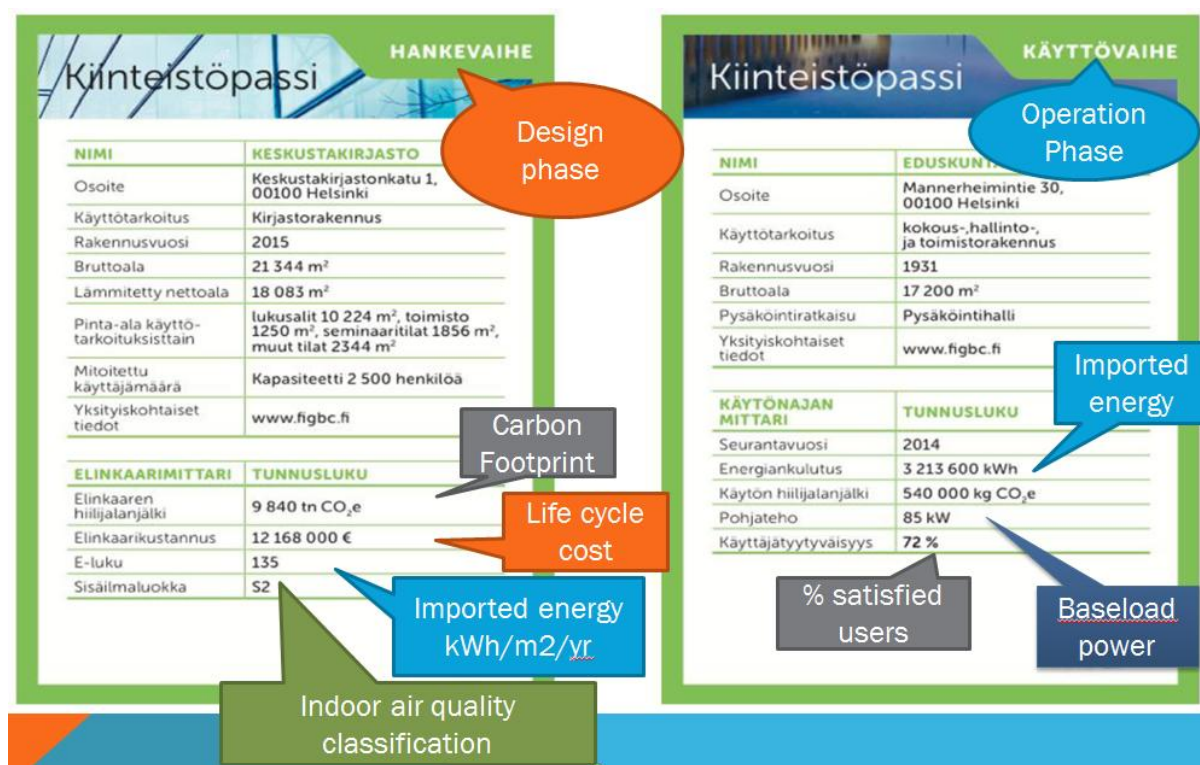


Figure 4: Finnish Building Passport certificates: design phase (left) and occupation phase (right)

3.2.2 Dutch Building File

Energy Performance Certificates (EPCs) are mandatory for all new Dutch buildings. Approximately 28% of their national building stock has registered EPCs on the publically available national EPC database⁷. The data base is used for quality assurance, scientific research and policy development, accountability and implementation. The Dutch national strategy for promoting energy efficiency in residential buildings includes:

- A Revolving Fund for Energy Savings (loans to landlords and housing associations)
- An Energy Investment Allowance (tax deductibility for energy saving investments)
- Green Funds Scheme (reduced interest rate bank loans for energy efficiency)
- Energy Efficiency in Mortgage Regulation (exemptions for energy efficiency measures)
- Energy Efficiency in Property Evaluation System (rent systems for landlords)
- Scientific research on labels and house pricing.

⁶ Green Building Council Finland. Retrieved from http://www.worldgbc.org/files/7113/8964/7585/Lifecycle_Metrics_for_Sustainable_Buildings_June_2013_FiGBC.pdf

⁷ Hoogelander, K.J. (2014) The learnings of the Dutch EPC database. Brussels, 4/11/2014. Retrieved from <http://building-request.eu/sites/building-request.eu/files/7.%20Best%20practice%20demonstrations,%20Netherlands,%20Kees-Jan%20Hoogelander,%20RVO.pdf>

The Dutch Building File^{8,9}, focused mainly on the energy performance requirements of the European EPBD, was conceived to describe the quality condition of existing dwellings and to act as a maintenance manual. Its objective is to improve insight into housing quality by:

- (i) Facilitating homeowners in their responsibility for maintaining housing quality;
- (ii) Improving transparency of the housing market; and
- (iii) Improving the possibility for specific quality policy.

Four types of essential data, as represented by Figure 5, have been identified. Homeowners are responsible for keeping the building file up to date, for making it available throughout sales processes, and providing updated files to local government.

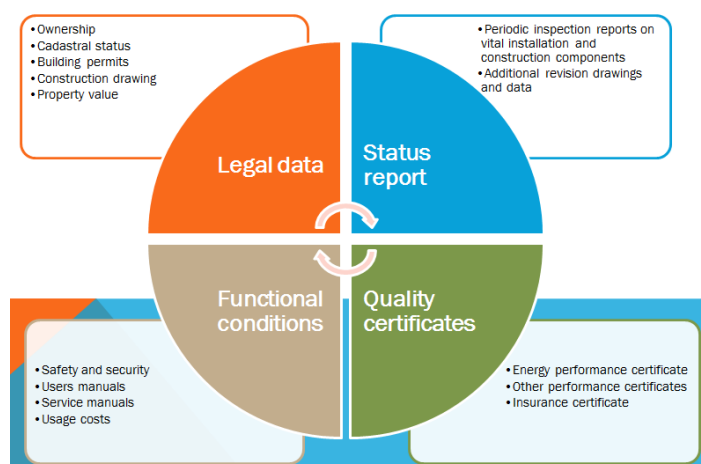
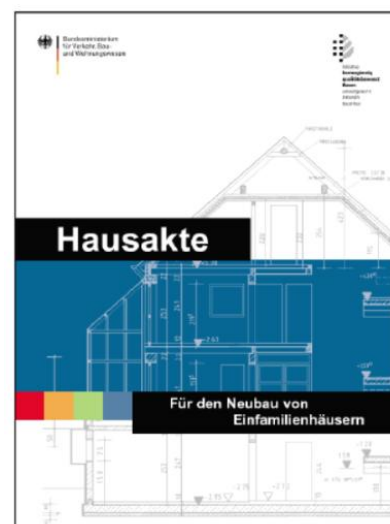


Figure 5: Dutch Building File Components

3.2.3 German Building Folder (HAUSAKTE)

The objective of the German House Folder / Logbook is to provide a ‘template’ or ‘process’ that allows for filing building related documents and information at the planning, construction, operation and contractual stages in the life of a dwelling. The voluntary Hausakte relates specifically to private single family homes and contains two distinct parts:

- “Building Certificate” (a collection of documents created during the construction process)
 - General details of the building (e.g. location, storeys living space)
 - Description of building construction and individual components (e.g. rain water use, renewable energy, waste management facilities, insulation details)
 - Declaration of finishing building materials (eg. Floor coverings, tiles, glue, built in furniture and fittings)



⁸ Van de Bos, Amarins and Meijer, Frits (2005) Dutch ideas for stressing the responsibility of homeowners for housing quality. Retrieved from http://www.researchgate.net/profile/Frits_Meijer/publication/27347807_Dutch_ideas_for_stressing_the_responsibility_of_homeowners_for_housing_quality/links/53f708a40cf22be01c452e49.pdf

⁹ Klomp, B (2006) Improvement of information for owner-occupiers about the quality of their house. In *Home ownership in Europe: Policy and research issues*. 23/24 November 2005, Delft, The Netherlands. Technical University Delft.

- Description of technical equipment (e.g. heating and cooling, telecommunications, electric equipment)
- Energy performance certificate
- Official documents (e.g. building permission, fire protection equipment, building plan)
- Index of companies involved in planning and extension
- Acceptance reports, tests and warranty periods
- House Document (collected data during use of the building)
 - Inspection and servicing reports
 - Operational costs (e.g. property taxes, insurances, inspection and maintenance of building and technical equipment, costs of services (e.g. water, electricity, gas and waste disposal))
 - Maintenance / modernisation / renovation works carried out
 - Photo documentation
 - Contractual documentation

3.2.4 United Kingdom Building Files, HIPs and EPCs

The UK has a number of systems that relate to building information. The Construction (Design Management) Regulation (2004) requires building owners to keep complete records of construction drawings, construction materials, detailed maintenance procedures and safe demolition processes for end of building life. In addition, Energy Performance Certificates are required for building, selling and renting properties. These EPCs contain information about energy use and costs and recommendations for improving energy performance. The EPCs are valid for 10 years.

Home Information Packs (HIP) were launched in 2007 (England and Wales) and were mandatory from April 2009. The purpose of a HIP was to provide buyers with key information (particularly energy related) about properties. A HIP was to be provided by the seller or the seller's agent, and include the following documentation:

- An Index: list of all documents contained in the pack, providing a checklist for sellers, real estate agents, and authorities.
- A Performance Information Questionnaire: completed by the seller, this document details utilities and services connected to the property, access arrangements, rates and local taxes etc
- Energy Performance Certificate and recommendations (see Figure 6)
- Predicted energy assessment: (for homes not yet constructed, when marketing starts)
- Sustainability Information: a sustainability certificate for sales of new homes, according to the Code for Sustainable Homes (complements the EPC)
- Sale statement: brief summary of the nature of the interest in the property being offered for sale
- Evidence of title to the property
- Standard searches

The requirement for a HIP was abolished by the coalition government in May 2010, due, at least in part, to concerns that the costs imposed on sellers and the additional 'red tape' in the selling process for real estate agents were stifling the housing market. An EPC is still required, however, for marketing a property for sale or rent. The Sustainability Information requirement was also suspended in 2010, and the Code for Sustainable Homes was withdrawn in 2015¹⁰.

¹⁰ <http://www.planningportal.gov.uk/buildingregulations/greenerbuildings/sustainablehomes>

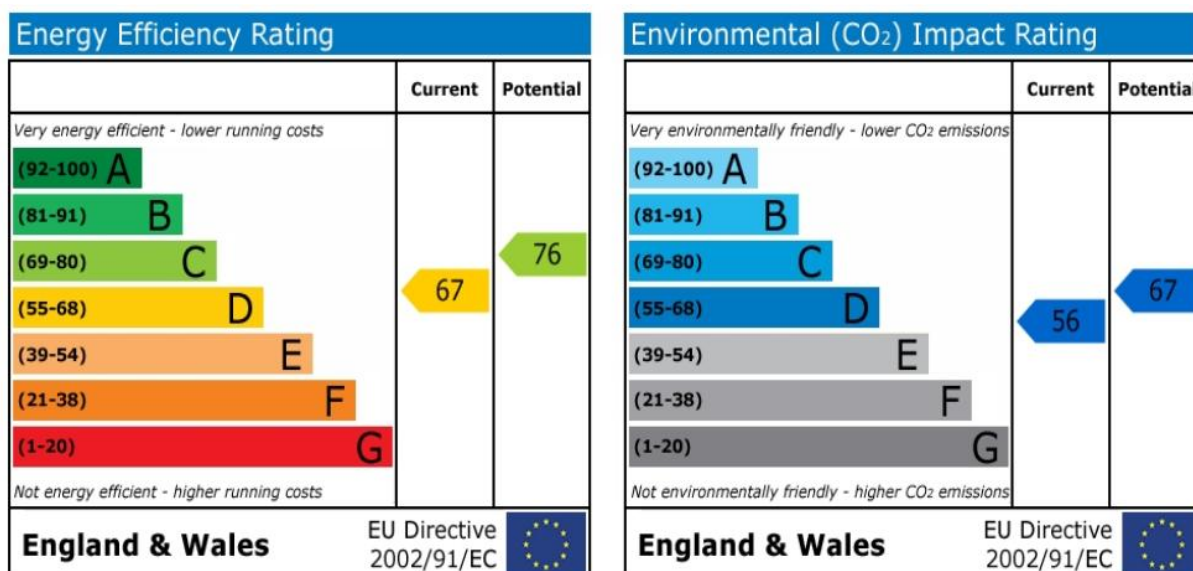


Figure 6: Sample EPC (www.energyassessuk.com)

The HIP equivalent in Scotland is the Home Report¹¹, consisting of

- A Single Survey (a surveyors assessment of the condition of the dwelling, a valuation, and an accessibility audit);
- An Energy Report (the equivalent of an EPC); and
- A Property Questionnaire (additional information provided by the seller, such as length of ownership; details on council tax; parking; renovations and alterations; service connections; guarantees etc).

The Home Report is still a requirement for selling property in Scotland.

3.2.5 France - Sustainable Building Passport (Passeport Bâtiment Durable)^{12, 13}

Though called a 'passport' this is really a label or certificate indicating in simple terms the sustainability performance of a building in four areas: energy, environment, health, and comfort. Each area can achieve up to four stars and the total number of stars indicates the level of overall performance (1-4 stars = good; 5-8 stars = very good; 9-11 stars = excellent; >12 stars = exceptional).



¹¹ <http://www.gov.scot/Topics/Built-Environment/Housing/BuyingSelling/Home-Report>

¹² UNEP (2012) *State of Play of Sustainable Building in France 2012*. Retrieved from <http://www.unep.org/sbci/pdfs/SOPFrance-Final.pdf>

¹³ http://www.gecina.fr/fo/fileadmin/user_upload/Actualites_groupe/2011/20110922-AN-PasseportBatDurable.pdf

3.2.6 European 'Longlife' project¹⁴

This Sustainable Building Assessment System project (2009 - 2011) was part of the EU Baltic Sea Region Programme and involved Germany, Denmark, Poland, Lithuania, and Russia. The main aim of this residential buildings project was to implement a whole life cycle approach to reducing energy consumption and costs by optimising construction methods, adapting and implementing advanced construction methods, and harmonising building procedures between participating countries. A further aim was to develop a concept or framework for a certification scheme for such buildings, including the use of electronic building passports and logbooks¹⁵. The annual energy consumption goal was 40kWh/m²/year.

The core purpose was to develop sustainability certification of buildings to prevent an information deficit for consumers. The project acknowledged that a balance was required between the information requirements relating to buildings as complex systems and a potential problem of information overload for any of the involved stakeholders. There was also an acknowledged need to integrate principles of sustainable buildings into the usual planning and construction processes. In line with previous research about building passports, three basic elements were deemed to be essential to sustainable building assessment systems:

1. *Reporting and documentation*: this is the input side, providing the scientific foundation for certification. It involves establishing the scope and criteria of performance regarding sustainability, and methodological aspects. A solid scientific foundation is considered crucial for the acceptance and value of certification. It requires the compilation of relevant information on both the building and the building process. Relevant to this context are those aspects of a building that relate to ecological, economic and social sustainability.
2. *Aggregation / Evaluation*: this element refers to the method of performing the actual assessment and the way the gathered results are embraced in a figure, pointing out the building's overall performance. This element flows from the previous one, and seeks broad stakeholder involvement e.g. clients, real-estate, environmental NGO's, consumer associations.
3. *Communication / awarding / labelling*: this element relates to how the building quality is communicated. It provides independent and transparent information to the owner / potential owner about the examined characteristics of the building. This element can also increase the competitiveness of assessed buildings on the real estate and tenancy market and enhance the image and social esteem of the builder / supplier.

As well as addressing the information imbalance between suppliers and purchasers, a sustainable building assessment system is also seen as a means of allowing and supporting stakeholders at the building planning stage, discussing and agreeing on sustainability characteristics to be incorporated into the building. This assists in removing some of the complications that sustainability features are considered to add to an already complex system.

The Longlife certification scheme was devised to reflect a life-cycle holistic approach to ecological, economical, and social sustainability (Figure 7) as well as a multi-level communication system with supporting certification tools (Figure 8).

¹⁴ www.ioer.de

¹⁵ *Longlife 2: Development of standards, criteria, specifications* (2010) Editor Klaus Rückert. Technical University Berlin, Berlin, Germany. ISBN 978-3-7983-2247-9

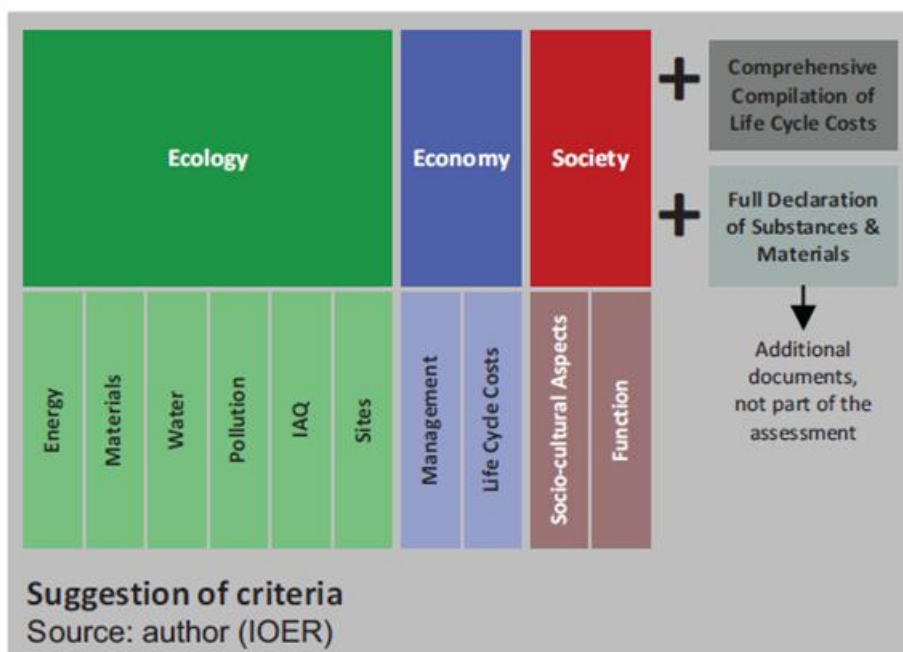


Figure 7: LONGLIFE Certification Scheme - Indicators (Dirlich)

Communicational Instruments		
LABEL	BUILDING PASSPORT	BUILDING LOGBOOK
Visualization of Sustainable Building Quality (indication of the certification level)	Detailed description and graphical depiction of the assessment results (scores for the individual topics , indicators & overall result)	Documentation of the planning & construction process & the operation phase through a structured "building folder" (drawings, operation costs, insurances, etc.)

Certification Tools		
Sust. Planning Checklist	Building Folder	Audit Form
Guideline including mandatory core requirements and voluntary additional measures	Pre-prepared structure for the filing of building documents	Recording of on-site inspections through a structured questionnaire/checklist
Full Declaration of Materials	List of Life-Cycle Costs	Positive-Negative-List
Complete list of materials used: minerals, metals, organics, plastics, hazardous subst., etc.	Compilation of life-cycle costs incl. cleaning, maintenance, repair, operation, dismantling, further costs	List indicating materials to be excluded, and materials to be preferably used in construction

Figure 8: LONGLIFE Certification Scheme Components (Dirlich)

3.3 Building Passport Common Features and Benefits

This review has shown that different types and levels of ‘building passports’ are used by governments or the free market to improve information flows. Better information supports decision making and creates opportunities for innovation of future energy efficiency and sustainability systems, processes and designs.

The LONGLIFE project explored why home owners, real estate companies and other stakeholders would assess dwellings for their sustainability aspects, and report such assessment. Three main reasons were identified¹⁶:

1. Sales and marketing reasons - leads to improvement of image of the building and owner
 - a. A high building quality is credibly visualised by certification
 - b. Certification provides a point of difference for vendors
2. Improve market function -
 - a. Assessment allows environmental performance to be priced
 - b. Successful assessment can prove the (potential) lower operating costs – allowing building operational performance to be priced
 - c. Certification allows standardised definitions of performance and confidence in assessment results
3. Planning (of a construction project) reasons -
 - a. If certification is the goal from the beginning of a construction project it provides a quality target for the completed building
 - b. The assessment scheme can function as a guideline for sustainable building and supports involved actors to reflect on quality issues.

Four fundamental aspects could be considered in common with the systems discussed above:

- The focus on communication of information about the sustainable building quality of specific properties to end users (potential buyers or renters)
- A strong bias towards **existing** information (i.e. improving document management and accessibility)
- Involvement of multiple stakeholders: not just the end user, but also the real estate sector, the finance sector, the design and construction sectors, and government regulators
- An adaptable and flexible structure to suit the local context. The systems vary in form and format and content. None of them are what could be termed integrated ‘electronic building passports’.

¹⁶ *Longlife 2: Development of standards, criteria, specifications* (2010) Editor Klaus Rückert. Technical University Berlin, Berlin, Germany. ISBN 978-3-7983-2247-9

4. The approvals process and documentary requirements - Australia

This section examines the building approvals process in Australia. It also identifies documentary and information needs that flow from the National Construction Code and state regulations. These information needs are important to the structure and functionality of the EBP.

4.1 An overview of the building approvals process

The building approvals process (relating specifically to housing) of each state was examined by collating information provided on local and state government websites relating to housing construction. A consumer's approach to this task was adopted, i.e. the information was viewed from the perspective of a person with no previous knowledge of the process and the industry jargon. Information accessibility varied greatly from state to state, with some websites collating all relevant building information succinctly and others having it scattered throughout and with little indication of what was important. Some sites were distinctly aimed at professionals (e.g. developers, builders, and certifiers needing to interact with the process) whilst others made attempts to demystify the process for the end clients (i.e. the building owner). Four main steps were identified as being relatively common to all states, with variations in the specific sub-steps within each main category (Table 3). This comparison of processes within each state jurisdiction was checked and amended by discussion with council representatives at the May workshop. Terminology variations between the states are explained in Table 2.

Table 2: Terminology definitions used in the building approvals process

Term	Definition or alternate names
Certifier	An accredited building certifier or building surveyor (private or government)
LGA	Local Government Authority i.e. the local council
Certificate	Construction Certificate, Complying Development Certificate, Building Permit, Building Approval Certificate
Occupancy Permit	Occupancy Certificate; Certificate of Occupancy
Permit Authority	Refers to Tasmania only; established at a local government level

Table 3: Comparison of State Building Approval Processes

Steps	Building Approval Process	State requirements							
		ACT	NSW	NT	QLD	VIC	SA	TAS	WA
	Sustainability assessment (BASIX) ¹⁷	x	✓	x	x	x	x	x	x
Step 1a	(i) Application (development or planning - DA or PA) lodged LGA; or (ii) Certifier checks LGA for the existing DA for a specified Lot (complying development); or (iii) Certifier checks with local Planning Scheme for compliance (checking 'deemed to comply')	✓	✓	✓	✓	✓	✓	✓	✓
Step 1b	Building permit application (BA) lodged with private certifier or LGA ¹⁸	✓	✓	✓	✓	✓	✓	✓	x
	Appointment of Certifier ¹⁹	✓	✓	✓	✓	✓	✓	✓	✓
Step 2a	(i) LGA or Private Certifier issues the appropriate certificate i.e. plans are certified as complying with the NCC and any conditions ²⁰ ; (ii) Documents submitted to LGA	✓	✓	✓	✓	✓	✓	✓	✓
Step 2b	LGA notified of expected building commencement / appointment of certifier	✓	✓	x	x	✓	x	✓	x
Step 3a	Certifier inspections during construction i.e. construction complies with plans ²¹	✓	✓	✓	✓	✓	✓	✓	x
Step 3b	Final inspection i.e. construction complies with plans; inspection can be by private certifier or local council. ²²	✓	✓	✓	✓	✓	✓	✓	x
Step 4	Certifier issues Occupation Permit ²³	✓	✓	✓	x	✓	✓	✓	x

¹⁷ BASIX certificate must accompany DA and application for construction permit and application for occupation certificate. All items must be certified as having been fulfilled, before final occupation certificate.

¹⁸ In SA, the private or council certifier grants building consent, but the council issues the DA once both planning and building consents have been granted. In Tasmania, the Permit Authority issues the certificate as well. In WA, the private certifier assesses code compliance but the council issues building approval

¹⁹ This can happen at the time of DA or BA lodgement

²⁰ In QLD, councils are not required to provide information about compliance of a BA with planning scheme requirements. There is no mechanism for the private certifier to rely on any information provided.

²¹ In Queensland it is the responsibility of the builder to request an inspection to be carried out. Certifiers do not initiate the inspections. Once a certifier realises that a builder has failed to give notice for an inspection, they are required to report this to the QBSA / QCCC. Required inspections in QLD for Class 1a and 10 buildings are at footing, slab, frame and final stages.

²² In SA the council conducts the final inspection.

²³ In Queensland, the Final Certificate is the trigger that documentation is complete and Class 1 detached dwellings can be occupied. In Western Australia, a Notice of Completion is submitted by the builder. No Final Certificate or Certificate of Occupancy is required. In Tasmania the Permit Authority issues this permit.

4.2 Documentary requirements

The minimum energy efficient requirements as stated in the NCC (2015) are primarily concerned with the reduction of greenhouse gas emissions and overall energy use. The requirements are in five main categories, as represented in Table 4.

Table 4: Summary of National Construction Code Energy Efficiency Requirements

Energy Efficiency Requirements (NCC)	Explanation
Building Envelope Thermal Performance: calculation of space heating and cooling loads	Heating & Cooling Loads and related star rating
Building fabric: elements that impact on thermal performance	Insulation Roofs Roof lights External walls Floors Glazing (physical properties) Glazing (amount of glazing) Glazing (shading / sun control)
Building Sealing: elements that impact on air infiltration rates and hence heating and cooling loads	Chimneys and Flues Construction of roofs, walls, floors Evaporative coolers
Air movement: elements that impact on the need for mechanical heating and cooling	Air movement Ventilation openings Ceiling fans and evaporative coolers
Services: the energy efficiency of main building services	Insulation of services (e.g. heating and cooling duct work; hot water pipes) Lighting (energy efficient) Water heating (low greenhouse gas emissions) ²⁴ Swimming pools and spas (energy efficiency of heating and pumping systems)

The National Construction Code states that assessment of compliance with performance requirements or deemed-to-satisfy provisions should be based on evidence that building designs, construction techniques, and materials meet the Code. We examined the Code in order to make a judgement on what documentation, relating to energy efficiency requirements, would provide evidence of compliance. Our interpretation of necessary documentary evidence is provided in Table 5.

The process of identifying documents, capable of supplying sufficient evidence, chiefly relied on the authors' judgment. Clear requirements for evidentiary documentation are not listed in the Code, and regulators do not appear to always impose definitive requirements for documentary evidence²⁵. It is assumed in this report that documentation should show evidence of compliance with energy efficiency standards – and additional documentation will be necessary to show evidence of compliance with structural, safety, health, amenity, and other standards.

²⁴ In QLD, the requirement for energy efficient hot water systems was removed from February 1, 2013.

²⁵ There is some regulator guidance in place, with a good example being the ACT's "Minimum documentation requirements for building approval lodgement Class 1 and 10 - residential construction" ACT Government, Environment and Sustainable Development.

As mentioned above the Code and the ABCB's supplementary publications are relatively silent on suitable evidence – on what document types are needed and what core information those document types should contain. Unsurprisingly then the guidance on documentation needs, that is available from regulators and councils, is not nationally consistent. Obviously when the state regulators only supply limited guidance there will be inconsistency, within states, of council interpretations of documentary needs. Logically one could assume that such documents should contain sufficient evidence to show compliance with the performance requirements of the Code. Some jurisdictions, such as the ACT, do provide useful details regarding the level of documentation required, and the specific content of these documents.

A related issue is that there is no national guidance on how documents and information should be utilised or passed between different stakeholders. The guidance provided by state regulators and individual councils is mainly focused on the application stage of the building approval process. This is discussed further in Section 4.3.

Table 5: Documentary evidence capable of showing compliance with NCC energy efficiency requirements

Broad documentation category	Types of suitable documents (derived from NCC, council practices and design/construction documentation practices)	NCC reference
Building plans (as designed)	Building and allotment plans, drawings and specifications	NCC 2015 Performance Requirements Extract page 3: <i>"The Performance Requirements are the only mandatory requirements of the NCC"</i> NCC 2015 Vol Two Housing Provisions: <ul style="list-style-type: none"> Introduction: page 10: Documentation of Decisions (<i>"All relevant plans and other documentation"</i> ... to establish compliance Section 1.0.9 Assessment Methods Section 1.2 Acceptance of Design and Construction; Evidence of Suitability V2.6 (Verification Methods) Section 3 Acceptable Construction (relevant subsections) NCC Volume Two Energy Efficiency Provisions Handbook 2015: <ul style="list-style-type: none"> Definition of Terms (pages 14+) Assessment Methods - evidence of suitability (pages 28, 29) and Verification Methods (pages 30 - 35) Performance Requirements P2.6.1 Assessment methods: Evidence of Suitability (page 40): <i>Reports, certificates, any other form of documentary evidence that adequately demonstrates suitability</i> <i>Proof of compliance with 3.12.1-4</i>
Air movement / building sealing control	Air movement certification and expert sign off Building sealing certification and expert sign off	
Glazing (safety and thermal performance)	Glazing certificate and purchase order	
House energy rating report or DTS (evidence of energy efficiency for relevant climate zone)	Star rated energy certificate, details or tests and calculations to prove compliance; proof of compliance with outdoor living area, impervious roofing, ceiling fans and lightweight flooring systems	
Insulation (location and R values)	Insulation certification (AS/NZS 4859.1) and purchase order Proof of compliance with total R value calculations	
Hot water system details (to meet EE requirements)	Additional energy efficiency appliance or systems to be certified and documented	
		NCC Volume Two Energy Efficiency Provisions 2015 page 166 (refers to NCC Volume 3 Part B2)

Broad documentation category	Types of suitable documents (derived from NCC, council practices and design/construction documentation practices)	NCC reference
		NCC 2015 Performance Requirements Extract BP 2.8BP2.8 V2.6.2.2 Proof of compliance with 3.12.5
Insulation of services (e.g. water pipes, duct work)	Insulation certification and purchase order	Proof of compliance with 3.12.5.1-4 V2.6.2.2
Lighting efficiency	Additional energy efficiency appliances or systems to be certified and documented.	Proof of compliance with 3.12.5 e.g. 3.12.5.3 Lighting design and lighting calculator V2.6.2.2
Certificate of Construction	(Certification that plans meet Code requirements)	

Two initiatives provide examples of attempts to add clarity and robustness to the issue of energy efficiency documentation. New South Wales implements the NCC through BASIX, the Building Sustainability Index. In addition to thermal comfort and energy efficiency targets, BASIX targets also include reductions in potable water consumption. A BASIX assessment must be completed prior to lodging plans with council and must accompany development, construction and occupancy applications. All commitments made on the BASIX certificate must be certified as having been fulfilled, prior to final occupation. A national initiative is the Universal Certificate for simulation tools that assess the thermal loads of houses according to the specifications of the Nationwide House Energy Rating Scheme (NatHERS). The information that is included in the certificates of the respective schemes is shown in Table 6.

Table 6: Comparison of information in BASIX certificate (NSW) and NatHERS Universal Certificate.

	BASIX Certificate	NatHERS Universal Certificate
Assessor details	Assessor number; certificate number	Name; company name; contact details; accreditation number; declaration of interest; client name'; certificate number; software name and version
Plan documents		File name; date plans issued; Plan ID; Plans processed by ...
Site details	Site area; roof area; conditioned floor area; unconditioned floor area; total area of garden and lawn	Conditioned floor area; unconditioned floor area; total floor area (excluding garage); LGA; Class of building; nominal orientation of dwelling's front door
Thermal loads	Climate zone; area adjusted heating and cooling loads	Climate zone; area adjusted heating the cooling load; building rating (out of 10)
Water fixtures	Showerheads; toilet flushing; kitchen and bathroom taps	
Alternative water -	Storage size; roof collection area feeding in	

	BASIX Certificate	NatHERS Universal Certificate
rainwater tank	to tank; connection points	
Thermal comfort construction details	Type and insulation level for floor, external walls, internal walls share with garage, ceiling and roof; roof colour / solar absorptance; window and glazing details (for each window: orientation, area, frame type, glass type, U value, SHGC, shading)	External walls (construction, insulation, colour / solar absorptance, details); ceilings (construction, insulation, details);
Hot water	Type and efficiency	
Cooling systems and Heating systems	Type and efficiency of each system; day/night zoning	
Ventilation and Infiltration	Ducting and control of each ventilator in bathroom, kitchen and laundry	Down-lights (number, type, details of where covered or not); Details of wall vents, chimneys, exhaust fans, un-flued gas appliances and other penetrations; Site exposure; Roof space openness
Lighting		Number and type of downlights; sealed or not sealed
Natural lighting	Location of skylights	
Refrigeration	Well ventilated space	
Clothes drying	Fixed outdoor drying	
Alternative energy	Type and system size	

4.3 Council practices

The documentation lodgement practices of the participating councils were noted, to highlight similarities and differences between jurisdictions as well as to enable comparison of council practices with NCC requirements. This information was obtained from the relevant council websites in the first instance then checked with participating councils. Table 7, at the end of this section, shows the metadata captured during council documentation lodgement processes. This represents data fields contained in their electronic or paper-based lodgement processes. It does not mean that all fields are filled by all applicants. This table shows that only generic based information is generally captured in the lodgement process, apart from the data required by the Australian Bureau of Statistics. This suggests that councils do not see a need for, or value in, capturing additional metadata through their lodgement process. It also shows that council lodgement systems can capture metadata beyond their own data needs (e.g. the ABS data) when required to do so by a higher authority²⁶.

The lodgement process captures a lot more than metadata however. Each council's process requires documents to be uploaded directly into the documentation system (or, for paper based lodgement, scanned then uploaded). This is where most of the energy efficiency information, if it exists at all, would be held. Examples of this documentation include building plans, energy rating certificates, inspection reports etc. The information contained *within* these documents is not extracted or put into a searchable format. In essence councils act as 'libraries' where building documents are stored. Access to these records is provided for conveyance purposes (i.e. when a prospective property owner does due diligence about that property).

²⁶ The compliance rate of councils supplying ABS data has not been examined.

An example of the type of supporting documentation required by councils at the 'Step 1' application stage of the approval process is provided in Figure 9.

This level of guidance is quite common - councils and regulators do specify the information that is required to support building applications.

However, guidance issued to council inspectors and private certifiers, on the information that should support inspections is far less prescriptive. For instance *Practice Note 2015-69 – Requirement for Mandatory Inspection* Issued July 2015 by the Victorian Building Authority (VBA) states that building inspectors should 'properly inspect and not approve non-compliant building work' and that it is 'critical that the builder has a full set of approved plans and other relevant documents on site' for the inspector to view. However there is no mention of what these relevant documents might be.

In general it appears that:

- A lot of information is consistently collected at the point where permission to build is given (councils hold this information).
- Information that provides evidence that actual building work does comply with the approved plans; energy assessment certificate etc. is less consistently collected. This information will be held by parties such as the builder and inspector (council or private certifier). So in many cases, this 'evidence of as-built compliance' will not be systematically collected by council.

Information required to be submitted for a building permit:

Building permit application form

Filled out correctly, signed and dated.

Energy efficiency rating certification - (amended)

Required for new dwellings, additions and commercial/industrial buildings.

Owner-builder - Certificate of Consent

Required where the landowner intends to carry out domestic building work valued at greater than \$12,000.

BAL Assessment (Bushfire Attack Level) - (amended)

Required for all Class one (houses) including alterations and additions and Class 10 (outbuildings) associated with homes constructed after March 11, 2009 or your home was constructed to comply with AS3959 - Buildings in bushfire prone areas

Site plan/allotment plan

Three copies of your site plan, showing boundaries and dimensions of the allotment together with levels, site cut, retaining walls, easements and method of drainage.

Plans of buildings

Three copies of drawings, including structural details, showing any alterations and additions.

Copy of title/plan of subdivision

Including block dimensions, easements, ownership, covenants and development control plans (DCPs).

Applicant

Is the person applying for the building permit on behalf of the owner and is responsible for the settlement of all applicable fees incurred.

Permit fees

The fees are determined by the cost of the works and type of construction. A quote is available upon request and is valid for 60 days from the application date.

Wodonga Building Services reserves the right to review fees and make necessary adjustments during the assessment of the building application.

Fees are due upon lodgement of the application. Home Owner's Warranty is required when the cost of any domestic works by a registered practitioner has a value of more the \$12,000.

Specifications

Three copies of the specifications of materials and other descriptive matter not shown on the plans.

Soil tests

Foundation soil report in accordance with AS2870.

Computations

Including 'Certificate of Compliance – Design', where structural work is proposed.

Protection of adjoining property

(where the construction or site cut adjoins or affects the boundary) See the building service's team for more details.

North East Water

Water main and sewer PIB connection applications must be lodged in person with the plumbers name provided.

Easements

Where you propose to seek approval to construct over the easement, you will need to contact the appropriate authority to arrange consent (for example, North East Water or the Council's Assets team).

Figure 9: Example list of information required by a Victorian council with a building permit application

Source: http://www.wodonga.vic.gov.au/downloads/images/Application_for_a_building_permit_May_2015.pdf

Table 7: Meta data captured in document lodgement processes at council level

	Ballina NSW ²⁷	Busselton WA	Launceston TAS	Playford SA	Townsville QLD	Yarra VIC
Map of property	✓	x	x	x	x	x
Description of land (address, lot / portion; DP)	✓	✓	✓	✓	✓	✓
Description of applicant (name, address, contact details)	✓	✓	✓	✓	✓	✓
Description of owner of land	✓	✓	✓	✓	✓	✓
Details of building practitioners and architects (including registration number)						
Details of certifier		✓	✓	✓	✓	✓
Construction certificate	✓	✓	✓	✓	✓	✓
ABS: Development type / nature of building work	✓	✓	✓	✓	✓	✓
ABS: Estimated cost of work	✓	✓	✓	✓	✓	✓
Statement of environmental impacts	✓	x	x	x	x	x
Approvals under Local government Act (e.g. connection to water, sewage, stormwater)	✓	x	x	x	x	x
ABS: number of storeys	✓	✓	✓	✓	✓	✓
ABS: gross floor area	✓	✓	✓	✓	✓	✓
ABS: number of dwellings	✓	✓	✓	✓	✓	✓
ABS: pre-existing dwellings	✓	✓	✓	✓	✓	✓
ABS: dwellings to be demolished	✓	✓	✓	✓	✓	✓
ABS: attached to other new dwellings	✓	✓	✓	✓	✓	✓
ABS: attached to existing dwellings	✓	✓	✓	✓	✓	✓
ABS: dual occupancy	✓	✓	✓	✓	✓	✓
ABS: materials used in floor, building frame, roof construction, and wall construction ²⁸	x	x	x	x	x	x

²⁷ Information from their online lodgement process

²⁸ This requirement was removed by the ABS in 2013. It appears that the ABS is only concerned with broad construction industry statistics and not with the details of individual dwellings or the collective impact of those dwellings on the nation. This could be due to resourcing issues (i.e. not enough funds to collect and utilised all of the data that is possible) or strategy issues (i.e. no concept of the importance of energy efficiency information).

5. The pilot tool

This section explains the form and function of the Pilot Electronic Building Passport Tool, and discusses some of the key findings of the test process.

5.1 The tool – description

5.1.1 Overview

The Electronic Building Passport Pilot Tool V1.1 is publicly available at <https://ebp.pittsh.com.au/>. The top portion of the opening page of the tool is shown in Figure 10 below.

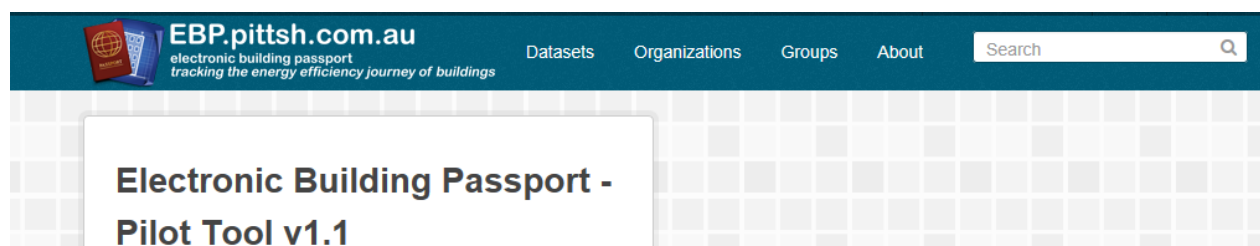


Figure 10: EBP tool home page screenshot



CKAN is open source software designed to make data accessible and was adopted as the platform for the EBP tool. CKAN is the platform used by many government data sharing websites, such as the Australian Government's data.gov.au website at <http://data.gov.au/> and the South Australian Government's Data.SA website at <https://data.sa.gov.au/>. For more information on CKAN see <http://ckan.org/>

EBP allows users to:

- Add their organisation (as the manager of datasets related to residential buildings) as a user
- Create dataset for individual residential buildings/dwellings
- Record key information on the identification and energy performance of the building
- Upload and store information on each building (i.e. plans, energy assessment reports, photos and all pieces of information discussed in section 4)
- Manage and update the dataset – for instance when a building moves from construction approval to occupancy approval stage
- Determine whether a dataset is for public or private viewing
- Search for datasets

Users under the V1.1 tool only included the project team members and participating councils.

However any building stakeholder can use the EBP to collect and manage building data. In addition to councils, the tool could be used by private building certifiers, builders, architects, designers, and other construction industry participants.

5.1.2 Organisations and Datasets

The EBP Version 1.1 tool, as explained above, allows users to create organisations and datasets.

Organisations

The local councils that are participating in the trial are prime examples of organisations that have registered to use the pilot EBP tool. However there are no restrictions within the Version 1.1 tool on organisation types. Other organisations registered include: a government agency - the SA Department of State Development, QUT and **pitt&sherry**. Any organisation that wishes to lodge data relating to residential buildings is able to register to use the EBP tool.

Datasets

The term *dataset* within the Electronic Building Passport tool means all the information, files, and links related to a single dwelling that is entered and uploaded into the tool. Each dataset acts as the passport for the building.

The EBP V1.1 tool does not set the amount or type of information held in datasets. Each dataset can be created with minimal data entry and upload. The time taken to enter the datasets typically entered into the V1.1 tool by participating councils was about half an hour. The only mandatory steps required to create a data set are:

- 1) Manual entry of a building's address
- 2) Upload of a single data file, or creation of a link to information held elsewhere on the Internet. The file for upload can be a certificate, photo, report, etc. in any format (i.e. a word, PDF, or photo). The alternative to uploading a file is the simple creation of a link to information held on an organisation's web storage system.

Datasets can be amended at any time, by the aligned organisation, under the current version of the tool, so the size of the dataset can increase as more information is collected.

The CKAN definition of a dataset (which is generic to the multitude of data types and uses facilitated by the CKAN platform) can be seen in Figure 11 below.

Further explanation of the manual entry data fields and data sources for upload is provided below.

5.1.3 Data Fields

EBP V1.1 has a fairly large number of manual data entry fields.

These fields are largely aligned with the information provided on a NatHERS universal certificate – the cover page of an energy assessment report. The fields also closely correspond with the data requirements under BASIX certification.

'Building Identification' data-fields are followed by data fields relating to 'Thermal Performance', 'Construction summary', 'Energy Use Systems', 'Energy Supply' and 'Additional Record Data'. Figure 11 below shows the top of the dataset creation page.

Figure 11: EBP Tool V1.1 Screen shot of Building Identification data fields

5.1.4 Data sources

Resources can be added by uploading files, or by creating links to information held on-line. This is shown in Figure 12 below.

Figure 12: EBP Tool Screenshot: add resource

5.2 Observations – from uploaded datasets

A comparison was made between the data set in the EBP (excluding the datasets provided by QUT) and the documentation required by the NCC. Examination of the metadata (individual data fields) shows that:

- Construction materials (roof, walls, floor) were well known, but approximately half of the data sets could not indicate roof absorptance or roof insulation type (unspecified or unknown).
- Ceiling and wall insulation type and R value was missing from approximately 20% of data sets (unknown or unspecified or blank fields)
- Glazing was generally known but was mostly described in unspecific language (e.g. single clear or single tint). Only 4 data sets had specific U and SHGC figures entered.
- 77% of data sets had no information on number of ceiling penetrations (sealed or unsealed)
- 40% of data sets had no information about the hot water system (mostly QLD)
- 59% of data sets had no information about the lighting efficiency (mostly QLD)

These findings could indicate that this data was either missing from council documents, or was difficult to extract from documents to enter into the metadata fields.

It must be noted though that under the V1.1 EBP tool, the inclusion of the above information is not compulsory. Therefore it is possible that the information was not completely unavailable, but that the council officers judged it was too difficult (or too time consuming) to find the requested information.

The supporting documents attached to each data set were then examined (again, removing QUT data sets). These results are shown in Table 8, comparing lodged documents with the NCC documentation requirements. This table shows that building plans and the associated energy certificates (as lodged at the beginning of the approvals process) are the most common documents submitted into the EBP V1.1 too.

There are several reasons that councils did not lodge more supporting documents. Privacy concerns, lack of time, and the lack of availability of electronic information are all factors that came into play.

The majority of information requested via the manual data field entries is available on energy certificates and BASIX certificates. Council officers mainly referred to these documents when completing the entry fields. Some also relied on plans. These data sources were then uploaded.

Under this trial no other documents were submitted (e.g. compliance certifications). Our conversations with council officers indicate that they do have access to permits and approval documentation that could be submitted into the EBP. However in most instances the documents required under the NCC (see Table 8) that were not submitted by any pilot council are not systematically collected as part of building approvals processes.

Table 8: Comparison of NCC document requirements and EBP dataset

Documents required by NCC	Comments on documents in EBP dataset
Building and allotment plans, drawings and specifications	55% of data sets did not contain any building specific documentation. The remainder contained fairly standard design drawings (e.g. floor plan, site plan, elevations etc). One data set contained a floor plan only.
Air movement certification and expert sign off	None provided
Building sealing certification and expert sign off	None provided; QUT provided some air tightness test certificates
Glazing certificate and purchase order	None provided
Hot water system certification / documentation	None provided
Star rated energy certificate, details or tests and calculations to prove compliance; proof of compliance with outdoor living area, impervious roofing, ceiling fans and lightweight flooring systems	67% of data sets had an energy certificate of some sort attached e.g. NATHERS report or DTS / Alternative Solutions report. These reports were for 'as designed' plans. Datasets for NSW homes all had BASIX reports.
Insulation certification (AS/NZS 4859.1) and purchase order Proof of compliance with total R value calculations	None provided
Insulation of services: Insulation certification and purchase order	None provided
Lighting energy efficiency certification and documentation	None provided
(Certification that plans meet Code)	None provided

Further comparison was made between the EBP dataset and Best Practice documentation (see Table 9).

The Best Practice documentation is an amalgamation of international practices explained earlier. Only energy efficiency related documentation has been included.

Table 9: Match between Best Practice energy efficiency documentation and EBP dataset

Best Practice documentation	Comments on documents in EBP dataset
<p>Energy</p> <ul style="list-style-type: none"> • Energy performance values (G-value, U-value, Ψ-value) for all elements (walls, windows, building envelope etc.) • Building thermal load (annual and seasonal space heating and cooling MJ/m²) • Energy consumption of building kWh/yr • Share of renewable energy • Imported energy kWh/m²/yr or total kWh/yr • Baseload power kW • Reduction in peak electrical energy demand 	<p>The data sets that contained energy certificates (e.g. NatHERS or DTS reports) contained information about the performance values of building elements considered at the design stage. No documents were submitted verifying that these values were actually installed. Each of these data sets contained simulated annual and seasonal building thermal load figures, with some reports (e.g. First Rate) containing these figures per conditioned space.</p> <p>There was no documentation relating to baseload and peak load electrical energy demand. For the few homes with solar PV or solar hot water installations, there was no documentation indicating expected % of energy provided by solar.</p>
<p>Documentation of planning and construction process</p> <ul style="list-style-type: none"> • Construction drawings (as approved) • Inspection reports • Compliance certificates <p>Documentation relating to operation</p> <ul style="list-style-type: none"> • Inspection reports • Additional drawings and data relating to renovations / additions • Performance certificates (EPCs etc) 	<p>Approximately half of the data sets provided construction drawings.</p> <p>No inspection reports or compliance certificates were provided.</p> <p>No operational documents were provided.</p>
<p>Indoor Environmental Quality</p> <ul style="list-style-type: none"> • Summer and winter thermal comfort conditions (all rooms) • Indoor air quality • Lighting conditions • Acoustic conditions 	<p>Not provided.</p> <p>Yarra City Sustainable Management Plan (for specific properties) contains council comments and recommendations for natural ventilation and daylight</p>
<p>Materials</p> <ul style="list-style-type: none"> • List of materials to be used / excluded (design stage) • Complete list of materials used (construction stage) • Embodied energy of materials 	<p>Not provided</p> <p>Yarra City Sustainable Management Plan (for specific properties) includes applicant commitments regarding materials (e.g. low VOCs.) and recommendations for consideration of low embodied energy materials</p>
<p>Life Cycle Aspects</p> <ul style="list-style-type: none"> • Expected life of building (as constructed) • Dis-assembly / recycling plan for end of life • Compilation of cleaning, maintenance, repair, operation, dismantling and other costs 	<p>Not provided</p>
<p>Pollution and emissions</p>	<p>Not provided</p>

6. Discussion – information barriers and EBP based solutions

Generally, information is critical to the efficient functioning of markets, and that also applies to the market for energy efficient buildings in Australia. However, it appears that both the demand for and the supply of information regarding the actual energy performance of at least residential buildings in Australia is less than optimal. The reasons for this are many and complex. This section opens with a discussion on where information shortfalls are causing problems in the building quality system. The potential role of an electronic building passport in addressing these problems is then explained. Finally issues around implementing an EBP are discussed. This section informs the recommendations offered in Section 7.

6.1 Problems under current practice

Poor consumer understanding of energy efficient homes

The NEEBP project has highlighted that the majority of consumers (such as house buyers, renters or owners) have limited technical knowledge with which to assess the energy efficiency features of a home. They may have a general understanding that higher star rated houses will be associated with lower energy bills. Some may understand that higher star rated houses may be more comfortable than lower star rated ones. But the details of this are not understood – and *therefore not accurately valued from an economic perspective*.

For example most consumers are unlikely to understand the connection between different design or construction features or inclusions, on the one hand, and the running costs of the house, on the other. A related issue is that few consumers understand the scale or significance of the issue. Councils report that building owners are commonly unaware the fact that the presence or absence of these features could mean tens of thousands of dollars of additional energy bills over the life of a dwelling, and potentially more again in the eventual resale value of the property.

Highly visible features, such as solar panels or solar hot water, are generally viewed as positive features. However, without purchaser understanding of such features' contribution to annual running costs or capital value of the home, even such visible features may still be undervalued.

Lack of consumer understanding of the regulatory system

Consumers appear to trust that the regulatory system is sufficient to ensure that their best interests are protected, and therefore do not often question this system. 'Bounded rationality' may be at play here, where consumers accept they do not have the time, inclination or skills required for full understanding – so they place their faith in the system. Consumers know that they are required to pay for the services of a building certifier or surveyor, and may also be required to pay for an energy assessment for a new home or extension (when a star rating is used as a compliance pathway). Also the initial purchaser will have access to at least some documentation indicating that the building complies with various regulatory requirements drawing on the National Construction Code and/or related Australian Standards. As a result, most consumers believe they are paying for and getting quality assurance as well as compliance via this system. Implicitly they trust that the regulatory system is effectively managing their interests, and therefore do not perceive any need to verify that this is in fact the case, unless the house contains very obvious/visible defects.

This would not be a problem if the regulatory system was operating very effectively, but –as NEEBP Phase 1 found – it is not. As it stands, the consumer is taking a hands-off attitude to the energy efficiency of homes as a result of both their faith in the regulatory system and their lack of independent energy efficiency knowledge. As a result of this, few consumers are seeking to independently verify the energy performance of their homes and, as a further result, consumer demand for energy efficiency related information and documentation is limited. Limited consumer demand for documentation should not be taken as evidence that all is well, but rather as evidence that most consumers are ill-equipped to enforce their own best interests in housing energy efficiency.

Non systematic collection and use of energy efficiency related information

We have learned during this project that some Councils are consciously reducing their collection of building documentation, and very few are undertaking any independent verification of the information contained in the documents they do collect. We recognise also that council practice varies greatly and that some councils do undertake audits from time to time. However, our overall impression is that in most council areas, evidence to support that actual building work matches the approved design is not being systematically gathered.

Unclear accountability and responsibility for information collection and storage

There are several parties involved during the building and construction approvals process. The main four might be considered to be:

- Councils
- Certifiers/inspectors from council and private organisations (building surveyors)
- Builders
- Building owners.

Other parties that produce information related to the likely and eventual energy efficiency of the building include energy assessors, designers, architects, engineers, and various professions and trades such as electricians, solar installers, plumbers, insulation installers and so on. The documentation produced by each of these parties can be critical to the ability to verify that the energy performance of houses matches that anticipated (and required) for the approved design. However, it is unclear who exactly should be collecting and storing all this documentation.

In the case of councils, we heard during this project that house owners (but not always other parties) are currently able to access building documentation held by the council upon request. In some cases this information (e.g. copies of documents) is provided free of charge or sometimes for a fee. Councils generally regarded themselves as a 'library' of building documentation, which should be available to those needing it. However, they also expressed the view that they did not see it as their role to ensure that the documentation file for any given dwelling is either complete or accurate. Therefore, if a document is held by the council, it will generally be available, at least to the building owner, but there will be no redress if documents are required but they are not already held by the council. In one case, we were told that a council is no longer requiring certificates of completion; however, if an owner/purchaser requests one, then it will be prepared at that time.

Privacy concerns

Apart from the varying completeness of building files and access charging, the other key access issue is who is able to receive information, or the degree of control of access. Here it appears that there are widely differing practices between Councils, with some providing documents only to current house owners, others to prospective purchasers (but with current householder details redacted), and others provided essentially universal access to all documents, without redacting data fields (like names and addresses) that might be considered private or sensitive.

For the most part, councils participating in this project expressed significant concerns regarding privacy issues and the need to protect any information that may be considered private. It was noted that privacy legislation varies considerably from state to state, but also there were examples presented of differing interpretations and practices within the one state. Clearly the latter examples cannot be attributed to legislative factors. We have noted in other projects that it is commonplace for those controlling access to documents to be more conservative, when processing requests for access, than is required by law. This is most likely attributable to a lack of training and detailed familiarity with legal requirements, combined with natural risk aversion. Councils noted that redacting sensitive fields can be a very laborious and time consuming, and therefore costly, task associated with providing access to building documentation. Some expressed the view that privacy concerns could be a major barrier to an EBP system. This is discussed in Section 6.4 below.

Weak enforcement

There is potentially a great deal of information produced during a house's design and construction phase that could support compliance checks. Most jurisdictions also have some inspection requirements to verify some aspects of 'as constructed' compliance, although only in NSW does this specifically extend to energy performance requirements. However in practice, it appears that there is very little emphasis on checking the energy efficiency requirements.

There is a modest amount of attention paid at the design approval stage to the energy efficiency requirements and almost none during the construction phases. This was noted in the Phase 1 National Energy Efficient Buildings Project Report, and vigorously confirmed by many stakeholders consulted in the Phase 2 projects.

Some of our council participants did confirm that some auditing of documentation/code compliance takes place in their jurisdiction, within their own council areas. However they reported that this activity was a bare minimum. A few councils said they had deliberately stopped undertaking audit work both to save money and because it was viewed as a low priority.

Council participants universally reported that there is little or no pressure from state based regulators to ensure the accuracy and completeness of documentation relating to energy efficiency. One council suggested they were actively discouraged from doing so due to 'red tape' concerns.

The lack of auditing and verification of building energy performance documentation means that the extent to which the building 'as built' agrees with the design drawings and specifications is not known, and the same applies to the efficiency ratings that are based on those drawings and specifications.

Product substitution

A further issue related to building efficiency documentation – and the lack of enforcement activity is that of product substitution. In order to achieve design approval, a particular dwelling may have specific product specification requirements, such as specific maximum u-values for windows, or non-standard insulation levels in walls, in order to balance out other design features and achieve an overall 6 star rating, for example.

As detailed in the NEEBP Phase 1 Report, there are strong suggestions that it is not uncommon for such high specification products to be substituted for cheaper and lower specification ones, with or without the house owners knowledge, during the construction process. The effect of these substitutions on the overall thermal performance of the house – and indeed of other possible unauthorised changes such as changes in window sizes, numbers or location, inter alia – can be large. Under most building permit processes, such changes trigger a requirement for re-rating and re-approval of the dwelling. However, this can only occur if the changes are declared or detected.

Participants confirmed that product substitution was common and problematic. They also confirmed that:

- Informational systems were insufficiently robust to track product use. For instance a mandatory, uniform and accredited labelling scheme that would allow builders, inspectors etc. to confirm products against specifications does not exist.
- Inspection regimes (paper based and physical based) are not thorough enough to allow robust checking.
- It is highly unrealistic to expect individual councils or private certifiers to impose tighter inspection regimes. For the situation to improve, changes to regulation or practice notes must be made at the level of state regulators.

Lack of ‘pull policies’

There is currently a lack of policies, at state and federal level, which are driving demand for improved information flows. Policies with the potential to stimulate better information practices include mandatory disclosure of residential building energy performance; mandatory labelling and performance requirements for building envelope elements (as is possible, but not used under GEMS legislation); consumer information campaigns; industry skills and training campaigns.

The current concern with ‘red tape reduction’ being employed by many governments appears to be exacerbating poor regulatory practices. Regulation is effective and low cost when:

- All parties understand clearly their obligations
- Information is easily available to allow the testing of whether obligations have been met
- All parties understand that testing could occur.

This does not appear to be the case under the present system of Code regulation and enforcement activity. Consumer awareness of people’s own best interests in energy efficient housing does not appear to be strong enough to motivate them to ensure that regulatory authorities in fact act to protect these interests. We could say that most people “don’t know what they don’t know” and, as a result, they are not aware of or incentivised to act to prevent poor regulatory practices.

Regulatory and market weakness in combination

It is worth exploring a particular example of how regulatory and market weaknesses combine to limit the availability of good information on building energy efficiency.

Many buyers will have an underlying assumption that a new house will have reasonable energy performance (i.e. the house will be functional and comfortable with modest energy bills) thanks to the National Construction Code’s energy performance requirements. This assumption will be driven by various factors, including their likely awareness (for example) that a ‘6 star’ refrigerator or washing machine would represent the cutting edge of energy efficiency on the market. Motivated consumers can readily discover (via the appliance energy efficiency label and/or the supporting website, energyrating.gov.au) the expected annual energy consumption and operating costs of rated appliances.

However, despite the fact that houses use many times the annual energy of a single appliance, there is no similar transparency regarding the expected energy performance of a six star house. Firstly, consumers would generally be unaware that the 6 star standard for housing corresponds to the Code ambition of ‘minimum necessary’ levels of energy performance (rather than best practice, as per the refrigerator example). Setting aside the fact that not all jurisdictions even apply the full 6 star standard, even in those that do, it is practically impossible for most consumers to judge whether a house does in fact have reasonable energy, or even thermal, performance. Even if the householder knows that the house is rated (as designed) at 6 stars, they will not know what annual or quarterly energy bills they should anticipate, and therefore they will have no firm basis for knowing whether their bills are too high. Nor will they know whether or not wall insulation or certain ceiling insulation types have been installed and fitted correctly, or that building sealing and detailing has been correctly undertaken. Finally they will not know whether the house ‘as built’ retains a 6 star rating or something less, as the Code requirement is only that the design achieves this rating, not the completed house.

Pressure testing and thermal imaging cameras could be used to investigate questions relating to thermal integrity. However this occurs rarely at present as there is no regulatory requirement to do so and because, as noted, consumers are unaware of the underlying issues and risks.

6.1.1 Low demand for good documentation processes and information = a public policy concern

The broad result of all the above problems is limited demand for access to building energy efficiency information, and little ‘user’ pressure to ensure its accuracy or completeness. This situation is not an abstract concern, but contributes to significant public policy shortfalls:

- Regulatory frameworks affecting new housing (amongst other building classes) and renovations are not sufficiently robust to have confidence that there is reasonable compliance with aspects of the National Construction Code, including its energy performance requirements²⁹;
- The construction and housing market does not accurately value energy performance; in fact it does not properly value many factors impacting the overall quality of buildings. These shortcomings mean that the market is not picking up the slack left by the weak regulatory framework. There are no strong drivers towards compliance with some aspects of the National Construction Code – such as energy performance requirements.
- As a result, householders may be consuming more energy, and paying greater energy costs, than expected under the regulatory regime, reducing their welfare;
- Total energy consumption and greenhouse gas emissions in Australia will be higher than expected;
- The productivity of investments in energy efficiency features will be lower than anticipated;
- There are likely to be negative health impacts where dwellings have poor thermal performance (limited resistance to extremes of heat and cold). A recent study in the *Lancet* found that 6.5% deaths in mild to hot Australia were exposure-to-cold related. In Sweden – a much colder climate – only 3.9% of deaths were cold related. One factor behind this seemingly extraordinary result was vividly explained by an Australian researcher – “*many Australian homes are just glorified tents*”.³⁰

²⁹ Noting that a separate NEEBP Phase 2 project is undertaking compliance audits that will assist in quantifying the extent and frequency of non-compliance.

³⁰ Source: Adrian Barnett, 2015. <http://theconversation.com/cold-weather-is-a-bigger-killer-than-extreme-heat-heres-why-42252>

The importance of actually achieving compliance with NCC energy performance requirements should not be understated. This is not a matter of red or green tape. Consumers have a very large financial interest in knowing that they are in fact getting the energy performance that they are paying for, in what is for most people the largest investment they will ever make in their lives. In addition, energy performance requirements in building codes are amongst the very largest and most cost-effective greenhouse gas abatement opportunities in Australia and around the world. The IPCC, for example, notes:

The development of portfolios of energy efficiency policies and their implementation has advanced considerably since AR4. Building codes and appliance standards, if well designed and implemented, have been among the most environmentally and cost-effective instruments for emission reductions (robust evidence, high agreement). In some developed countries they have contributed to a stabilization of, or reduction in, total energy demand for buildings. Substantially strengthening these codes, adopting them in further jurisdictions, and extending them to more building and appliance types, will be a key factor in reaching ambitious climate goals. [9.10, 2.6.5.3]³¹

6.2 The role of an Electronic Building Passport system

An electronic building passport could help address many, but realistically not all, of the issues noted above. This section reviews these opportunities in turn. By way of overview, however, we note that an EBP is unlikely to be a stand-alone or holistic solution to all of the above concerns. Rather, an EBP could be considered as one of the foundation stones of a quality assurance system for housing in Australia. Figure 13 below shows the EBP as one of the elements of a system delivering assurance of high quality homes. An effective quality system is juxtaposed with a version that delivers homes of varying quality – the system effectively operating at present.

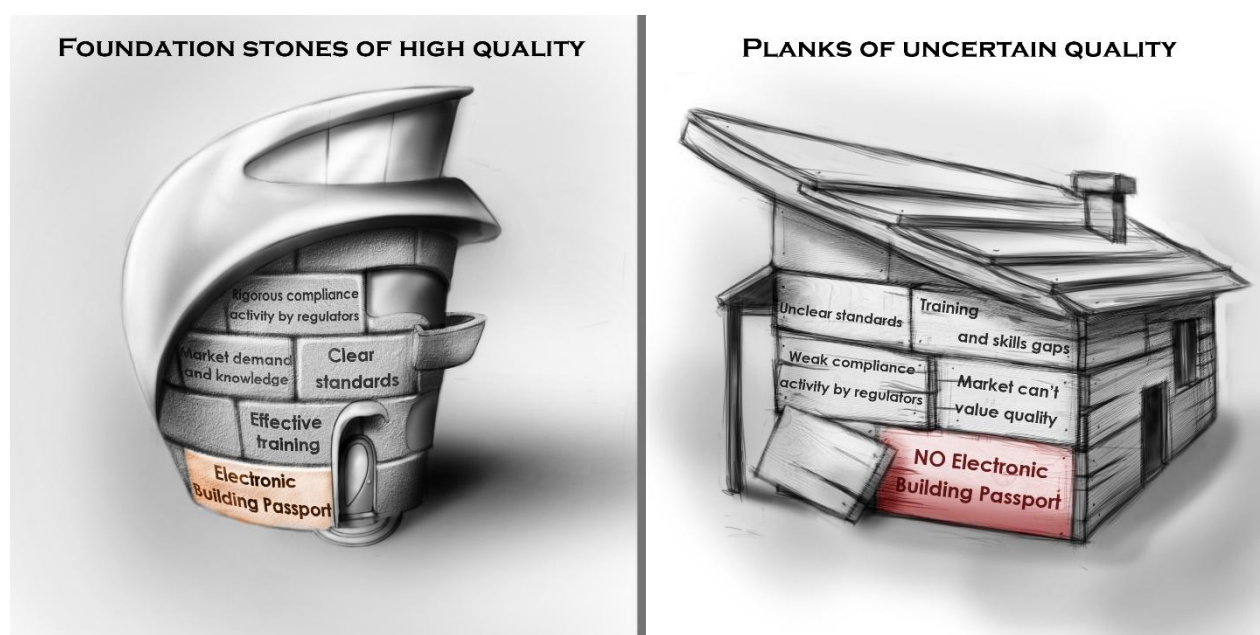


Figure 13: An Electronic Building Passport as a Cornerstone to Building Quality

The following sections present specific opportunities that an EBP could help to realise.

³¹ IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

6.2.1 Reduced compliance costs via electronic document lodgement and storage

In many council areas/states, the project team was told that there is a move already underway towards fully electronic submission of building/permit applications, approvals and related documentation. The NSW Government, for instance, has developed an Electronic Housing Code, for the online management of development and building approvals. This system has been adopted by many councils, who have simultaneously upgraded their own electronic document management systems. With virtually all documents – such as technical drawings, energy assessment reports, certificates and others – originating in (or at least moving to) an electronic format, it is increasingly unnecessary to commit such documentation to paper. Electronic document management systems generally can dramatically speed up lodgement, processing, and retrieval times and therefore reduce associated costs and resource consumption. Where councils do not already have this in place, moving to an EBP ready system would help realise these efficiencies and cost savings.

An EBP would be better placed to manage the privacy concerns raised earlier. It is likely (but not inevitable) that shifting documentation onto an electronic format would simplify the process of determining which parties are entitled to what kinds of information, minimising occurrences of unauthorised or inappropriate access.

6.2.2 Allowing information to drive value chains

It was noted above that the information contained in (or that should be contained in) documentation relating to the energy performance of the building (inter alia) has very considerable potential value. However, to realise that potential value, the information has to be accessible (in a controlled manner), reasonably complete and accurate, and available in a useful/understandable format and a low cost. In addition, of course, there must be a demand for this information (discussed further in Section 6.3 below).

6.2.3 Improved documentation accountability

An EBP would help all parties – from Council staff to energy assessors, certifiers/surveyors, real estate agents, builders, designers and others – to know what documentation *should* be provided, when and to what standard. This could be facilitated by standard-form lodgement templates and simple error-messaging when required documents/fields are not yet complete. While simple, such strategies can be very effective in ensuring that documentation requirements are a) understood and b) complied with. This in turn is critical to ensuring that the potential information value of these documents is in fact realisable, by minimising instances of missing documentation, facilitating rapid and low cost auditing of documentation completeness, and regular exception reporting to flag missing documentation. In these ways, an EBP would be expected to have a significantly positive effect, over time, in improving knowledge of and compliance with energy performance requirements. This would apply to all parties that contribute to meeting those requirements.

6.2.4 Facilitating audits and improving compliance

Another Phase 2 National Energy Efficient Building Project is concurrently designing and piloting a protocol for auditing building energy performance documentation. However, this protocol can only effectively function with the presence of complete and accurate building documentation. While this project is still underway, early results confirm – as this project has done – that in many instances important documentation is in fact missing. An EBP would, as noted above, facilitate both knowledge about what documents should be provided, the lodgement process itself, and also error checking/document auditing. This, in turn, would facilitate third parties undertaking more detailed audits, using the protocol that is currently being piloted, to measure the degree of compliance with Code requirements.

Improved ease of auditing, and evidence of audits being undertaken, have a significant deterrent effect against non-compliance or deliberate misreporting. As the cost of undertaking audits falls, their frequency and effectiveness can be higher. Increased industry awareness of these facts increases the perceived 'discoverability' threat, in turn leading to improved accountability and compliance. This effect can, of course, be heightened by taking high profile action against those who do not comply, including strategies such as naming and shaming, financial penalties, or even court action.

6.2.5 Making use of current technologies and reducing compliance costs

As a general statement, the pace of development of information technology and communication methods has far outstripped the pace of development of regulatory compliance and document and information management systems. As a result, regulatory compliance systems are typically not taking full or any advantage of readily available, even ubiquitous technologies, such as smart phones and related apps, tablets and cloud-based data storage and upload services. As a result, regulatory systems can involve unnecessary costs and process duplication, while at the same time failing to deliver the most valuable service possible.

In the housing energy performance area, 'verification' is a key quality attribute. At present, and as detailed in the NEEBP Phase 1 Report, there is a widespread culture of 'sign-offs' that are not accompanied by physical inspections (verification) or even auditing (verification of a statistically significant sample). This may be a key factor contributing to low compliance and quality outcomes. The virtually universal reason offered during this project as to why audits and inspections were not in fact being carried out was cost concerns and related budget/staff cuts.

However, virtually all builders carry smart phones these days. It would be relatively straightforward to create a practice (e.g., via a Practice Note or regulation) whereby builders were required to submit date-stamped photographs of insulation installation or building sealing details prior to finishing. The same approach could be taken to images of windows and window installation, receipts for windows or other EE features. The electronic documentation record could at least match the data fields covered by the NatHERS universal certificate (whether or not the particular building has such a certificate). A phone app could be developed to facilitate the uploading of date-stamped images to an EBP, with the only other key information required being the address details of the house and the builder's details. While such a system might not be fool-proof, it would add an additional layer of accountability. Those knowingly supplying false information would face a heightened risk of discovery, and this would be even more effective if audits were conducted in a highly-visible manner.

6.2.6 Facilitating voluntary disclosure, building verification and other best practice initiatives

The question of drivers for the uptake and use of an EBP is considered further below. However, it is the case that there are already parties promoting best practices such as energy performance verification and sustainability check-lists, and these voluntary, market-led initiatives would be supported by the roll-out of an EBP. Key examples include the Building Verification Council, ASBEC's National Framework for Residential Ratings, and LJ Hooker's '17 Things'. It may also assist in the delivery of industry quality assurance programs run by associations such as the Housing Industry Association and Master Builders Australia. An EBP could store and provide easy access to ratings, assessments and other information created for a particular dwelling under these voluntary initiatives, assisting current and future owners to understand the performance track record of the building. QUT is trialling the addition of 'tag words' to the EBP, based on LJ Hooker's 17 Things. The purpose of this is to test whether the EBP is a potentially useful tool for the real estate market in their role as intermediaries and information conduits between buyers and sellers.

6.2.7 Improved national consistency, reducing regulatory uncertainty, boosting competition

A national roll-out of an EBP system would have the considerable benefit of requiring the documentation required by each state's regulatory arrangements to be transparently identified. That information would be available to all parties, for example via the document upload template (which could sit on multiple websites, e.g. ABCB, council and regulator websites).

This process would also facilitate a single agreed documentation process to be developed Australia-wide, as differences in documentation requirements between states (or local government areas) would be highly visible. This would enable bodies such as the Australian Building Codes Board or regulatory reviewers at different levels of government to facilitate alignment of practices between states and territories. This would have the effect of reducing regulatory uncertainty and compliance costs, particularly for parties that operate in multiple jurisdictions.

A nationally supported and consistent system would also better allow the participation of multiple parties operating in more than one council area and jurisdiction. Datasets (building information on a single dwelling) could be supported on a national system (like the current tool). Energy assessors for instance could be the ones responsible to loading the energy certificate into a dataset. Engineers would upload structural certification details. Insulation installers would upload the insulation certificate – and so on. This multi-use access would lower costs of information gathering.

It would also support competition – a nationally consistent and uniform system allows operators the opportunity to compete in multiple council areas and jurisdictions.

6.2.8 Spill-over benefits – build quality, safety and comfort

While the pilot EBP developed in this project focuses on documentation relating to building energy performance, the system and many of the processes around it would lend themselves to use in other domains. For example, documentation and images relating to structural integrity and NCC Section F compliance (health and amenity factors) could readily be accommodated within the same tool. This would imply that the tool is accessible to and used by building certifiers/surveyors as well. This could provide an additional resource for such practitioners, helping them to be sure that claims made by energy assessors, builders or other parties are in fact well based. By helping to improve compliance in all of these areas, building quality, safety and thermal comfort – and therefore economic value – could all be enhanced, at the same time as reducing compliance and audit costs.

6.2.9 Improved statistical information for policy development

A final outcome of a national roll-out of EBP would be the progressive capture of meta-data relating to the energy performance of the dwelling stock in Australia. Such information at present is extremely rare and yet is essential to undertaking effective reviews and evaluations of past policies. It is also needed to design more effective and least-cost policies for the future. Statistical information is already being created by many councils for the Australia Bureau of Statistics (Building Activity data). An EBP system could a) facilitate the creation of the required data fields for those reporting to the ABS and b) create similar data for those not reporting to the ABS, and c) provide de-identified data at a greater level of detail and resolution than is available from the ABS. As an example, the ABS does not publically report information on the distribution of the building stock by star band, or on the compliance method used, or on key inclusions, or average floor area; area demolished, refurbished and new building; and many other factors where statistical (de-identified) information could create very considerable value in the public interest for policy reviewers and designers.

6.3 The drivers for use of an EBP

In considering the drivers for the uptake and use of an EBP, we need to consider separately the current and potential future drivers.

6.3.1 Current drivers

Current drivers for the uptake of an EBP include purely voluntary, consumer-led inquiries/research. Examples include due diligence checking during the purchase of an existing house, or where there are concerns held regarding the performance of a new dwelling. Second, and as noted, some councils do undertake audits of building/planning approval processes, and these would be facilitated by an EBP. Similarly, where councils do not already offer electronic lodgement and search/retrieval functions for building and planning permits, an EBP would provide significant administrative cost and time savings as well as the potential for a streamlined and improved service offering by councils. Third, policy researchers would benefit in proportion to the number of records that are stored in an EBP system, by helping them to understand key market trends and analyse the performance of measures designed to impact on those trends.

More generally, there is a growing appreciation – post the Phase 1 NEEBP Report – that compliance with building energy performance requirements in the NCC appears to be poor. As a result, many parties – including the Australian Building Codes Board and some state/territory building regulators and councils – are currently seeking to better understand trends and to improve them where necessary. An EBP would help such parties both with improved understanding, but also (as noted in the previous section) with one opportunity to seek improved compliance practices.

There is modest but increasing interest in voluntary best practice initiatives designed either to increase consumer awareness of energy efficiency/sustainability features of housing, or to provide quality assurance/verification services. As the market familiarity with such initiatives increases it would facilitate the storage and retrieval of documentation related to these by householders and service providers alike. Examples are LJHooker's 17 Things, or building verification services.

While the current drivers supporting the roll-out of an EBP are significant, there are also a number of barriers to this which are detailed in Section 6.4 below. If not addressed, and in the absence of new policy or regulatory initiatives, then these barriers could limit market demand for an EBP in the short term. However, the potential for future drivers to emerge should also be considered.

6.3.2 Potential Drivers

An EBP would help to support the roll out of, and in turn be supported by, several program types including:

- Increased enforcement and verification activity
- Product certification and verification platforms
- Consumer awareness activities
- Industry awareness, skills and obligation training activities
- Energy productivity rating systems – for instance mandatory disclosure.

6.4 Barriers to uptake of an EBP

Despite the opportunities and drivers noted above, during this project we were also introduced to some significant barriers to the roll-out of an EBP. The input from councils in particular on these barriers is extremely important, as councils would be the key users of an EBP and are keenly aware of the actual operating environment.

6.4.1 Cost and duplication of effort

By far the most common concern expressed regarding an EBP is that it must not lead to duplication of existing effort or additional cost, particularly additional staff time. All councils described increasing budgetary and cost cutting pressure, and reducing staff numbers, as the key challenge in their service operating environment. Therefore, concern was expressed that establishing an EBP could require a great deal of additional effort, such as additional data entry keystrokes, much of which would duplicate existing processes and systems already in place. Many noted their perception that the potential benefits of an EBP would not merit such additional cost, at least in the absence of uniform and mandatory drivers.

Related to this concern was the overall cost of the system. The cost might include software licensing costs but also, and potentially more importantly, staff time for data entry and also staff training time. Essentially all councils expressed a strong preference for EBP functionality to be delivered via software solutions that were fully and seamlessly integrated into their existing electronic document management systems and related administrative processes.

6.4.2 Software platforms

Councils noted that many had existing electronic document management systems in place, and that therefore any EBP system would need to be compatible with those systems and, preferably, able to interact with them to extract existing data records, in order to minimise the additional keystroke risk noted above. While essentially a technical IT concern, there may also be software licensing issues and costs, additional data storage costs and data security concerns to manage.

We note that in NSW, an independent review of the Building Professionals Act 2005 is almost complete. The Draft Report's discussion of information systems is highly relevant. It finds that the non-standardisation of the information systems of councils and certifiers is a major shortcoming of the building regulatory system. It recommends that a standardised, electronic system or protocol be developed, to apply across all councils. It also recommends that an online 'Building Manual' be established – this is analogous (but broader as it deals with all code requirements) to the EBP piloted in this study.³²

6.4.3 Multi-user access

Many councils pointed out that an EBP would be most efficient and effective if it allowed multiple parties to enter and upload information - energy assessors, builders, etc. This is not a barrier to the use of an EBP – but points to the non desirability of designing an EBP for council and certifier use only. Instead an 'opens systems' approach, where many parties could potentially access an EBP system, to upload and download documents, would be preferred.

³² Michael Lambert, *Independent Review of the Building Professionals Act 2005 – Draft Report*, August 2015, State of New South Wales, See Chapters 12 and 14 and Recommendation 3.

6.4.4 Privacy

As noted in Section 6.1 above, the majority of councils that participated in this project noted a concern that an EBP system could potentially conflict with actual or perceived privacy constraints. The key concern appeared to be the release of personal names in association with addresses. Clearly, the management of privacy concerns would be a key criterion to be designed into a fully fledged EBP system, noting that requirements may vary around Australia, therefore demanding some flexibility in the EBP system design to manage differing degrees of disclosure.

Overall, we note that the vast majority of valuable information held on an EBP would, as a necessity, be associated with a street address (and/or lot/parcel numbers), while the names of the current owners/tenants of the property would not need to be discoverable (as indeed is the case in the pilot EBP tool). Councils will require (and already hold) this data for other purposes – such as rates – but name fields could be eliminated from metadata in an EBP. However, names may appear on documents held by the system, and this may in some cases require redaction of this detail before documents can be accessed, as indeed is already the case in many council areas.

6.5 Towards Effective, Low Cost Solutions

6.5.1 Software Protocol/Australian Standards

We noted above that a key concern of councils was the risk that an EBP might duplicate existing IT systems and/or require duplicative keystrokes and therefore staff time and cost. Many councils felt that an ideal solution would be for EBP functionality to be offered within their existing software platforms. Many councils use industry-standard applications, like SAP, TRIM, Infor Pathway, Planning Xchange, while some state and federal ‘data access’ portals are based on the same C-KAN platform, as was used for the pilot EBP tool.

It remains to be proven whether this could be a practical solution, however, it is far from impossible. Several pathways could lead to this outcome over time. The first would be a purely voluntary approach to software service providers. This could potentially be made more effective if co-ordinated between large numbers of councils, potentially facilitated/led by a body such as ALGA. Another approach would be to offer a commercial incentive – for example in the form of a software development contract or a bulk purchase agreement – to software providers willing to develop EBP modules/functionality within their existing electronic document management systems supplied to local governments in Australia.

Beyond these, more ‘leveraged’ solutions could involve including comprehensive documentation requirements within the National Construction Code and/or state/territory building regulations (flowed through into appropriate Practice Notes for industry) that would create a common and large enough ‘market’ for documentation services to be commercially attractive for software providers to meet this demand.

Another related solution would be to create an Australian Standard for Building Energy Performance Documentation and then to call up this standard in the NCC and/or state/territory building regulations and/or local government building/planning permit processes. In effect, this would make compliance with such an Australian Standard quasi-mandatory for software and solution providers for local government, while ensuring a consistent (functional) approach. A key barrier to this solution is the time required for developing new Australian Standards, which can be many years. Therefore another solution, or at least interim solution, could be to develop an ‘EBP Software Protocol’, similar to an Australian Standard, and promote this to both councils and software service providers alike as a best practice solution, at least during the period in which an Australian Standard is developed.

We note again that NSW has been urged, in the Lambert review, to develop a building information strategy and ‘Building Manual’. It would be very sensible to make this a national project.

6.5.2 A stand-alone solution (that doesn't stand alone)

If instead an EBP tool were to be developed as a 'stand-alone' solution – for example, as a continued development of the existing pilot tool – then it would be critical that the maximum degree of interoperability is designed into such a system. This would include, at a minimum, the ability for an EBP tool to access and upload existing data held by councils with minimal additional keystrokes or verification required. Such a facility could be identified as a required feature of any fully developed/operational EBP tool. This functionality has not been delivered within the existing pilot tool due to the limited number of building records processed.

A stand-alone option may offer some advantages. Such a system may better allow use from multiple parties. The NSW BASIX on-line tool is an example of a stand-alone system used by multiple parties (owners, builders, energy assessors, etc) across different council areas.

6.5.3 Spreading the compliance burden and costs

While councils expressed concern about the costs and practicality of council staff completing the required data fields for an EBP, in fact it is not apparent that this would be the most optimal solution in any case. Council staff may in some cases lack the required degree of technical knowledge to accurately capture and quality assure data as it is uploaded to the EBP system in any case. However, many of the 'meta data' fields cover areas that other service providers – notably energy assessors and/or building surveyors/certifiers – will be required to identify in any case. Also as noted, there may be opportunities for some data and/or documents to be uploaded to the system directly by other parties such as builders, inspectors/certifiers or independent 'building verification' service providers. Such an approach would be likely both to reduce costs to councils and, by eliminating intermediaries in the process, reduce the risk of undetected or inadvertent errors.

To progress towards such a solution, it would of course be necessary to engage with at least building energy assessors and certifiers, to ascertain what may be practical and low-cost solutions. As one example, we learned during the conduct of this project that the Australian Institute of Building Surveyors is already engaged in a process to poll its members (notably the younger ones in particular!) about opportunities to roll out apps or other smart solutions that would make their jobs easier and more efficient. There could be synergies between such efforts and opportunities to integrate EBP functionality into existing data/reporting processes. See <http://aibs.com.au/wp-content/uploads/2015/07/AIBS-Innovation-Futures-Team-Member-Notice.pdf>

We learned that, in some cases, councils are applying sophisticated risk management approaches to determining which aspects of their service delivery can be streamlined without creating unacceptable risks for the councils or their communities. In some cases, this contributes to councils not collecting documents that are important and required elements of the building regulation (including but not limited to energy performance regulation) system in Australia. We are certainly not critical of councils for this, as their budgets are highly constrained. At the same time, we note that there are material consequences for the community; risks for councils, private certifiers, trades and professions; and poor environmental outcomes, particularly for greenhouse gas emissions, where there is poor or unverified compliance with NCC energy performance requirements.

7. Conclusions and Recommendations

7.1 Conclusions

The NEEBP Phase One report raised widespread concern that non-compliance with the energy performance requirements in the National Construction Code appears to be unacceptably high. Council participants in the pilot Electronic Building Passport project confirmed that this concern was justified.

Further, participants reported that the documentation and information element of the building quality system is generally not working to assure compliance and good energy productivity. Information shortcomings are also a key cause of generally low consumer and industry demand for high quality and energy efficient homes.

The impacts of poor compliance, combined with weak demand for high energy productivity, are likely to be significant, including unnecessarily high energy bills, lower wellbeing and comfort, and higher greenhouse gas emissions.

Every stakeholder consulted in the EBP pilot agreed that documentation and information processes need to work more effectively if the potential regulatory and market drivers towards energy efficient homes are to be properly harnessed.

An EBP system could play an important role in improving documentation and information processes. An EBP system should at least encompass councils, private certifiers, building regulators, builders and energy assessors in particular. An ideal system would also allow interaction with a multitude of construction related trades and professions along with the real estate industry and building purchasers, owners and occupiers.

Councils are facing very considerable budget and staffing challenges, and they are often unable to meet all community demands from the resources available to them. They cannot be expected to bear the burden of driving the use of an EBP system.

The public good would be well served if the Australian, state and territory governments continued to develop and implement an Electronic Building Passport system. This development should occur with detailed input from building regulators, the ABCB, councils and private certifiers.

The recommendations below are intended to advance the development of a national EBP system.

7.2 Recommendations

The following recommendations fit within the overarching strategies that were recommended in the Phase 1 National Energy Efficient Building Project. The four strategies to guide the reform of the building energy efficiency requirements system, as set out in the Phase 1 Report, are:

- 1) *Being clear what is at stake*: ensuring that all participants in every phase of the construction cycle understand the importance and value of effective building energy performance policy, regulatory and knowledge management frameworks
- 2) *Getting the incentives right*: ensuring that the code, regulations and supporting policies are driving the delivery of buildings that meet or exceed the set standards of building energy performance
- 3) *Delivering quality outcomes*: ensuring that all participants in the construction cycle have access to, and are using, the right knowledge, training, tools and products
- 4) *Empowering the community*: ensuring that those involved in the delivery of buildings, building owners and building users all understand - the value of energy performance; what should be expected of buildings and the industry; and how buildings should be used.

The EBP tool and protocol is essentially a tool to increase the quality and accessibility of information. Improved information flows will of course touch on all four strategies. That understood, our recommendations are grouped to particularly support strategies 2, 3 and 4. Recommendations to drive the further development and early use of an electronic building passport support *strategy 3 – delivering quality outcomes*. We suggest that EBP development occurs as part of a coordinated effort to reform the building regulatory system. This supports *strategy 2 – getting the incentives right*. Longer term recommendations to encourage the wider take-up and use of the EBP support *strategy 4 – empowering the community*.

Integration of the electronic building passport and the residential energy efficiency as-built audit process

The EBP's sister project under Phase 2 of the National Energy Efficient Building Project is the pilot of a residential energy efficiency building requirements audit process.

There are strong synergies between the EBP system and audit process. The audit process is partly reliant on comprehensive documentary evidence. The process of compiling and supplying this evidence will be made much more efficient and consistent when councils and certifiers follow an EBP system.

We accordingly envisage that the further development (in Phase 3 and beyond) of both the audit process and electronic building passport will occur under an integrated action plan. The recommendations reflect this integration where applicable.

Our audit project colleagues have developed a diagram showing an integrated audit and EBP verification model – please see below.



Figure 14: Integrated verification model - audit and EBP process

Recommendation 1A: Appoint an EBP and Audit Protocol expert committee to steer EBP and Audit process development (Strategies 2 and 3).

Prior to further piloting taking place, we recommend the establishment of an expert committee to agree (based on the findings of all Phase 2 projects) the guidelines for an integrated documentary and audit process that melds documentary requirements and physical inspection processes. These guidelines would be followed and tested under the piloting to follow.

An example of the title of the resultant guidance document would be *NCC Verification – Part 1.1 – Energy Performance Electronic Building Verification – Electronic Building Passport and Audit guidelines*.

The committee would ideally include representatives from councils, the ABCB, building policy makers and regulators from all jurisdictions, the ABCB, councils, private certifiers, research institutions and the digital information management industry.

The chair and secretariat for the committee should include the EBP & Audit Phase 3 project manager and their team (either consultants or departmental staff).

Recommendation 1B – The guidelines should include minimum documentary requirements to be held within the EBP and also set the minimum requirements for meta-data field completion.

The minimum documentary requirements would align with NCC performance requirements and deemed to satisfy provisions (refer to Table 4: Summary of National Construction Code Energy Efficiency Requirements).

Recommendation 1C – The guidelines should explain that EBP information requirements (see Rec. 1B) can be achieved under two IT pathways.

Pathway 1 being use of the EBP Pilot Tool and Pathway 2 being the achievement of EBP functionality within the IT document management systems used by councils, private certifiers etc.

Recommendation 2A: The EBP and Audit Protocol expert committee should steer EBP and Audit implementation pathways (Strategies 2 and 3).

The committee should agree an implementation pathway/s that drives uptake and efficient use of the new protocol/guidance. The pathway should encompass the identification of drivers (the value of adopting the new protocol) and support the development of implementation solutions.

The Phase 2 pilot found that most councils believe EBP would be of more value if rolled out within the existing digital information management systems used by councils (and private certifiers).

Recommendation 2B: The expert committee should open a dialogue with relevant stakeholders (including ALGA, AIBS, ABSA, ASBEC, Standards Australia, ABCB, CASBE, etc) regarding optimal and collaborative implementation solutions for an EBP (strategies 3 and 4).

This dialogue should have two parts. 1) looking at implementation of EBP from a verification and enforcement perspective and 2) looking at implementation of EBP from an industry and consumer education and knowledge management perspective.

This could include exploring possible linkages with NatHERS tools, BASIX, BESS, NABERS, etc., The 17 Things to maximise ‘integration’.

The result of 2B should be the development of a ‘functional specification’ for a full EBP tool, for market-testing as below.

Recommendation 2C: Undertake a Request for Information (RFI) process with software solution providers, based on the above functional specification, to identify optimal delivery solutions and to understand costs associated with full national roll-out of an EBP tool.

Recommendation 3: Facilitate ongoing access to the pilot EBP tool (strategy 3).

A key intention of this project has been to create a positive legacy in the form of an active and growing community of practice around the pilot EBP tool. **pitt&sherry** will continue to provide access to the tool via its website for 12 months after the delivery of its Final Report. This will enable new councils and stakeholders to be registered as participants. It will also permit the active use of the pilot tool as a reference tool in the development of protocols and integrated compliance systems. It will also support ongoing use of the tool by research institutions, including QUT.

Recommendation 4: Update the tool once the recommendations 1A & 1B have been actioned (strategies 2 and 3).

Recommendation 5A: Maximise awareness of the EBP and audit pilots and further development (strategy 4). This could occur, for example, through ALGA newsletters, trade journals, local government conferences and forums, the Council Alliance for a Sustainable Built Environment, etc.

Recommendation 5B: Continue to encourage and support the academic use and development of EBP.

QUT, through its Housing Innovation research program, expects to undertake a number of activities relating to the trial EBP during the period July 2015 - June 2016. This would occur in harmony with recommendations above – for example, with close consultation with the expert committee (it would be desirable for QUT to be on the expert committee).

Activities may include:

- Academic publication of the trial EBP program (and related presentations at conferences)
- Further engagement with Townsville City Council to
 - Input more housing data sets and extract energy efficiency information into metadata fields
 - Trial the conversion of this data into spatial mapping layers
 - Examine whether information can be extracted in a manner that is of value to the real estate sector (e.g. a precursor to a Sustainability Declaration / EPC / EER).
- Utilisation of EBP for other case study houses that are being examined by QUT
 - Input house data with regards to energy efficiency and other sustainability features
 - Examine the potential value / usefulness of this information to other parties
- Possible extension of the metadata fields in the trial EBP to capture other sustainability related information, and examination of methods for extracting statistical data from the EBP

Recommendation 6: Conduct pilot testing of the new EBP and audit protocol and updated tool and new applications with councils, private certifiers and builders.

Recommendation 7A: Commence development of a national compliance framework that clearly explains the whole NCC and regulatory compliance system, and the role of the EBP and Audit protocol within that system (strategy 2).

Many stakeholders query the value of isolating energy performance requirements from the remaining NCC requirements. While some issues are indeed energy performance specific, many others are cross-cutting. It is therefore important that a map of the whole of NCC compliance is developed – and the role of the Energy Performance EBP and Audit pinpointed on that map. Ideally the map would also facilitate integration - for instance the EBP could be the documentary basis for all aspects of compliance.

Recommendation 7B: Develop a project plan for the establishment of the above protocols and frameworks as part of the NCC, or as a suite of Australian Standards.

Recommendation 8: Ensure that development and implementation pathways (see above recommendations) allow the future extension of the scope of the EBP and audit protocol beyond energy efficiency.

The energy efficiency and performance of buildings support overarching goals of total building quality & consumer satisfaction. The guidance systems and technological solutions that are developed in phase 3 and beyond should be designed to allow this larger scope in the future.

8. References

ABCB – Australian Building Codes Board, National Construction Code Series – available at <http://www.abcb.gov.au/en/ncc-products.aspx>

ACT Planning & Land Authority, 2010, *Building Quality in the ACT: Report to the ACT Legislative Assembly*

ACT Government. Environment and Sustainable Development, *Minimum documentation requirements for building approval lodgement Class 1 and 10 - residential construction*.

Adrian Barnett, 2015. <http://theconversation.com/cold-weather-is-a-bigger-killer-than-extreme-heat-heres-why-42252>

Blum, A. (2001) “Building-Passport” - a Tool for Quality, Environmental Awareness and Performance in the Building Sector. In “OECD/IEA Joint Workshop on the Design of Sustainable Building Policies -0 Summary and Conclusions and Contributed Papers. Part 2. Page 3. Retrieved from www.ioer.de.

COAG Energy Council, July, 2015, *COAG Energy Council Statement: Perth – 23 July 2015*, accessed at <https://scer.govspace.gov.au/files/2015/07/National-Energy-Productivity-Plan-Statement-FINAL.pdf>

Department of Science & Industry, *2015 Energy White Paper*, Commonwealth of Australia, 2015

Gecina website - <http://www.gecina.fr>

Green Building Council Finland. Retrieved from http://www.worldgbc.org/files/7113/8964/7585/Lifecycle_Metrics_for_Sustainable_Buildings_June_2013_FiGBC.pdf

Hoogelander, K.J. (2014) The learnings of the Dutch EPC database. Brussels, 4/11/2014. Retrieved from <http://building-request.eu/sites/building-request.eu/files/7.%20Best%20practice%20demonstrations,%20Netherlands,%20Kees-Jan%20Hoogelander,%20RVO.pdf>

IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

Karl, H; Orwat, C. (1999) Environmental labelling in Europe: European and National Tasks. *European Environment* 1999; 9:212-220

Klomp, B (2006) Improvement of information for owner-occupiers about the quality of their house. In *Home ownership in Europe: Policy and research issues*. 23/24 November 2005, Delft, The Netherlands. Technical University Delft

Lambert, Michael, *Independent Review of the Building Professionals Act 2005 – Draft Report*, August 2015, State of New South Wales

Leibniz Institute of Ecological Urban and Regional Development (IOER) - <http://www.ioer.de/1/home/>

NSW Government – BASIX Building Sustainability Index – website <https://www.basix.nsw.gov.au/basixcms/>

NSW Government – Electronic Housing Code Pilot – *Possible documents you will need to upload*
http://www.ehc.nsw.gov.au/Portals/0/InformationSheets/EHC_Possible%20documents%20for%20uploading.pdf

pitt&sherry and Swinburne University of Technology, 2014, *National Energy Efficient Building Project*, State of South Australia 2014

Rückert, K. *Longlife 2: Development of standards, criteria, specifications* (2010) Technical University Berlin, Berlin, Germany. ISBN 978-3-7983-2247-9

The Scottish Government - <http://www.gov.scot/Topics/Built-Environment/Housing/BuyingSelling/Home-Report>

UK Government - <http://www.planningportal.gov.uk/>

UNEP (2012) *State of Play of Sustainable Building in France 2012*. Retrieved from <http://www.unep.org/sbci/pdfs/SoPFrance-Final.pdf>

Van de Bos, Amarins and Meijer, Frits (2005) *Dutch ideas for stressing the responsibility of homeowners for housing quality*. Retrieved from http://www.researchgate.net/profile/Frits_Meijer/publication/27347807_Dutch_ideas_for_stressing_the_responsibility_of_homeowners_for_housing_quality/links/53f708a40cf22be01c452e49.pdf

Appendix A

Sources of Information for Documentation Review Process

The building documentation processes were determined through analysis of information freely available online, as indicated by Table 10 below.

Table 10: Information Sources for this report

State	Sample of documents reviewed on State Government websites	Council websites reviewed
Tasmania	<ul style="list-style-type: none"> BSOL Building Standards and Occupational Licensing: Your guide to 6 star energy efficiency houses in Tasmania 2014. Department of Justice. Obtaining an Occupancy Permit Forms 2 and 3 	Launceston Sorell Huon
NSW	<ul style="list-style-type: none"> NSW Department of Planning - BASIX NSW Electronic Housing Code 	Ballina City of Sydney Clarence Valley Wagga Wagga
South Australia	<ul style="list-style-type: none"> Development Act 1993: Guide for Applicants - All applications. July 2001 Residential Code Dwellings and Additions: Development Application Form Advisory Notice - Building 04/12: Alternative methods for complying with the six star energy efficiency requirements 	City of Adelaide Playford Charles Sturt
ACT	<ul style="list-style-type: none"> Minimum documentation requirements for building approval lodgement Class 1 and 10 - Residential construction. ACT Government: Environment and Sustainable Development Approval Process Flow Chart Building in the ACR - A Consumer guide to the building process. October 2014 Form 1 - Residential zones Form 3 - Per application advice Energy Efficiency Rating Certificate for a single dwelling 	
QLD	<ul style="list-style-type: none"> Queensland Development Code Mandatory Part 4.1 - Sustainable buildings guideline (Version May 2011) and (Version 1.12. 15 January 2013) Sustainable Planning Act 2009 IDAS Forms 1, 2, 8 Development Application Form 	Brisbane Cairns Gold Coast Sunshine Coast Townsville
Victoria	<ul style="list-style-type: none"> Form 1: Application for a Building Permit 	Moreland Yarra Valley Melbourne Port Philip
Western Australia	<ul style="list-style-type: none"> Form BA4 Building Permit 	Busselton Freemantle Joondalup

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