



**Australian Government**

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**Department of the Environment and Heritage  
Australian Greenhouse Office**

# A STUDY INTO INTERNATIONAL DIRECTIONS FOR THE MANDATORY DISCLOSURE OF THE ENERGY PERFORMANCE OF BUILDINGS

The Australian Greenhouse Office commissioned FaberMaunsell London to undertake a study into international directions for the mandatory disclosure of the energy performance of buildings as part of the scoping for the National Framework on Energy Efficiency. Its purpose is to inform interested parties of technical and administrative procedures being considered or adopted in some countries for the disclosure of building energy performance. This is a preliminary study and any future proposals on disclosure will require detailed economic analysis.



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# A STUDY INTO INTERNATIONAL DIRECTIONS FOR THE MANDATORY DISCLOSURE OF THE ENERGY PERFORMANCE OF BUILDINGS

REPORT V8 (INTERNET)

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## 1. EXECUTIVE SUMMARY



# 1. Executive Summary

The Australian Greenhouse Office commissioned FaberMaunsell to undertake this study into international directions for the mandatory disclosure of the energy performance of buildings.

The study aims to cover a wide range of issues related to the development and implementation of an energy disclosure scheme, including technical issues, regulatory frameworks, costs and benefits and securing stakeholders' commitment.

The objective of the study is to present available options, to give evidence of the experience or thinking in countries where such scheme are being developed and to draw some conclusions about the successes and difficulties associated with each option.

The study has focused on Europe Union Member States, which are to transpose into their respective national legislation the requirements of the *Energy Performance of Buildings Directive* (EPBD) by January 2006. Information was obtained through specific contact with France, Portugal, the UK, Denmark and the Netherlands. Other information was obtained from a survey by the European Commission on the progress of EU countries towards implementing the EPBD and from Euro Prosper, a European research project.

The study has also drawn on experiences outside the European Union. Experts in Norway, Canada, and the USA were also contacted. Other countries are known to have been or to be considering energy disclosure schemes. Unfortunately no information could be obtained despite contacting Japan and Singapore.

The study shows that the broad interests and concerns of the countries investigated are generally similar. Development of schemes in different countries varies greatly and reflects historical precedents and experience, government policies, national characteristics, levels of sophistication of energy awareness and many other factors. All countries contacted are putting considerable resources and effort into designing and operating their disclosure schemes.

The study concludes that the introduction of such schemes is no small matter. Significant changes in existing legislation or new legislation, understanding of existing building stocks, development of schemes and energy modelling and auditing systems are required. Auditors and modellers must be recruited and trained, the public must be wooed and cajoled into accepting the new requirements. Significant costs will fall on building owners, users and governments in order to implement successful schemes.

Schemes will require maintenance in the areas of training and reviewing of auditors, quality control, reviewing standards and benchmarks, policing, databases for building characteristics and audit results along with the inevitable revisions and improvements of the initial schemes.

There are many similarities between schemes, including the need to consider all building types and uses, new and existing buildings and the need for different systems for each, the need for registered modellers and assessors or auditors, approved calculation models and the need for regular reporting over a building's life, when selling, letting and at 5-10 year intervals.

Several technical issues remain unresolved. There are great variations between routes proposed to resolve them including how to measure or record the energy performance, how to incorporate specific energy conservation measures into modelling and benchmarking. whether it is possible to use operational, measured energy data rather than modelled results for disclosure, how to incorporate building equipment and use information, what level of disclosure is best and the issue of confidentiality and whether third party assessment is required.

Overall the study concludes that mandatory energy disclosure is feasible and can be implemented in a range of ways depending on specific conditions in individual countries. There is little experience of live schemes at present but implementation of the EPBD in 2006 will produce many interesting results.

## 2. INTRODUCTION



## 2. Introduction

The Australian Greenhouse Office commissioned FaberMaunsell in November 2004 to undertake a study into international directions excluding Australia for the mandatory disclosure of the energy performance of buildings.

The invitation to tender covered a wide range of issues related to implementing an energy disclosure scheme - technical issues, regulatory frameworks, costs and benefits and getting the stakeholders on board.

The strategy for the study was to present the available options, give evidence of the experience or thinking of those countries which have adopted the different options and finally to draw some conclusions about the successes and difficulties associated with each.

This report presents findings based on literature reviews, internet searches and face-to-face meetings with national experts from France, Portugal, the Netherlands and the UK and telephone interviews with the Danish and Norwegian experts. Some further information has been obtained from Canada and Kansas in the USA. Most of the information comes from Europe where the greatest activity in this area is due to the European Union requirements contained in the *Energy Performance in Buildings Directive*.

The European Union has carried out a survey of member states to collect information on how they are implementing the directive and what progress they have made to date. The draft results of this survey have also informed this study.

EuroProsper is a completed European research project that focused on energy consumption disclosure from existing office buildings in the UK. Relevant discussions and conclusions have been incorporated into this survey.

Our contact in Portugal has been particularly important as he is coordinating a pan-European programme financed by the European Union. He has been able to provide background information and understanding of the current position.

We have sought information on other countries. Unfortunately and for different reasons no information could be obtained.

- USA: we are aware that a scheme is in place in Los Angeles but no information could be obtained.
- Japan: the expert was contacted but no information was obtained.
- Singapore: the expert was contacted but no information obtained.

Disclosure of the energy rating of houses and apartments at the time of sale has been required in the Australian Capital Territory (Canberra) since 1999. This scheme will be reviewed in further studies by the Australian Greenhouse Office and is not covered in this study (refer [http://www.actpla.act.gov.au/design-guide/acthers/eer\\_sell.htm](http://www.actpla.act.gov.au/design-guide/acthers/eer_sell.htm)).

We would like to thank all the experts who gave their time to respond to our queries and completed our questionnaire. There was a great willingness to provide information and share their thoughts and experiences with us.

### 3. BACKGROUND TO STUDY



### 3. Background to Study

Beyond marketing and publicising issues, the disclosure of building energy performance (measured or calculated) is a critical item of the many tools available to reduce energy consumption, including energy performance standards, economic incentives and / or penalties and building control. While mandatory disclosure of energy consumption may be seen to be crucial to reducing building energy consumption, there still is little actual experience of setting up, implementing and managing such a scheme.

Theoretical and practical thinking and, to a lesser degree, experience are slowly building up in Europe where the European Union *Energy Performance of Buildings Directive* (Appendix 2), which must be transposed into Member States' national legislation by January 2006, has been a key catalyst. Although there are some common projects (such as ENPER) involving several EU members exchanging ideas, most countries seem to be developing implementation methods according to their existing systems and laws and appropriate to their local conditions.

There are also energy disclosure schemes in place and or being implemented outside Europe and it is hoped that this study will be able to draw from those countries' thinking and experiences.

This study aims to factually present the options available and give evidence of the thinking and experience developed in those countries that have and are implementing an energy disclosure scheme. The study will draw conclusions about the successes and difficulties associated with the options identified.

The research method for this study has been to collect information from contacts in various countries by means of a specially developed proforma. The analysis presented in Section 6 retains the same format and sequence as the proforma so that the methods being considered or adopted by different countries can be compared directly. Some conclusions are drawn on each section.

## 4. OVERVIEW OF KEY ISSUES



## 4. Overview of Key Issues

Existing building controls mechanisms provide an ideal support for mandatory disclosure of predicted energy consumption in new buildings. Disclosure will use energy calculations based on final design intentions thus allowing an assessment of compliance with pre-defined energy benchmarks.

Historically, many national building control mechanisms have relied on elemental compliance (i.e. component compliance) and do not use whole building energy use modelling. Recently increasing flexibility has been introduced into building control mechanisms through the availability of different routes to demonstrate compliance. The use of whole building energy use models is increasingly offered as one route to demonstrate compliance and this is becoming the more common route.

Through their higher operational energy use, existing buildings may have a much greater environmental impact than new buildings. Unfortunately this is more problematic to control as little regulation is generally in place compared with new construction. Several control points are available for existing buildings (e.g. selling and letting points and refurbishments falling under building control mechanisms) but the basis for energy disclosure via measurement or calculation remains an issue.

The use of actual (measured) energy consumption raises the issue of the frequent mismatch between actual and calculated consumptions. This is due to the importance of user behaviour and control on actual energy consumption and the difficulty or impossibility to reflect this accurately in energy consumption modelling.

Energy calculation models fit into two broad categories - simple models that make use of default values and comprehensive models which require detailed input data such as building fabric, use patterns and equipment efficiency. While simple models may apparently be more suited for regulatory purpose (e.g. greater consistency of results, quick and cheap to use) the lack of accuracy and the likely insensitivity to energy conservation measures are potential drawbacks. Comprehensive models may in theory be more accurate but they require well developed databases as well as detailed input data which are generally difficult to obtain for existing buildings.

A number of other issues are critical to the successful implementation of a mandatory building energy disclosure scheme and come under the scope of this study. They include regulatory frameworks, financial and environmental costs and benefits, securing stakeholders' commitment and the availability of competent technicians. These are discussed in the following section.

## 5. ANALYSIS



## 5. Analysis

The following analysis is structured in accordance with the themes of the interview proforma agreed with the Australian Greenhouse Office.

The analysis consists of six sections:

- A. Directions for mandatory disclosure
- B. Regulatory frameworks
- C. Technical aspects of mandatory disclosure
- D. Quantification of the economic and environmental benefits
- E. Other issues
- F. Any other comments

Under each section (A, B, C, ..... ) a series of sub-sections (1, 2, 3, ..... ) is included to address specific issues. Conclusions are issue specific and are drawn at the beginning of each new sub-section.

## A. DIRECTIONS FOR MANDATORY DISCLOSURE

### *A1 What is your country's overall approach to building energy use assessment and disclosure?*

With the exception of Denmark and Kansas, countries investigated had no experience of comprehensive mandatory disclosure schemes. Sector specific voluntary schemes were identified in Canada and the Netherlands. Today European countries are investing significant resources to develop EPBD-compliant schemes to meet the deadline for the EPBD of January 2006

National building control mechanisms for new buildings incorporate some form of energy use or energy efficiency regulation, either through an elemental method (by building components) or by using a whole building approach e.g. through setting dimensionless energy benchmarks (the Netherlands).

#### **CANADA**

Currently mandatory reporting is not being considered and a voluntary approach is favoured. However to assist with the goal of the survey, information is presented with regards to the voluntary approaches used. Canada's building energy use assessment is mainly done through surveys and the overall approach relies on voluntary reporting. Statistics Canada, Canada's central data collection agency, collects most of the information for the Office of Energy Efficiency (OEE). The OEE also relies on private agencies to collect data. Associations also directly report data to the OEE.

#### **DENMARK**

To update and broaden the existing scheme to satisfy and, where deemed appropriate and feasible, exceed EPBD requirements.

#### **FRANCE**

To develop and implement a building energy disclosure scheme which complies with the EPBD

#### **KANSAS, USA**

Kansas requires energy efficiency of new residential buildings to be disclosed to prospective buyers. Disclosure may be based on compliance with the International Energy Conservation Code, IECC 2003, a federal US standard that sets building energy efficiency requirements.

#### **NORWAY**

Though not strictly a EU member state, Norway intends to set up a disclosure scheme that complies with EPBD requirements.

#### **PORTUGAL**

The existing Building Regulations applicable nation wide to new buildings and major refurbishments will be amended to set new construction and operational requirements in line with the EPBD. The new requirements, to come into force in 2005, will also require improved U-value for buildings envelope (about 50% improvement compared to current requirements).

New legislation has been drafted and is expected to come into force before the end of 2005. The legislation sets the general requirements of the entire process for the certification of buildings, assessment, and disclosure of energy consumption, etc. It also addresses "enabling" issues such as the training of certifiers.

The new legislation will not refer to specific requirements (e.g. minimum thresholds for compliance). A series of decrees has also been drafted and will come into force by the end of 2005. The decrees will provide the detailed requirements referenced in the new legislation. As the amendment of decrees is a simple and fast process, the proposed legislative framework will provide a significant degree of flexibility to accommodate future changes, e.g. lowering of compliance thresholds.

#### **THE NETHERLANDS**

The Dutch building control system includes an Energy Performance Coefficient (EPC) since 1995. New buildings must comply with the relevant EPC. There is one EPCw for domestic buildings and a series of EPCu for various types of non-domestic buildings. In 2000, a voluntary energy performance assessment scheme was introduced for existing domestic buildings (EPAw) and in 2003 a similar scheme was developed for existing non-domestic buildings (EPAu) to comply with EPBD requirements.

Both EPCs and EPAs are dimensionless measures of the energy quality of a building based on a whole building assessment of its energy performance. EPCw and EPAw do not consider lighting in the assessment of domestic buildings. Instead, lighting products are labelled for energy efficiency. This does not apply to non-domestic buildings.

**UNITED KINGDOM**

The Energy Saving Trust (a government funded body) operates a voluntary energy advice scheme for existing domestic buildings. A Standard Assessment Procedure (SAP) for the energy rating of dwellings is mandatory for new domestic buildings at the selling point. The remit of the Carbon Trust (a government funded body) includes harmonising the reporting of energy use in non-domestic buildings.

**EUROPROSPER**

Not applicable or within the scope of the project.

## ***A2 What options have been or are being considered to implement your country's approach?***

A large number of options have been considered in each of the countries investigated. The preferred options have generally been based on

- whether an existing disclosure scheme (voluntary or mandatory) is already in place
- the national building control mechanisms currently in place and envisaged for the medium term future
- feedback from consultation exercises to ensure that stakeholders' commitment is secured

**CANADA**

Statistics Canada on behalf of OEE conducts several surveys that collect information on energy use, energy efficiency characteristics and building characteristics. Among the main initiatives are the Commercial and Institutional Building Energy Use Survey, the Commercial and Institutional Consumption of Energy Survey and the Survey of Household Energy Use.

**DENMARK**

See below.

**FRANCE**

It is envisaged that assessment (certification) and disclosure will be required at selling and letting points for both new and existing buildings. It is also envisaged that the assessment procedure be used as an advisory scheme and that strict compliance would not be required.

Display of certificates would be required in "public buildings" i.e. buildings that house public institutions. Display of certificates in other (privately owned) buildings is being considered.

**KANSAS, USA**

Kansas adopted House Bill 2131 in 2003. The Bill amended existing legislation by

- designating IECC 2003 as the thermal efficiency standard for buildings (industrial, commercial and residential)
- requiring mandatory disclosure of energy efficiency levels to prospective buyers of new residential buildings

**NORWAY**

The approach considered is similar for both non-domestic and domestic buildings. New buildings will have to comply with energy benchmarks set out in building regulations. All buildings will have to disclose energy consumption on a regular basis.

**PORTUGAL**

Numerous options were investigated, proposed and discussed with stakeholder groups. The options described herein were retained in agreement with the stakeholder group as the most practical to implement and operate.

**THE NETHERLANDS**

The existing EPC and EPA schemes are being amended to integrate EPBD requirements. Accredited businesses are to issue energy certificates for building owners to demonstrate EPC compliance and obtain building permission from local authorities. Accredited certifiers will issue EPA certificates for existing buildings. It is anticipated that estates agents and solicitors will control the provision of energy certificates at building selling and letting points. Note that energy performance is to be included in the legal "rating" structure used to help set building selling and letting prices. It is also intended to integrate the EPC and EPA approaches by 2008.

**UNITED KINGDOM**

New dwellings: the existing SAP rating for the energy rating of dwellings is being amended to satisfy the requirements of the EPBD.

Existing dwellings: a modified SAP rating is being developed for inclusion in the new Home Condition Report, required when selling the building. Because there are many SAP data items that cannot be

collected in a survey of an existing building, the reduced SAP uses a database for those items that the surveyor would otherwise have to guess.

**Non-domestic buildings:**

Three methods are being considered.

- Asset rating: a computer energy assessment tool (the National Calculation Tool or NCT) that takes into consideration the performance of the building envelope, basic building services and standard operating conditions. The asset rating does not include energy used by the building's processes (e.g. electricity used to operate computers used in an office).
- Tailored asset rating: a computer energy assessment tool (NCT) that takes into consideration actual operating conditions, e.g. process loads and actual occupancy.
- Operational rating: based on meter readings. The operational rating ignores green electricity unless generated on site. It is intended that outputs from the tailored asset rating and the operational rating would be comparable.

Outputs from the above methodologies would be checked against minimum performance requirements expressed as kg CO<sub>2</sub> / year / m<sup>2</sup>. Currently no penalties are envisaged for existing buildings if outputs from calculations are above recommended energy benchmarks. In the future, compliance with energy benchmarks may be one way for new buildings to comply with Building Regulations.

A key European issue is how the phrase "public building" as found in the EPBD is interpreted, whether it exclusively applies to buildings housing government institutions or includes buildings visited by the public. This is still being debated at the time of this report.

Requirements for public building are the same as those for private buildings with the addition that energy certificate must be prominently displayed in the building.

**EUROPROSPER**

Not applicable or within the scope of the project.

***A3 What is your country's strategy to promote mandatory disclosure and secure stakeholders' support?***

The following measures have been considered or adopted to ensure stakeholders' support.

- Wide consultation exercises, as early as possible in the scheme's development process.
- Varying level of involvement of stakeholders and consultation groups. In Portugal stakeholders were able to vote on available options defining the scheme. In the Netherlands the introduction of any new regulation requires comprehensive consultation.
- Economic incentives and financial support. As the financial implications of these incentives may be significant, such incentives are closely linked to support from governments.
- The availability at minimal or no cost of the calculation tools enabling disclosure.

Promotional routes identified include existing building control authorities, existing national energy saving bodies, seminars (mainly aimed at industry) and the media.

In Denmark, utilities providers are by law required to promote energy efficiency to their customers.

**CANADA**

The participation of the respondent is on a voluntary basis. Statistics Canada, the national statistical agency, is prohibited by law from publishing or releasing any statistical information that could identify any person, business or institution. The *Statistics Act*, adopted by the Parliament in 1985, defines the confidentiality requirements for the release of the data. In the event where mandatory disclosure would be required by OEE, the data collection would have to be conducted under a new act in which confidentiality issues would be addressed.

**DENMARK**

There have been national incentive programmes in the past but not currently. These programmes have been periodic and dependent on government's support. Utilities responsible for distribution of energy (electricity, natural gas, district heating) are required to promote energy efficiency to end-users.

**FRANCE**

Representatives from interested groups were being consulted at the time of the interview. Interested groups included solicitors and notaries (widely used in France when selling or buying a house), estate agents, consumer groups, the building industry, etc.

Promotional routes envisaged include collaboration with the national energy efficiency office (ADEME) and raising awareness through local authorities at the point of delivery of building permits (required for all new buildings and major extensions to existing buildings).

No financial incentives are being envisaged.

**KANSAS, USA**

The *House Bill* was drafted with input from a consultation group including government and industry representatives e.g. the homebuilding and real estate industries and manufacturers associations.

**NORWAY**

It is recognised that a number of professionals from the building industry will require training. The government is currently considering how best to engage and train these experts. Opportunities to secure wider public support are also being investigated. It appears that public interest in the issues at stake is significant.

**PORTUGAL**

A group of interested stakeholders (including developers and building consultants) was formed and consulted throughout the development of the new system. A majority of stakeholders agreed the final options which were then submitted to the government for approval. Minor amendments were made by the government to the proposed new legislation. The (simple) assessment model (for asset rating calculation) will be publicly available from a government website at minimal costs (proposed cost about 50 Euros or 65 USD). Promotion of the new requirements includes a series of seminars in all major cities. Media coverage will be sought.

**THE NETHERLANDS**

It is required to undertake extensive stakeholders consultation whenever new legislation is developed. In addition, mass public communication (a major cost of implementing the proposed scheme) is being undertaken including brochures, nationwide TV commercials, a website, workshops and newsletters. Key stakeholder groups have also been targeted because of their role in the implementation of the scheme e.g. certification businesses, estates agents and solicitors. Financial incentives will continue to be available although funding has been significantly reduced from 250 million euros in 2001 (325 million USD) to 34 million euros for 2006 (44.2 million USD).

**UNITED KINGDOM**

An extensive consultation exercise is being undertaken. Potential options for financial support and / or other incentives are currently being considered.

**EUROPROSPER**

Not applicable or within the scope of the project.

## B. REGULATORY FRAMEWORKS

### *B1 How does your country's approach achieve national consistency?*

Achieving national consistency is very much dependent on the existing legislative set up as well as on potential regional and climatic differences, historic issues such as construction techniques and fuel uses.

Where national legislation is applicable through the country and regional variance is minimal no significant differences are envisaged (e.g. Denmark and the Netherlands).

Where national legislation is applicable through the country and regional differences are important (e.g. Portuguese and French climates vary greatly between North and South) the national legislation sets up the general requirements of the scheme. National decrees provide details of the national scheme, allowing for regional differences. If necessary, regional or local by-laws may be used to detail how best the decrees are implemented at this level.

Where the country is divided into separate jurisdictions (e.g. the UK) and a certain degree of consistency is nevertheless required, local schemes are developed on a common basis and allowances are introduced to take into consideration jurisdictional variations.

#### **CANADA**

Statistics Canada is the central data collection agency covering all Canada. Other statistical agencies in the provinces and territories are also involved and consulted to ensure that the quality and the consistency of the data collected are relevant.

#### **DENMARK**

National legislation is applicable through the country.

#### **FRANCE**

New national legislation will define the overall framework of the scheme. It will include provisions for regional variances (e.g. climate and historical building construction variations). As with most national legislation, national decrees and by-laws will be used to further define how the legislation is to be implemented.

#### **KANSAS, USA**

The national (state) House Bill sets out

- disclosure requirements for new residential buildings
- thermal efficiency standards requirements for new buildings (commercial, industrial and residential).

#### **NORWAY**

National legislation is to be complied with throughout the country. However, local authorities have the legislative power to enforce stricter requirements e.g. lower energy benchmarks. Differences in energy benchmarks are likely to be linked to available energy utilities e.g. where district heating is available.

#### **PORTUGAL**

The new legislation will be applicable throughout the country. However Portugal is subdivided into 3 climate zones and the new legislation and decrees include different thresholds or targets for heating, cooling and hot water demand (for domestic buildings only) as well as for primary energy use (all buildings). Primary energy is defined as the total energy used (tons of oil equivalent) as opposed to delivered energy.

#### **THE NETHERLANDS**

The suggested scheme will be implemented at national level and local authorities will retain their legislative building control functions.

#### **UNITED KINGDOM**

There are 3 jurisdictions in the UK relating to building regulations viz. England and Wales, Northern Ireland and Scotland. The methodologies described above (including calculation methods) are to be adopted nationally although there will be provisions for regional parameters to reflect differing legal provisions and the different fuel markets and infrastructure in the 3 jurisdictions. For example, heating oil is primarily used in Northern Ireland while gas is used in England and Wales. Scotland has a different legal system, independent from England & Wales.

#### **EUROPROSPER**

Not applicable or within the scope of the project.

## ***B2 Will new requirements be incorporated in existing legislation or new legislation introduced?***

The route followed by most countries consists in a combination of amendments to existing building control legislation and new legislation. France appears to be using only new legislation as energy efficiency regulations are being updated simultaneously.

Defining new building control compliance routes, compliance benchmarks, etc. may easily be achieved through the amendment of existing building control regulations. It was found that the legal framework required to set up the new mandatory disclosure scheme required new legislation to be developed.

The development of new legislation was often seen as an opportunity to

- learn from the experience of the existing building control legislation
- convert a voluntary scheme into a mandatory one
- build in the legislative framework enough flexibility to allow for future amendments e.g. more stringent European requirements.

### **CANADA**

Nothing is planned on the commercial or residential section at this time.

### **DENMARK**

A new law has been proposed. Existing legislation may also require amending.

### **FRANCE**

New national legislation is being produced

- to set up and define the requirements of the new scheme
- to review and update energy consumption benchmarks for new buildings (RT 2005).

No minimum energy consumption requirements are envisaged in the short term for existing buildings.

### **KANSAS, USA**

New requirements were incorporated into existing legislation: K.S.A. 66-1227 for commercial and industrial buildings, K.S.A. 66-1228 for residential buildings.

### **NORWAY**

Existing legislation setting out building regulations will be amended to incorporate energy calculation requirements and energy benchmarks. Proposed new legislation detailing the energy certification scheme is currently before parliament.

### **PORTUGAL**

New requirements will be incorporated in existing building regulations to address the constructional and operational requirements of the EPBD. Amendments of the existing building regulations will also include improved U-values for building envelopes. New legislation will also be introduced to set the framework for the new certification system. The new legislation will be supported by a series of decrees that will define details of the new requirements, to be updated as and when necessary.

### **THE NETHERLANDS**

Legislation defining the existing EPC scheme for new buildings is being amended. New legislation is being introduced for existing buildings to change the existing voluntary EPA scheme into a compulsory scheme.

### **UNITED KINGDOM**

Amendments to the Housing Act are underway. The new Act will set the framework for the new Home Information Pack requirement. The Home Condition Report will be one of the new requirements and will include an energy efficiency report (linked to the modified SAP rating).

The Building Act (amended by the Sustainable and Secure Building Act) includes the Building Regulations. The calculations methods will be introduced via amendments to the Building Regulations. The European Community Act will be amended to incorporate requirements of the EPBD that cannot be incorporated in the above Acts.

### **EUROPROSPER**

Not applicable or within the scope of the project.

### ***B3 Have jurisdictional issues been identified? If so, how will they be addressed e.g. will state and regional legislation need to be amended?***

In those countries (e.g. the UK) where jurisdictional issues have been identified, the national disclosure schemes have been developed from a common basis that allows for national variances such as varying legislative systems, utilities markets and infrastructures to be reflected.

At the European level, the implementation of the EPBD provides a good example of how jurisdictional issues may be overcome by setting high-level broad requirements (the directive) and refining the requirements at the local level (member states national legislation).

#### **CANADA**

Not applicable at this stage.

#### **DENMARK**

No.

#### **FRANCE**

It is expected that the regulatory set up of the scheme will deal with any potential jurisdictional issues.

#### **KANSAS, USA**

The standard adopted at state level encourage local governments (counties and municipalities) to adopt the IECC 2003. Local governments are autonomous and may disregard, partially adopt or exceed IECC 2003.

#### **NORWAY**

Legislation is implemented at the national level and no jurisdictional issues have been identified.

#### **PORTUGAL**

Not applicable. All regions have to comply with the national legislation and regulations. Portugal is divided into 3 climate zones and new requirements will vary between different climate zones.

#### **THE NETHERLANDS**

No jurisdictional issues are anticipated.

#### **UNITED KINGDOM**

There are 3 jurisdictions in the UK - England and Wales, Northern Ireland and Scotland. The methodologies described herein (including calculation methods) are to be adopted through the UK although there will be provisions for regional parameters to reflect differing legal provisions and the different fuel markets and infrastructure in the 3 jurisdictions. For example, non-mandatory benchmarks for low and zero carbon (LZC) systems will be included in England, Wales and Northern Ireland. Scotland is still considering this option.

#### **EUROPROSPER**

Not applicable or within the scope of the project.

## ***B4 What regulatory systems are being considered to implement your country's approach to mandatory disclosure?***

For new buildings, mandatory disclosure requirements have been introduced into existing building control mechanisms. The combining of disclosure and demonstration of compliance with existing building regulations has been taken in some countries (e.g. Denmark) while it is still being considered in others (e.g. the UK).

For existing buildings, mandatory disclosure will be introduced at the selling and letting points as well as when major renovations are undertaken as required in Europe by the EPBD. Note that the definition of "major renovation" remains contentious.

The compliance requirement for existing buildings to meet energy benchmarks has not generally been envisaged, with the exception of Denmark for government buildings. It is deemed too impractical and unpopular. Disclosure is seen as an opportunity to inform existing building owners of potential energy saving improvements.

### **CANADA**

Not applicable at this stage.

### **DENMARK**

The calculated or measured energy consumption will be compared to indicative energy benchmarks, available for heating, electricity use, water use and CO<sub>2</sub> emissions. For existing buildings, there will be no obligation to comply with the benchmarks.

Potential improvement measures will be ranked according to a "priority factor". The priority factor is based on the energy saved, the lifetime of the equipment required for the improvement, the financial savings achieved and the capital cost of the improvement.

The assessor will recommend that improvement measures that have a priority factor above a pre-defined threshold be implemented. It is being considered whether the implementation of qualifying measures should be mandatory in Government buildings.

For new buildings, achievement of energy benchmarks (heating, electricity and water) will be one route to demonstrate building control compliance.

The scheme will be overseen by a dedicated government body, as is currently the case.

### **FRANCE**

See B2.

### **KANSAS, USA**

Relevant information not obtained.

### **NORWAY**

See B1 and B2. In addition, under existing building regulations local authorities grant building permission based on information provided by building development teams. The information provided to local authorities already includes energy calculations and only minor amendments are necessary to satisfy EPBD requirements.

### **PORTUGAL**

New buildings (domestic and non-domestic): Under the existing system developers and design teams initially submit an "architectural design" (preliminary design) to city or local authorities. When agreement from the city or local authority is obtained the developer or design team submits a final detailed design. As part of the detailed design submission, the developer or design team also submits a series of certificates demonstrating compliance of the structural design, fire design, etc. with relevant standards. The authorities are then able to take an informed view on whether the development may be granted planning permission. The certificates of compliance are issued by accredited third parties and the proposed response to the EPBD will add a "thermal certificate" to the existing list of required certificates.

Existing buildings (domestic and non-domestic): In line with the EPBD requirements certificates will be required at points of sale, lease and when major renovation works are undertaken.

### **THE NETHERLANDS**

See B2.

### **UNITED KINGDOM**

See B2.

### **EUROPROSPER**

Not applicable or within the scope of the project.

## ***B5 Has / will the specification of mandatory disclosure be considered for inclusion in***

- ***base building briefs***
- ***tenant leases***
- ***any other contractually binding document(s)***

Mandatory disclosure is being considered for inclusion at various milestones during the building's life including

- for all new buildings, in most cases mandatory disclosure has been linked to existing building control mechanism
- for existing buildings, at the selling and letting points as well as when major renovations (e.g. requiring building control approval) are undertaken
- at a regular points in the life of the building (e.g. every 10 years) if no other triggers have been activated before. Note this implies that an overseeing body has an intimate knowledge of the building stock and that a database of the building stock and issued certificates is live, allowing tracking of certificates validity.

The existing Danish requirement for large building to be issued a certificate every year has not been very popular and is recognised as quite onerous by the government overseeing body as buildings do not change dramatically over the course of a year.

### **CANADA**

Not applicable at this stage.

### **DENMARK**

The proposed law suggests

- for small buildings (under 1000m<sup>2</sup>), certification required at selling and renting points with maximum validity of certificates 10 years
- for large buildings (above 1000m<sup>2</sup>), certification required every 5 to 8 years

The current scheme (for large buildings) requires annual certification and this has been found very onerous and not popular. In addition, it has been found that buildings' characteristics do not vary greatly over 1 year.

### **FRANCE**

The following options are being considered for the provision / disclosure of energy certificates

- new buildings - with base building briefs and / or with information package submission to local authorities for building permit and / or with declaration of building completion
- existing buildings - provision at selling and / or letting points.

### **KANSAS, USA**

Relevant information not obtained.

### **NORWAY**

This issue had not been resolved at the time of the interview.

### **PORTUGAL**

It is proposed that the requirement for mandatory disclosure be included in base building briefs.

### **THE NETHERLANDS**

It is expected that mandatory disclosure requirements will be integrated in base building briefs and tenants leases.

### **UNITED KINGDOM**

Links to mandatory disclosure are being considered for

- new tenant leases (non-domestic buildings)
- when major renovations and refurbishments are undertaken (the threshold for "major renovations" could be based on the value of the renovations as a percentage of the value of the building)
- at the point of sale for all buildings

To date it is unclear whether letting of dwellings would require a new SAP rating to be undertaken.

### **EUROPROSPER**

Not applicable or within the scope of the project.

## ***B6 What degree of disclosure is being considered e.g. full public disclosure or disclosure restricted to interested parties?***

In Europe the EPBD requires certificates to be prominently displayed in "public buildings". In addition, certificates are to be made available to prospective buyers or tenants.

Some countries (e.g. the UK) are investigating the practicalities and the legality of allowing full public disclosure of the certificates for example through access to a database of national certificates. This option has been rejected by other countries (e.g. Denmark) where it is thought to have the potential to raise privacy issues. In Denmark building owners can opt to waive their right to a private certificate. In this instance full public access to the certificate will be allowed through web-based access to the national overseeing body's database.

Geographical statistical information, based on data available from the certificates, is already publicly available in Denmark. In Portugal this information will solely be available to the scheme's overseeing body.

### **CANADA**

Not applicable at this stage.

### **DENMARK**

Certificates are available to interested parties. In addition, geographical statistical information on certificates, buildings performances, etc. will be freely accessible on the internet. If building owners choose, full details of their certificates will be disclosed on the internet.

### **FRANCE**

Public buildings - certificates to be displayed in the building in line with the EPBD.

Other buildings - certificates to be made available to interested stakeholders (e.g. prospective buyers, tenants).

### **KANSAS, USA**

The person building or selling new, previously unoccupied residential buildings must disclose to prospective buyers on request or prior to closing the sale contract the thermal efficiency of the building.

### **NORWAY**

This issue had not been resolved at the time of the interview. However, EPBD requires public display of energy certificates in "public buildings".

### **PORTUGAL**

#### Domestic buildings:

Certificates will only be available to interested parties (e.g. potential buyers). Letting and renting of domestic buildings is traditionally very low in Portugal and usually very informal. However, legislation will require certificates to be made available to prospective tenants.

#### Non-domestic buildings:

It will be required that certificates be publicly displayed in all non-domestic buildings (except for exempted buildings types listed in the EPBD e.g. churches, monuments, etc.). All non-domestic buildings will be considered "public buildings" for the purpose of compliance with the EPBD.

### **THE NETHERLANDS**

There is full disclosure for public buildings as required by the EPBD. For other buildings, only prospective buyers and tenants will have access to the certificates. It is also intended that a database of certificates be kept and some information (e.g. statistics) be made available to the public. Parliament did not accept the proposed draft in its current form and alternatives are being investigated.

### **UNITED KINGDOM**

To date and with the exception of public buildings where certificate must be prominently displayed, only stakeholders that have or can demonstrate an interest in the building would have access to the certificate. The concept of operating and maintaining publicly accessible databases of certificates and their use as information for the public and as a basis of national benchmarking is being explored.

### **EUROPROSPER**

Not applicable or within the scope of the project.

## ***B7 Have dispute resolution procedures been incorporated in your country's approach? If so, what mechanisms are being considered?***

Where a national overseeing body has been set up it is generally expected that disputes that cannot be resolved (e.g. between the building owner and the accredited energy assessor) will first be brought before the national body.

In Portugal the dispute resolution procedure calls for a second assessment of the building to be carried out by an independent assessor from outside the dispute. If the second assessment does not settle the dispute the national overseeing body is to take a decision. Denmark has a similar system of using an independent third party assessor whose assessment informs the "Board's" decision. There have been very few complaints under the existing Danish system.

In all instances building owners will have the option to bring the dispute before the national or European courts.

### **CANADA**

Not applicable at this stage.

### **DENMARK**

The overseeing government body (the Energy Labelling Board) receives and supervises investigations into formal complaints. The board initially reviews disputed energy certificates. When the board's initial review fails to settle the dispute, the board appoints a certified assessor not involved in the dispute to undertake a new assessment of the building. The new assessment informs the board's final decision. Few complaints have been received under the existing scheme. However the level of competence of assessors who verify disputed buildings' certificates is deemed critical. Opportunities to specifically train these assessors are being investigated.

### **FRANCE**

It is expected that the existing judicial system would be best equipped to deal with dispute resolution. For existing buildings, it envisaged that energy assessments be used as advisory tools, thus minimising the scope for dispute to arise.

### **KANSAS, USA**

This is dealt with by local governments, counties and municipalities.

### **NORWAY**

This issue had not been resolved at the time of the interview. However it is intended that the proposed scheme will allow building development teams to appeal certification outcomes deemed contentious.

### **PORTUGAL**

When disagreement between the developers or design teams and the certifier cannot be resolved, the national controlling body will designate an alternative certifier to undertake a second assessment of the building. The second certifier will not be aware of the dispute history of the building.

Based on the second certifier's views, the party at fault (i.e. the developer, design team or the initial certifier) will be required to support the cost of the certification process. In those instances where the developer or design team does not agree with the second certifier's views, the decision will be left to the Energy Department (i.e. the overseeing government department). Disputes may eventually be brought before the courts.

### **THE NETHERLANDS**

Building owners will be able to appeal to various parties of the energy disclosure scheme.

- 1st appeal point - the accredited certifier that issued the disputed certificate
- 2nd appeal point - the scheme's administering body will ensure that another accredited certifier undertakes an assessment of the building
- 3rd appeal point - the courts for those instances where appeals with all relevant administrative bodies have been exhausted

### **UNITED KINGDOM**

The interpretation of the law would be left to the national and European courts. It is recognised that the national certification bodies may also have a role to play to minimise the number of disputes being brought before the courts.

### **EUROPROSPER**

Not applicable or within the scope of the project.

## C. TECHNICAL ASPECTS OF MANDATORY DISCLOSURE

### ***C1 What information is being considered for disclosure e.g. energy consumption, environmental performance, compliance with comfort benchmarks, a combination of the above, etc.?***

A combination of the following indicators is being considered.

- Conventional energy use indicators such as kWh / m<sup>2</sup> / year (based on calculations).
- Energy indicators specific to building types are also considered in the UK (based on calculations).
- Equivalent CO<sub>2</sub> emissions are also likely to be disclosed although more problematic as highly dependent on technology used to generate energy.
- Measured energy consumption (e.g. from meter readings) is also considered for disclosure generally in combination with calculated energy consumption and / or key features of building use patterns. Measured energy consumption may be normalised to a degree e.g. weather, occupancy, etc.
- Key features of building use patterns are also disclosed in Denmark where normalisation has been dismissed for specific building use features such as occupancy.
- Comfort indicators such as temperature and humidity may also be disclosed as “secondary” indicators of the building’s performance.
- Primary (total) energy as opposed to delivered energy is also being considered for disclosure.

#### **CANADA**

**RESIDENTIAL:** Homeowners participating in the EnerGuide program are required to sign a waiver authorizing the information collected about their house during the EnerGuide for Houses service to be supplied to Natural Resources Canada for the purpose of statistical analysis and quality assurance. The types of information collected are: a description of the archetype (i.e. size, footprint, volume, number of storey), location, year of construction, type of insulation (i.e. basement, walls, foundation), type of heating, cooling, ventilation and domestic hot water system, design heat loss, heat losses by component, energy consumption, green house gas emissions and house rating. However, no personal information is being collected.

As part of the EnerGuide for Houses Retrofit Incentive Program, the same type of information about the house is collected to allow a comparison of the building before and after renovations. The information will permit the calculation of the grant to be issued to the homeowner. The additional information being captured at the time of the second assessment are: homeowner name, mailing address, mailing city, province, postal code and tax number for the purpose of issuing the grant to the homeowner. All non-personal information is available for sharing with utilities, academia and energy policy analysis upon request.

**COMMERCIAL:** Existing buildings participating in the Energy Innovators Initiative (EII) program are asked to submit annual energy cost and consumption by energy source, building type and building area information. New commercial buildings requesting incentive through the Commercial Building Incentive program (CBIP) (see Appendix 4) are required to provide a detailed modelling estimation of the building energy consumption using software.

#### **DENMARK**

For existing buildings, both calculated and measured energy consumptions will be disclosed on the certificate. It is not anticipated that measured energy consumption will be normalised. Instead, general building’s characteristics will also be disclosed e.g. dwelling occupied 2 days / week, number of occupants. Note that the energy “certificate” systematically includes an “energy plan” which consists of a full report into the energy consumption of the building and opportunities to improve efficiency.

#### **FRANCE**

It is likely that energy consumption and CO<sub>2</sub> emissions be disclosed. Conversion of energy consumption in equivalent ecological footprint terms was also considered. The asset rating certificate may include comfort indices, while operational rating certificates may comprise theoretical versus actual temperatures. The following energy uses are being considered to calculate the energy consumption to be disclosed: heating, lighting, air-conditioning (cooling) and ventilation. Standard electricity consumptions for the operation of the building are also likely to be used.

Note that in France nuclear power stations (low CO<sub>2</sub> emissions) supply most of the electricity demand. The national electricity provider uses fossil fuel power stations (high CO<sub>2</sub> emissions) to meet peaks in demand as fossil fuel power stations are easier to switch on and off. While the national energy provider is able to predict the mix of nuclear and fossil fuel electricity supplied to the grid (thus enabling accurate CO<sub>2</sub> calculations) unforeseen peaks in demand have a very significant impact on the CO<sub>2</sub> emissions associated with building energy use.

**KANSAS, USA**

Disclosure of the energy performance of components such as doors, walls, water heaters and air conditioners, or statement of compliance with IECC 2003 standards, or achieving 80% under the Home Energy Rating System (HERS, see Appendix 4).

Note a HERS assessment includes various tests including a “pressure test” which subjects a home to a small negative pressure and measures the amount of air that flows out around doors, windows and openings in the building envelope.

**NORWAY**

Delivered energy consumption will be prominently displayed on certificates. Energy consumption will be normalised for standard building use and will intend to cover all building energy uses e.g. including normalised equipment use.

Weighted energy consumption will also be disclosed on certificates to account for the environmental impacts of different energy sources e.g. oil, electricity, gas, bio-fuel. Technical information such as actual building use and U-values are also being considered for inclusion.

**PORTUGAL**

Energy consumption in terms of  $\text{CO}_2 / \text{m}^2 / \text{year}$  and/or  $\text{kWh} / \text{m}^2 / \text{year}$  will be disclosed based on heating, cooling, hot water and lighting demand. Ventilation loads will be included as part of the heating or cooling loads as appropriate.

Note that energy benchmarks will also be set in terms of primary energy i.e. total energy used (in tons of oil equivalent) as opposed to delivered energy used.

**THE NETHERLANDS**

Information considered for inclusion on certificates includes:

- EPC or EPA ratings
- predicted or measured energy consumption
- measures for energy performance improvements

**UNITED KINGDOM**

Outputs from the calculation tools are likely to be expressed as  $\text{kg CO}_2 / \text{m}^2 / \text{year}$ . Other units such as  $\text{GJ} / \text{m}^3$  and their suitability to specific building types are also being considered. The Department for Environment, Food and Rural Affairs (DEFRA) reviews conversion factors for kWh to  $\text{CO}_2$  every 10 years (next update 2010). Health and comfort indicators are also being considered.

**EUROPROSPER**

The disclosure of both normalised and actual energy consumption is suggested. The certificate is also to include recommendations for energy efficiency improvements.

## ***C2 What format will the information being disclosed consist of e.g. star bands, energy levels, equivalent greenhouse gas emissions, etc.?***

A wide range of measurements and indicators are likely to be used in different countries.

The use of energy ranges (e.g. C = 50 to 99 kWh /  $\text{m}^2 / \text{year}$ ; D = 100 to 149 kWh /  $\text{m}^2 / \text{year}$ ) implies that the pre-defined ranges will need to be revised regularly as new energy efficient technologies become available or more affordable, thus lowering the most energy efficient end of the scale.

The use of equivalent  $\text{CO}_2$  emissions ranges linked to energy consumption is intrinsically tied to the technologies used to generate energy. Therefore  $\text{CO}_2$  ranges must be developed at a level where energy infrastructures are consistent (e.g. use of fuel oil in Northern Ireland versus the use of gas in England and Wales).

Scales (e.g. ranging from 0 to 100) and linked to energy use or  $\text{CO}_2$  emissions are also being considered. Similar issues to ranges are expected.

Energy costs (Denmark) and particular energy performance of building components (Kansas) are also proposed.

**CANADA**

RESIDENTIAL: Greenhouse gas reductions, energy savings, decade of construction, house rating.

COMMERCIAL EXISTING: energy consumption, floor area, energy costs.

COMMERCIAL NEW CONSTRUCTION: energy consumption, floor area, energy costs, performance in comparison with the Model National Energy Code of Canada for Buildings (MNECB), energy intensity.

## DENMARK

Specific energy bands (from A to M) have been defined for a wide range of building types. For each building type, specific energy ranges have been defined for each energy use: electricity (e.g. A = 0 to 2 kWh / m<sup>2</sup> / year), water (e.g. A = 0 to 0.57 m<sup>3</sup> / m<sup>2</sup> / year), for various types of heating fuels and for CO<sub>2</sub> emissions (e.g. A = 0 to 5 kg / m<sup>2</sup> / year).

The energy certificate includes

- energy performance against the relevant scale, e.g. C rating for electricity, B rating for heating, D rating for CO<sub>2</sub> emissions and C rating for water
- numerical information on energy consumption for each energy use and CO<sub>2</sub>
- costs incurred for each energy use over the period considered
- historical energy consumption (per energy use) from previous assessments

Since the launch of the existing scheme in 1997, energy ranges for each building type and energy use have been reviewed and adjusted a few times. It demonstrates the difficulties associated with this approach where energy ranges are intended to reflect current practice and progress in the energy efficiency of buildings.

## FRANCE

This issue is still under discussion. Both star bands and energy levels are being considered.

## KANSAS, USA

Modelled energy consumption levels are not disclosed. The Kansas Energy Efficiency Disclosure form (see Appendix 5) provides 3 options for disclosure

- disclosing energy performance ratings of components such as doors, walls, water heaters and air conditioners i.e. U-values, R-values, systems efficiency
- statement of compliance with IECC 2003 standards
- statement of compliance with a minimum 80% HERS rating

## NORWAY

Near linear scales have been devised for different building types (e.g. A = 70 to 99 kWh/m<sup>2</sup>/year, B = 100 to 129 kWh/m<sup>2</sup>/year). Buildings regulations benchmarks and current best practice were considered when devising the scales.

## PORTUGAL

The format for disclosure will be based on A, B, C energy ranges or thresholds currently under development by CEN (European Committee for Normalisation).

## THE NETHERLANDS

Predicted or actual energy consumption in kWh / m<sup>2</sup> / year will be shown on certificate. This information will not be prominently displayed on the certificate. Energy ranges (e.g. "A" from 0 to 10 kWh / m<sup>2</sup> / year, "B" from 11 to 20 kWh / m<sup>2</sup> / year, etc.) will be more prominent.

## UNITED KINGDOM

Two options are being considered

- an A to G rating in line with Europrosper propositions
- a more likely approach is a 0 to 100 scale linked to CO<sub>2</sub> emissions

## EUROPROSPER

Two approaches are investigated.

1. An absolute scale (e.g. 0 to 300 kg CO<sub>2</sub> / m<sup>2</sup> / year) divided into different bands (e.g. "D" rating = 100 to 149 kg CO<sub>2</sub> / m<sup>2</sup> / year; "E" rating = 150 to 199 kg CO<sub>2</sub> / m<sup>2</sup> / year; etc.) may be appropriate for this specific case study (i.e. existing offices in the UK). To encourage continuous improvement and more accurately reflect efforts and investments made by building owners, the scale may use a finer resolution (i.e. narrower bands) at the low energy use / high efficiency end of the scale.
2. A grading scale based on outputs from the tailored benchmark approach (see C8) extrapolating typical, good and best practice benchmarks. For example the scale may range from 75% of best practice benchmark (high efficiency) to 150% of the typical benchmark (low efficiency).

***C3 What performance assessment tools are being considered for use in the various sectors considered e.g. housing, commercial and public buildings? Provide a brief description of the tools and specify whether the tools are accurate assessment models or cruder models based on standardised data.***

Both simple and complex tools are being considered for energy performance calculations with many variations. Different types of models may be used for different sectors particularly domestic and non-domestic. The simple calculation tools rely heavily on pre-defined databases and are based on a whole building energy use approach.

In general, modelling of energy use based on more comprehensive calculation tools will be allowed providing the selected tool complies with a set of pre-defined criteria (CEN, quality, performance). The gathering of the required data to model existing buildings energy use is problematic. The accuracy of existing building assessments is expected to vary greatly. A solution is the disclosure of measured energy consumption in conjunction with the calculated energy consumption. EuroProsper recommends the use of operational, measured energy consumption data for existing buildings.

### **CANADA**

RESIDENTIAL The EnerGuide for Houses makes use of **HOT2000™** energy analysis and design software. Up-to-date heat loss or gain and system performance models provide an accurate way of evaluating building designs. This evaluation takes into account the thermal effectiveness of the building and its components, the passive solar heating owing to the location of the building and the operation and performance of the building's ventilation, heating and cooling systems. HOT2000™ is accurate and easy to use. Results are calculated from pull-down menus offering hundreds of input options for details on the building design, site and climatic zone. The accuracy of HOT2000™ has been tested and verified against actual houses. State-of-the-art heat loss/gain and system modelling will help design residential projects for optimal: thermal effectiveness, choice and placement of windows, heating and cooling system performance to maximize energy efficiency.

**HOT2@XP** is a new member of the HOT2000™ family of energy analysis software. It serves as a quick and easy tool for analysing energy use in residential buildings. While its graphical interface is simple enough to be used by homeowners, the underlying analysis engine is that of HOT2000™, which is based on over 10 years of building simulation experience and has been validated against DOE-2 and other hourly simulation models. HOT2@XP can therefore stand on its own or serve as a fast gateway to research-quality analysis.

COMMERCIAL EXISTING Currently a simple electronic calculator is provided on-line to allow owners to determine their energy intensity. Clients have the option of using different methods. Templates are available. Registered 'Energy Innovators' are also polled annually with a survey (electronic or paper format) to complete an energy use survey requesting crude consumption and area.

COMMERCIAL NEW CONSTRUCTION: Three evaluation tools are currently used for new construction. The number of input fields requested and detail in simulation increases by about 10 fold for each of the following.

- A **Screening Tool**, allows designer to obtain a ballpark estimation of the energy use, % savings in comparison to a building constructed according to the MNECB and an energy used estimate of the service hot water, heating, cooling, auxiliary, lighting and equipment. Simulations are not incented for this cruder model.
- The **EE Wizard** (energy evaluation wizard) is an Internet-based tool that will be used to demonstrate CBIP compliance for retail food stores and arenas. Designers will use this tool to evaluate whether their design meets the 25% better than MNECB requirement which will qualify their project for a CBIP incentive. This simplified tool, which allows more technology options than the Screening Tool, is being expanded to include the main building types. The output includes everything from the Screening Tool plus a compliance report for the CBIP program, demands estimate, monthly estimate of the energy consumption, summary of building energy performance and advisory messages based on data input.
- **EE4 CBIP** is the verification software tool that will be used to demonstrate CBIP compliance for the performance path. Designers will use this tool to evaluate whether their design meets the 25% better than the Model National Energy Code for Buildings requirement, which will qualify their building for a CBIP incentive. The tool which is based on DOE 2.1 allows more flexibility in design systems and details the building to individual zones and spaces. The output includes everything from the EE Wizard plus more information in the .bdl file.

### **DENMARK**

Two models are envisaged, one for small buildings (loadable on a PC from CD) and a web-based tool for large buildings which may be linked to a national database in the future. Data gathering for existing buildings has been recognised as a key issue.

## FRANCE

For new domestic and non-domestic buildings, accurate calculation tools in line with European CEN standards have been used for some time as part of the building regulations legislation RT 2000, to be replaced by in 2005 by RT 2005.

For existing domestic buildings, a bespoke tool (“outil affichage”) has been developed. The accuracy of the output depends on the accuracy of the input data. Where input data are unknown, default values are assumed.

For existing non-domestic buildings, an approach based on operational ratings, i.e. metered energy consumption, was being considered at the time of the interview.

## KANSAS, USA

- Elemental energy performance ratings of components such as doors, walls, water heaters and air conditioners.
- Home Energy Rating System, HERS, an accurate assessment.
- Bespoke IECC 2003 compliance tools.

## NORWAY

The following calculation tools are being considered.

- Existing building regulation calculation tool for both new and existing buildings that are simple to model. Note that the tool uses default data where information is not available.
- Detailed calculation / modelling tools that have been validated. These are to be used for more complex buildings and technologies not adequately taken into account by the building regulation tool.
- Other calculation tools that have been tested over time by the industry and have demonstrated the accuracy of their outputs.

## PORTUGAL

A simple tool will enable assessment of both domestic and non-domestic buildings (asset rating). The tool will be based on databases of the most common construction elements and their impacts on energy consumption. This simple tool will not allow the modelling of sophisticated systems such as CHP (Combined Heat and Power or Cogeneration) or sophisticated lighting controls.

The use of recognised software tools will be allowed to model complex design systems. Currently the relevant ASHRAE standards are used to assess the suitability of the software suggested for use by assessors. A CEN standard to assess the suitability of software modelling tools is currently being developed and will be adopted in Portugal when published.

## THE NETHERLANDS

New buildings A very comprehensive energy calculation tool taking into account all energy uses (including renewables technologies, but excluding lighting for domestic buildings) is used to calculate EPCs. The tool uses default values for different building types, energy saving measures, etc. EPC certified assessors use the tool for building control and building permit purpose.

The comprehensive EPA calculation tool for existing buildings takes into account space heating, domestic hot water, electricity for fans and pumps and renewables but not lighting for domestic buildings.

## UNITED KINGDOM

Non-domestic buildings The National Calculation Tool (NCT) will be based on the CEN standard which is currently being developed. NCT’s approach is quite simplistic. For more complex buildings, it is anticipated that commercial calculation tools (e.g. APACHE, TAS) may be used providing they satisfy criteria being developed that would ensure compliance with the CEN / NCT approach.

New dwellings Existing (amended) SAP rating.

Existing dwellings Modified SAP rating (under-development).

The various calculation tools proposed will include national and regional variations.

## EUROPROSPER

New building Final energy certificate should take into account what is actually constructed and installed and any available commissioning or test results. The UK in a similar move to Portugal is considering the practicalities of requiring new buildings to get an operational certificate after 3 years of operation, i.e. after the building and its management have had time to settle down.

Existing buildings Construction dimensions, materials and the nature and efficiency of installed building services plant are often unknown or difficult to determine. It is suggested that worst options should be assumed.

Public buildings The driver for disclosing energy performance is to inform occupier and public. Disclosure is not triggered by selling or letting. Therefore it is critical that certificates be based on measured energy consumption. Calculated energy consumption is also useful if building is to be sold or let and to determine whether energy performance is attributable to building design or management.

***C4 Will energy conservation measures be adequately reflected or considered in modelling, particularly with cruder models and tools? If so, please describe how this will be achieved?***

It is recognised that this is an important issue and that energy conservation measures must be given due value, but it has been found that this requires considerable effort. While allowances are claimed to be provided for common energy saving measures, it is recognised that unconventional designs and energy saving measures are not adequately reflected in the simple tools that are being proposed to calculate energy consumption. This issue is usually resolved through the use of more comprehensive calculation tools that satisfy a set pre-defined criteria (CEN quality, performance, etc.).

**CANADA**

**HOUSING** The energy conservation measures are adequately being reflected when using the HOT2000 and HOT2XP software.

**COMMERCIAL EXISTING** Professional engineers perform calculations using their preferred tools and models. ERA(P) clients have the options to use this methods. NRCan collects the reports.

**COMMERCIAL NEW CONSTRUCTION** With the screening tool, limited measures can be input. The focus is on the impact of the efficiency of main systems. With the EE Wizard common measures are input but the integrated design approach is limited because of the pre-established zones and set of measures. All measures of the EE Wizard except refrigeration are included plus with EE4 there is increased design flexibility and specification of equipment. With EE4, workarounds in DOE 2.1 can also be performed for some features.

**DENMARK**

Energy conservation measures will be taken into consideration in the calculation tools envisaged. Note that according to the new Heat Supply Act, specific town areas have been designated for different heat supply systems. Individual building owners cannot choose among CHP, natural gas or renewable.

**FRANCE**

Adequate provisions have been made in the new building calculation tools. Existing building calculation tools will be aligned on the CEN standard being developed.

**KANSAS, USA**

Elemental energy performance ratings does not reflect conservation measures beyond elements' individual performance. Home Energy Rating System (HERS) allows trade-offs between various energy efficient technologies, which are reflected in the overall building energy performance output.

**NORWAY**

The detailed calculation tools will allow energy conservation measures to be adequately reflected in building models.

**PORTUGAL**

The simple tool will not allow modelling of systems such as CHP, sophisticated daylight control or natural ventilation, heat / cool storage or district heating or cooling. The use of a recognised software will be necessary to adequately model these systems.

**THE NETHERLANDS**

It is believed that energy conservation measures are accurately reflected in the calculation tools available.

**UNITED KINGDOM**

NCT will allow simple measures to be incorporated into the assessment. It is intended that more complex tool would allow "unconventional" energy saving measures to be incorporated in the calculations. A database of 600 energy audits and trained energy auditors will be available to inform the impact of specific energy saving measures.

**EUROPROSPER**

The approach suggested based on actual energy consumption would allow energy conservation measures to taken into consideration.

## ***C5 What is the frequency or milestones of assessment & reporting being considered e.g. regular disclosure (every 5 years) and/or disclosure at renewal or change of tenancy?***

The minimum disclosure requirements specified in the EPBD are for all new buildings at the selling and letting points and every 10 years. Most EU countries are likely to adopt this.

Some countries have set stricter requirements.

- In Denmark, the current requirement of annual energy assessment for large buildings is seen as to onerous and revisions are being considered.
- In Portugal, a new building certificate is only valid 3 years after which an existing building certificate must be obtained. This process is used to ensure that measured energy performances of new buildings are in line with predicted (calculated) energy performances.
- The UK is considering a shorter period than 10 years for non-domestic buildings.

### **CANADA**

**HOUSING** Reporting and assessment will be performed at the time of the initial energy evaluation of the house and following the evaluation of the house after renovation.

**COMMERCIAL EXISTING** Registered Innovators are requested to provide regular updates. Those requesting financial incentive for implementation of a project must provide consumption information before starting the project, an estimate of savings upon completion and report on savings one year after completion. For the audits under the ERA(P) a post work follow up component is completed.

**COMMERCIAL NEW BUILDINGS** No disclosure except for projects requesting incentive. Disclosure is only requested based on the design plans. Preliminary efforts have begun to investigate post-construction reporting options.

### **DENMARK**

For small buildings, at selling and letting points, and every 10 years. For large buildings, at selling and letting points and every 5 to 8 years (currently an annual assessment is required)

### **FRANCE**

In line with the EPBD, certificates will be valid for 10 years.

### **KANSAS, USA**

Disclosure at buying of a new residential building.

### **NORWAY**

These issues had not been resolved at the time of the interview.

### **PORTUGAL**

New non-domestic buildings New buildings get a “new building” certificate valid for 3 years. This allows adequate commissioning of the building’s systems as well as giving owners, users or managers time to learn how to use the building efficiently. After 3 years, the building must get an “existing building” certificate valid for the following 6 years. If energy meter readings are above the specified thresholds and no suitable rationale can be provided, then an asset rating must be undertaken. If the asset rating fails then all necessary efficiency measures must be implemented (no payback threshold – see C6) and an additional fine is being considered. The existing building certificate must then be renewed every 6 years.

Existing non-domestic buildings See C6.

New domestic buildings For all new domestic buildings an asset rating, i.e. an assessment of the building using the simple model based on CEN standards, must be undertaken. The certificate obtained is valid 8 years. For new domestic buildings, a building permit will only be issued when it is demonstrated that the building meets energy benchmarks set out in the regulations. If the calculated energy consumption exceeds regulatory benchmarks, no building permit will be issued until the energy consumption is brought into conformity with regulations.

Existing domestic buildings When a certificate is required for an existing domestic building and no certificate is available (i.e. selling or letting of an existing building) then an asset rating must be undertaken. For existing domestic buildings, the certificate is merely a statement about the building’s performance. The implementation of recommendations for energy performance improvements will be left to the building owner’s discretion.

**THE NETHERLANDS**

In line with the EPBD, certificates will be required for all new buildings at selling and letting points. The certificate's maximum validity will be 10 years.

**UNITED KINGDOM**

For non-domestic buildings, 3 to 5 years reporting is being considered. For public buildings yearly reporting is being considered. See B5 for other reporting milestones.

**EUROPROSPER**

Not applicable or within the scope of the project.

## ***C6 Will energy meter readings be used or considered when disclosing energy performance?***

Approaches vary greatly, the following options are considered.

- Disclosure of measured energy consumption (partially normalised) alongside the building's specific use patterns e.g. occupancy.
- Disclosure of measured energy consumption (partially normalised) alongside calculated energy consumption.
- The use of measured energy consumption to identify worst energy performers and improve the energy performance of the building stock.

In some instances, the use or disclosure of measured energy consumption have been dismissed for domestic buildings as it is inherently dependent on building use patterns which vary significantly. For non-domestic buildings disclosure of measured energy consumption data is more commonly being considered. This is recognised as a difficult area and there may be confidentiality issues to be resolved (e.g. Canada).

**CANADA**

HOUSING No reconciliation to metered statements is being considered at this time.

COMMERCIAL EXISTING Yes, as provided by the client or facility manager.

COMMERCIAL NEW CONSTRUCTION Meters are required in the MNECB but reporting metering is not being considered at this time.

**DENMARK**

See C1.

**FRANCE**

The inclusion of meter readings will be aligned on the European CEN standard being developed.

**KANSAS, USA**

Energy meter readings are not considered.

**NORWAY**

Energy meter readings are being considered for disclosure of existing buildings consumption.

**PORTUGAL**

Energy meter readings will not be used for domestic buildings. Only asset rating, i.e. modelling of the building using the simple tool, will be used.

For non-domestic existing buildings, energy meter readings will be used. If meter readings are below the regulation threshold (set at 40% of worst energy performers for each building type) no additional work is required. Above this threshold, energy meter readings will be compared against operational rating thresholds i.e. a model of the building based on real occupancy / use and based on standard occupancy profiles. If the building with standard occupancy profiles remains below the threshold, i.e. if the extra energy consumption can be explained from additional occupants or equipment use, no additional measures will be required. If rationales for the excess energy consumption are not conclusive then an energy plan must be implemented and energy efficiency measures with a payback of less than 8 years, must be implemented within 3 years.

**THE NETHERLANDS**

EPA assessments will consider both the energy performance of the building considered as well as the energy consumption of the building's processes. Energy meter readings will be used for monitoring purposes and advice only.

**UNITED KINGDOM**

Meter readings are being considered for inclusion in the Operational Rating. A number of issues are currently being debated including normalisation of readings and access to the data. A number of issues are outstanding and need to be resolved.

**EUROPROSPER**

Energy meter readings form the basis of this case study. However access to reliable fuel consumption data can be difficult. It is suggested that the disclosure scheme incorporates a statutory requirement for fuel suppliers to provide annual statements of energy supplied to each point of supply. Access to this information may be restricted, for example to building owners and accredited assessors.

### ***C7 How will differing energy profiles be reconciled e.g. model's outputs and actual meter readings?***

The following options have been considered to resolve this issue.

- Disclosure of both calculated and measured data alongside each other, together with operational information.
- Disclosure of measured energy consumption (partially normalised) alongside the building's specific use patterns (e.g. occupancy) to inform interested parties. This option has limitations as not all building use patterns can be obtained or disclosed e.g. frequency of washing machine uses or baths.
- Calculation of operational energy consumption based on actual building use patterns including occupancy. A key limitation for this option is the accessibility of data for existing buildings.

**CANADA**

The demand policy analysis division uses various approaches, standards and methods to reconcile data.

**HOUSING** Only modelled profile is being considered.

**COMMERCIAL EXISTING** Only metered output is considered. However the Energy Retrofit Assistance Planning incentive of EII aids owners to engage professional energy service to complete detailed audits of the facility. ERA incentive newer clients choose to adjust for variables.

**COMMERCIAL NEW CONSTRUCTION** Data reconciliation is being investigated but currently only modelled consumption is completed.

**DENMARK**

See C1.

**FRANCE**

This issue has been recognised. However it had not been fully considered at the time of the interview.

**KANSAS, USA**

Relevant information not obtained.

**NORWAY**

**Existing buildings (non-domestic and domestic)** It is intended that both metered and calculated energy consumptions (based on actual occupancy patterns) be displayed on certificates.

**New buildings (non-domestic and domestic)** It is suggested that where metered energy consumption significantly differs from calculations (based on actual occupancy patterns) the scheme's overseeing body would investigate or require investigations.

**PORTUGAL**

See C6.

**THE NETHERLANDS**

See C6.

**UNITED KINGDOM**

Different rating schemes are proposed at different points in the life of the building see A2. This issue is still being debated.

**EUROPROSPER**

Europrosper includes all relevant significant building services in the model e.g. heating, hot water heating, cooling, ventilation, lighting, humidification, lifts. It recognises difficulties to divorce the energy

performance of a building and its services from the energy used by the building's processes, e.g. computer centre and restaurants in office buildings, swimming pool in hotels.

### ***C8 How will differing building use, occupancy levels, etc. be reflected in the information disclosed?***

The two options were identified for disclosure on building use patterns.

- The full disclosure in so far as it is possible of specific building use patterns. This option is limited as not all building use patterns can be obtained or disclosed, e.g. frequency of washing machine uses, baths.
- The definition of standard building use patterns for each type of buildings, i.e. so that only the normalised energy consumption for the building is disclosed. Varying degrees of normalisation are being considered depending on the factors being normalised. Weather is generally normalised while building occupancy and building use may not systematically be normalised.

#### **CANADA**

**HOUSING:** The cornerstone of the EGH rating is the standard occupancy and operational conditions of domestic hot water consumption, lighting load and air leakage. These conditions are a way to standardize the evaluation and allow comparison of various houses across Canada. Therefore information disclosure can be standardized for these factors.

**COMMERCIAL EXISTING:** Data is collected and can be published in aggregate by building type, region or floor area to respect confidentiality issues.

**COMMERCIAL NEW CONSTRUCTION:** All the simulation tools include fields to account for climatic variations, building use and occupancy levels. The impact of changes to equipment measures can also be modelled. Data is collected and can be published in aggregate to respect confidentiality issues.

#### **DENMARK**

It is not suggested that measured data (meter readings) be normalised for building use or occupancy, etc. This information will be directly available on the certificates. Note that weather normalisation is currently in place.

#### **FRANCE**

Specific conditions of the building being assessed including building occupancy and use will be provided on the certificate.

#### **KANSAS, USA**

Relevant information not obtained.

#### **NORWAY**

Normalised building use and occupancy patterns used in energy calculations will be referenced on the certificates.

#### **PORTUGAL**

The information disclosed will be based on standard occupancy and use patterns and on the type of building being used.

#### **THE NETHERLANDS**

Building energy use will be normalised. Specific building energy use will be disclosed on the certificate as part of the assessment of the building processes.

#### **UNITED KINGDOM**

It is proposed that building use and occupancy levels, etc. be normalised and included in calculations and measurements assumptions.

#### **EUROPROSPER**

Buildings may be designed for specific non-standard use. This should be built into the design of energy consumption benchmarks. Certificate may allow for a "standard rating" (based on standard use) and a "tailored rating" (based on intended or non-standard use).

It is suggested that a customised energy consumption benchmark be calculated for each individual office building. The suggested approach builds up energy consumption from the roots of consumption (e.g. lighting lux levels, efficiency of luminaries, hours of use, management and control factor) thus separating out the asset, control and management elements of energy use. This approach allows actual energy consumption to be compared against typical, good and best practice consumptions by inputting typical, good and best practice factors (e.g. efficiency, control, etc.) in the model.

## ***C9 Will assessments be verified by a third party; will third party assessors or verifiers have to be registered e.g. in a similar way to the BREEAM scheme?***

All of the identified schemes use or will use accredited assessors to undertake energy calculations and building surveys, to recommend an energy consumption rating or to actually issue the certificate. In Norway energy calculations undertaken by a member of the building development team are certified by an accredited assessor.

Some countries require the use of third party assessors and others allow an accredited in-house person or team to undertake the assessment.

In most instances calculation tools will be accessible to design teams to inform building design. In some countries the tools will be accessible free of charge, in others a small fee will be charged. On-line calculations are also being considered.

The key issue identified when operating an accreditation scheme for assessors is the consistency of the assessments undertaken. Options being considered to ensure this is achieved are

- the role and remit of the assessors may be defined very strictly
- bespoke training of assessors according to their respective background and weaknesses (e.g. architects versus engineers)
- on-going training and assessment of assessors
- quality assurance of the assessments undertaken may partly be achieved through random quality checks
- the pre-definition of advice options for assessors to choose from. To ensure building owners with no technical background understand the advice provided

Self-certification is being considered for local authorities in the UK. Potential conflicts of interest are being considered.

### **CANADA**

HOUSING: To ensure that the evaluations and the services meet the requirements of Natural Resources Canada, a tri-level quality assurance protocol is in-place.

1. At the Service Organizations. Each one is required to perform regular quality assurance. This will include customer callbacks, file and process reviews.
2. At NRCan upon reception electronic files generated by the simulation software. Service organizations will generate two files for each evaluation (a native file with all the inputs and an export file containing results of the evaluation such as heat loss, fuel consumption, air change per hour, requirement for ventilation, rating of the house).
3. The third level is done by organization under contract with NRCan. These organizations will perform customer callbacks, file reviews and on-site quality assurance.

COMMERCIAL EXISTING: For financial incentive, a review of information is completed with an in-house review team. Selected files are also audited externally for quality assurance and can include a site visit.

COMMERCIAL NEW CONSTRUCTION: Files are reviewed by an external team who successfully responded to a request for standing offer that meets required levels of experience. A quality control of files for consistency of reviews is performed internally upon receipt of the technical review. A list of CBIP experienced consultants is also made available via the website to assist applicants.

### **DENMARK**

Third-party assessors carry out the assessments. The Ministry is trying to define the assessors' brief as precisely as possible to ensure this national scheme achieves greater consistency. For instance, the Ministry is pre-defining standard advice options that assessors will be able to recommend to building owners in non-technical terms.

### **FRANCE**

Third party assessors will require approved training. It is envisaged that the training includes regular updates to ensure consistency over time and among assessors.

### **KANSAS, USA**

HERS assessments are to be carried out by certified assessors, registered with the Residential Energy Services Network (RESNET).

### **NORWAY**

It is anticipated that competent members of the building development team will undertake energy calculations and modelling which independent verifiers will then certify. It is proposed that a Government-accredited body undertakes random quality assurance of certified energy assessments.

### **PORTUGAL**

While developers, owners and design teams will be able to undertake an assessment (of asset or operational rating) the assessment's outputs will be verified by an accredited certifier who will then issue a certificate.

All certificates issued will be recorded in a central national database which will be used for statistical purposes and which will not be accessible by the public. Statistical analysis will be used to inform future amendments to the regulations e.g. changes in energy consumption compliance thresholds. A random sample of certificates issued will be audited by the authorities to ensure that correct procedures are followed (see F).

### **THE NETHERLANDS**

The scheme administering body accredits businesses to undertake energy performance assessments and issue certificates to building owners. It is the responsibility of the accredited business to ensure that its assessors are competent.

Quality control is primarily provided through crosschecking of randomly selected certificates. All assessors (i.e. businesses) that issue certificates regularly provide a number of certificates to the administering body. The certificates selected are passed on to other certified assessors for quality assurance. Local authorities checks (on submission of building permit applications for new buildings or major refurbishments) as well as random checks undertaken by the administering body provide additional quality assurance.

### **UNITED KINGDOM**

A third party certification scheme for domestic assessors (SAP ratings) is being developed. Opportunities to develop a similar scheme for non-domestic buildings (NCT) are also being considered. Currently SAP is a "freely" accessible calculation method. Different bodies (e.g. NHER National Home Energy Rating) have developed their own SAP software and certificates can be obtained from these bodies, providing the SAP assessor is registered with the body. Self-certification is being considered for local authorities operational rating. It is thought that local authorities would have no reason not to disclose this type of information.

### **EUROPROSPER**

It is suggested that accredited assessors undertake or verify the assessments.

## ***C10 If relevant to your country's approach, has the availability of skilled auditors and verifiers been assessed? How many auditors would be needed e.g. these may be auditors of existing buildings as well as desk-based modellers from building plans?***

In countries where no disclosure scheme is currently in place (i.e. most countries) the availability of competent individuals is generally seen as problematic, primarily in the first few years of the implementation of the scheme.

After an initial period of 2 to 3 years it is generally expected that the backlog of outstanding assessments will be cleared, allowing the schemes to run normally.

Peaks in demand for certificates (thus demand for assessors) will be aligned with the frequency of the disclosure requirements under each scheme. Periodic peaks are not thought to be a significant issue once the schemes run normally.

### **CANADA**

**HOUSING:** The EnerGuide for Houses currently has 22 service organizations across Canada, a minimum of one in each of the provinces, and more than 500 energy advisors. We are hoping to increase this number to more than 30 services organizations and 700 energy advisors.

**COMMERCIAL EXISTING:** A directory of skilled professionals in the energy field shows over 550 companies. Currently needs are hard to meet in certain regions.

**COMMERCIAL NEW CONSTRUCTION:** There are 2800 registered users of EE4 CBIP software and 500 registered users of EE Wizard software.

### **DENMARK**

It is anticipated that sufficient assessors will be available.

**FRANCE**

Assuming an assessor produces 1 certificate in half a day and is occupied 200 days a year, it is anticipated 5,000 assessors would be required. This is equivalent to about 2 million certificates being issued a year. It is anticipated that the availability of suitably qualified assessors will be a problem in the first few years of the scheme.

**KANSAS, USA**

Relevant information not obtained.

**NORWAY**

The availability of skilled certifiers is considered a critical issue for compliance with EPBD requirements, primarily for existing buildings as energy calculation procedures are already in place for new buildings.

**PORTUGAL**

Significant interest has been shown by existing building professionals to become accredited certifiers. It is anticipated that about 2000 full-time certifiers (or 4000 part-time certifiers) will be required.

**THE NETHERLANDS**

Domestic buildings: About 1000 assessors are currently accredited. The number of additional full time assessors required has not been accurately determined. Up to 50% more assessors may be required.

Non-domestic: About 500 assessors are currently accredited. The number of additional full time assessors required has not been accurately determined. Up to 50% more assessors may be required. The lack of qualified assessors is expected to be a significant issue in the early stages of the implementation of EPBD requirements.

**UNITED KINGDOM**

Initial estimates suggest 20,000 full time employed building energy assessors might be required in the UK. About 5 million certificates per year would be required in the first few years. After the initial period, in excess of 2 million certificates per year might be required. Further research is required to validate these initial figures.

**EUROPROSPER**

Not applicable or within the scope of the project.

### ***C11 If relevant to your country's approach, have specific training needs for assessors and verifiers been identified?***

Training of the assessors is generally identified as a key issue to achieve consistency of assessments and advice provided.

General training programmes are being developed for individuals seeking accreditation.

In Denmark where an existing scheme is in place, bespoke training of the assessors based on an individuals background is being considered to remedy the individuals weaknesses and ensure maximum consistency.

On-going assessments and training of accredited assessors is also being considered.

**CANADA**

Housing: NRCan initiates the training by offering *Train-the-trainer* session. Service organisations are required to coordinate and implement the EGH Program whether it be for existing houses or new houses or both at the local or regional level by guaranteeing the integrity and administration of the EGH Program. They also recruit qualified energy advisors and provide workshops for their new recruits. NRCan has developed a screening examination to assist in the latter process.

Commercial existing: *Dollars to \$ense* training courses are offered on implementation of an energy plan as well as opportunities workshops. Courses are also offered at Seneca College.

Commercial new construction: Training needs include charettes to initiate people to the integrated design process as well as a two day course covering the EE4 modelling software. A course on the MNECB is also envisioned. Courses are offered in partnership with building associations and academic institutions.

**DENMARK**

Assessors have various backgrounds such as engineering, architectural, etc. The training provided will vary and will be in line with the assessor's training needs.

**FRANCE**

While acknowledged as a significant issue, training needs had not been investigated at the time of the interview.

**KANSAS, USA**

Training and education of the public, builders, real estate agents and code officials has been undertaken using Special Projects Funding from the US Department of Energy State Energy Program (DOE SEP) since 1998.

**NORWAY**

It is expected that training will be provided based on the experts skills e.g. experts used to undertake energy calculations under existing building regulations are likely to require less training than others.

**PORTUGAL**

A training course is currently being developed to train accredited certifiers.

**THE NETHERLANDS**

Existing Government training courses are being updated to ensure EPBD compliance. It is proposed that building owners be offered 2 levels of advice by accredited assessors.

- General advice level (domestic certificate cost cap 200 euros or 260 USD): Minimal training will be required to provide advice.
- Bespoke advice level (domestic certificate cost cap 400 euros or 520 USD): In-depth training of assessors into building sciences will be required to provide advice.

**UNITED KINGDOM**

The limited availability of skills professionals is seen as a key issue in the UK.

**EUROPROSPER**

Not applicable or within the scope of the project.

### ***C12 Have the anticipated costs of introducing and administering such a mandatory disclosure scheme been investigated? If so, can you provide an estimate?***

This information was either not generally available or difficult to obtain. One estimate from the Netherlands is that the scheme will cost businesses and individuals 47 million euros per year. It seems that several governments are supporting or intending to subsidise these costs nationally.

However in two instances the intention was for the costs of administering a disclosure scheme to be partially met by returning a percentage of the certification fee charged to building owners to the national overseeing body.

Through such charging system the Portuguese expert's intention was to make the disclosure scheme (development, implementation, administration and updating) cost neutral.

**CANADA**

**HOUSING:** The administrative goal of *EnerGuide for Houses* was to use information management technology to develop and deploy a national program for maximum impact at minimum cost. With limited administrative and management resources, the system allowed for growth, adaptability and sustainability. Although not mandatory, the current information can be provided on the *EnerGuide* program. The program's agenda was crafted with demanding goals from its inception. A total of 11 person years currently manages the service. The developments cost for the system are approximately C\$350K (USD 280K).

**COMMERCIAL:** Since mandatory reporting is not planned, large energy consumers were targeted by the program. Administratively, NRCan has a large database established to track the information. The database could be expanded if required.

**DENMARK**

This information was not available at the time of the interview. A small fee from the certification cost is paid to the overseeing government body to manage the scheme. It has been found that a large part of the management costs goes towards quality assurance, ensuring that the scheme is consistent through random quality checks and bespoke training of assessors.

Certification costs to building owners are well defined and based on fixed rates. For small buildings, the certification cost is based on an assessor's input equivalent to about 5 hours of work. This cost includes a site survey for existing buildings. Certification cost for large buildings is based on a fixed cost (circa 400 euros or 520 USD) to which a standard fee per m<sup>2</sup> is added.

**FRANCE**

This information was not available at the time of the interview.

**KANSAS, USA**

More than USD 1 million has been received from DOE SEP since 1998 for training only.

**NORWAY**

Domestic buildings: certification fees are likely to be capped at 350 to 400 euros (455 to 520 USD).

Non-domestic buildings: a base fee and a standard fee per m<sup>2</sup> are being investigated. It is anticipated that certification costs will range from 2000 euros to 3000 euros (2600 to 3900 USD).

Government subsidies for the certification of both domestic and non-domestic buildings are being considered.

**PORTUGAL**

The cost of certification is expected to be about 250 Euros (325 USD) per certificate for a single-family home. It will be lower for apartments and higher for non-residential buildings, based on the building's floor area.

The proposed scheme will be self-funding and no Government subsidy is envisaged. A small fee will be paid to the national authority in charge of the scheme for each certificate issued. It is expected that the scheme's research, development and implementations costs will be recouped through the certification charging process.

**THE NETHERLANDS**

It is expected that the costs of developing, implementing and administering such a scheme will be fully supported by the Government. The additional cost to businesses and individuals associated with the implementation of the proposed scheme are expected to be in the region of 47 million euros (61.1 million USD) per year.

**UNITED KINGDOM**

No information was available at the time of the interview.

**EUROPROSPER**

Not applicable or within the scope of the project.

***C13 Has your country's approach considered strategies for updating and accommodating expansion of the mandatory disclosure protocol in the future? If so, what strategies have been considered?***

Generally the development of an entirely new scheme is seen as an opportunity to build in as much flexibility as possible. This is particularly the case in Europe where new directives are likely to be produced in the future to tighten current EPBD requirements.

The favoured option to build in flexibility consists of specifying the general framework of the national disclosure schemes in national legislation and to set out details of the schemes in decrees and by-laws which are more easily amended.

**CANADA**

HOUSING: The system has been built to allow expansion of the voluntary system.

COMMERCIAL: The system has been built to allow expansion of the voluntary system.

**DENMARK**

It is hoped the new scheme will provide enough flexibility to accommodate future amendments.

**FRANCE**

It is hoped that the regulatory structure adopted will allow enough flexibility for updates to be implemented with minimum amendments to the scheme.

**KANSAS, USA**

Relevant information not obtained.

**NORWAY**

It is hoped that the proposed scheme will allow future expansion.

**PORTUGAL**

The new legislation being introduced will set the broad requirements of the certification scheme. A series of decrees will define the certification scheme's details e.g. compliance thresholds. As decrees are easy

and fast (under 1 month) to amend, this approach allows a significant degree of flexibility to accommodate future changes.

**THE NETHERLANDS**

It is expected that this will best be achieved through combining amendments to existing legislation and the development of new legislation.

**UNITED KINGDOM**

The UK schemes would aim towards third party certification of buildings. As much flexibility as possible is sought.

**EUROPROSPER**

Not applicable or within the scope of the project.

## D. QUANTIFICATION OF THE ECONOMIC AND ENVIRONMENTAL BENEFITS

### ***D1 Have the economic and environmental benefits of the approach being considered by your country been quantified? If so, what economic and environmental modelling techniques have been used? Can you provide overall results?***

Information was not readily available but it seems that (surprisingly) this aspect has not been generally assessed. Various forms of assessments (regulatory impact assessment, economic, environmental) may be either underway or scheduled to be undertaken some time after the launch of the scheme.

In Portugal it was expected that the scheme would enable CO<sub>2</sub> emissions from the building sector to be maintained at current level. It may be of interest to return to the Portuguese expert in the future to assess whether this objective has been achieved.

#### **CANADA**

Not applicable.

#### **DENMARK**

Attempts have been made to investigate the rationales for building owners to invest in (more) energy efficient building elements. However a variety of rationales were proposed and it was found difficult to draw any specific trend. It is hoped that in the future certified assessors will be able to register the actual changes made to the building following certification.

#### **FRANCE**

Impacts and benefits will be assessed when the scheme is live. It is envisaged that statistical information will be collected for monitoring of the scheme.

#### **KANSAS, USA**

Relevant information not obtained.

#### **NORWAY**

Generally, positive outputs are expected, as well as increased competition between building development businesses, and increased significance of energy efficiency in building marketing.

#### **PORTUGAL**

Results are confidential. However, it is estimated that circa 500,000 certificates will be issued every year, and that the scheme will allow Portugal to maintain CO<sub>2</sub> emissions from the building sector to current level i.e. 0% increase of CO<sub>2</sub> emissions.

#### **THE NETHERLANDS**

No significant benefits are expected with regard to a reduction in CO<sub>2</sub> emissions. Note that well-developed building controls and voluntary energy performance schemes have been in place for some time. The financial benefits of the scheme have not been assessed. The current focus is more on the scheme's development, implementation and maintenance costs and investigations of future benefits have just commenced.

#### **UNITED KINGDOM**

A regulatory impact assessment is underway.

#### **EUROPROSPER**

Not applicable or within the scope of the project.

### ***D2 Have the economic and environmental benefits been quantified based on***

- ***various future projection horizons and***
- ***building stock types including existing buildings, new buildings and renovations***

Information was not readily available (see D1 above) possibly because European countries are still focusing their efforts on developing and implementing a disclosure scheme to satisfy EPBD requirements.

Most European countries assess the impacts of introducing new legislation. Most countries expected to undertake reactive assessments some time after the launch of their respective scheme. In the UK a pre-emptive regulatory impact assessment was underway at the time of the interview.

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**CANADA**

Not applicable.

**DENMARK**

See D1.

**FRANCE**

This information was not available at the time of the interview.

**KANSAS, USA**

Relevant information not obtained.

**NORWAY**

See D1.

**PORTUGAL**

See D1.

**THE NETHERLANDS**

See D1.

**UNITED KINGDOM**

No information was available at the time of the interview. It is anticipated that the impacts of the new regulations will be monitored as it has been done in the past when significant regulatory changes have occurred.

**EUROPROSPER**

Not applicable or within the scope of the project.

***D3 Has current work to date demonstrated that mandatory disclosure would lead to further voluntary improvements in the environmental performance of buildings?***

Peripheral environmental benefits associated with the implementation of a mandatory building energy consumption disclosure scheme had generally not been considered at the time of the interviews. Several responses indicated that they thought it unlikely.

Significant similarities can be drawn between energy and water consumption. The opportunities to integrate water consumption disclosure alongside energy have been recognised by some countries as is fully integrated in one and being considered in another.

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**CANADA**

Not applicable.

**DENMARK**

The existing energy disclosure scheme fully integrates water consumption and the proposed revised EPBD-compliant scheme will also do so. However, it is thought that further voluntary improvements are unlikely as sustainability issues have lost popularity.

**FRANCE**

Peripheral impacts associated with the implementation of the proposed scheme had not been considered at the time of the interview.

**KANSAS, USA**

It is suggested that demands for energy efficiency from educated procurers and buyers have a significant impact on providers and builders. "We know now that if buyers are informed and they say they want energy efficient homes, those homes will be built." State Energy Program, Case Study, Kansas, March 2004.

**NORWAY**

It is not expected that a mandatory disclosure scheme will lead to environmental improvements beyond reductions in CO<sub>2</sub> emissions.

**PORTUGAL**

No study has been undertaken to investigate these impacts.

**THE NETHERLANDS**

This issue has not been considered.

**UNITED KINGDOM**

To date, no further environmental performance improvements are expected. The impacts of developing a water consumption disclosure scheme, whether parallel to or as part of the energy disclosure scheme, were being discussed at the time of the interview.

**EUROPROSPER**

Not applicable or within the scope of the project.

## E. OTHER ISSUES

### ***E1 Has your country's approach considered the potential for embodied energy to be included in the building's energy performance disclosure?***

Embodied energy had not been considered for integration in the energy disclosure schemes investigated for the following two reasons.

- A building's embodied energy is much smaller than the operational energy used during the lifetime of the building and current efforts focus where maximum potential impact may be achieved.
- The science of embodied energy is currently not exact. It is believed that progress into understanding the issues at stake is necessary for embodied energy to be considered for inclusion in energy disclosure schemes.

#### **CANADA**

Embodied energy is not included in the commercial buildings tool.

#### **DENMARK**

No, as the embodied energy of a building is significantly less than energy consumed by the building's operations during its lifetime.

#### **FRANCE**

The approach adopted does not provide for embodied energy to be included in the energy consumption assessment of the building.

#### **KANSAS, USA**

Relevant information not obtained.

#### **NORWAY**

Embodied energy will not be considered in building energy calculations.

#### **PORTUGAL**

Embodied energy has not been considered for inclusion. The rationale being that a building's embodied energy is significantly less than the energy used by the building over its 50 to 100 years life span.

#### **THE NETHERLANDS**

Embodied energy has not been considered for inclusion in EPC or EPA assessments. Research is currently being undertaken into the Life Cycle Assessment of buildings.

#### **UNITED KINGDOM**

Embodied energy has not been considered to date. It is possible in the long term that embodied energy may be considered for inclusion. However it is believed to be a long way away as the science is currently not exact.

#### **EUROPROSPER**

The approach considered does not take embodied energy into consideration.

### ***E2 Have any consultation exercises been undertaken? If so, can you provide an overall view of the results?***

Consultation with interested parties was widespread in countries investigated. It was seen as a key process to secure stakeholders' support and therefore critical for ensuring the success of the schemes proposed.

Most outputs from consultation exercises were not available at the time of the interviews. The available outputs showed that stakeholders' concerns were widespread and generally aligned with national experts' concerns.

#### **CANADA**

National consultation was not necessary since our surveys are voluntary. Consultations on a smaller scale (focus group) were done to measure the willingness of building and home owners to sign release forms to allow the statistical agency to collect this information from the utilities.

#### **DENMARK**

Consultation had been undertaken about 5 years ago. However results were not available at the time of the interview. The views of a wide range of stakeholders and other interested parties had been sought and had informed the development of the new scheme.

#### **FRANCE**

Consultation was underway (see A3) and results were not available at the time of the meeting.

#### **KANSAS, USA**

House Bill 2131 was drafted with input from a broad-based consultation group. Industry support contributed to the rapid adoption of the bill.

#### **NORWAY**

The energy calculation methods introduced into building regulations in 1997 were initially criticised. Overall, public and industry feedback on the proposed disclosure scheme has been positive and encouraging.

#### **PORTUGAL**

Consultation of relevant stakeholders was undertaken throughout the development of the scheme. A general consensus was reached prior to detailed proposals of the scheme being submitted to the government.

#### **THE NETHERLANDS**

Positive feedback has been received with regard to the existing EPA scheme. However, the current scheme is heavily subsidised and the new scheme does not incorporate subsidies which is likely to affect perception of the scheme.

#### **UNITED KINGDOM**

Provisional comments and issues of interest generated by the on-going consultation included

- including thermal mass in the simple domestic calculation tool
- defining health as well as energy benchmarks
- assessors' qualification and training requirements and how their independence may be assured
- setting adequate validity for certificates; 10 years deemed too long
- using a central database to record certificates issued
- using an on-line compliance and certification process providing designers have access to calculation tools
- setting up a government supported help-line

#### **EUROPROSPER**

Not applicable or within the scope of the project.

### ***E3 Does your country have practical experience of any energy disclosure yet –or other similar– protocols? If so, what effects have been observed to date?***

Most of the countries investigated to date did not have experience of energy disclosure scheme. The Netherlands is one country to reporting generally positive feedback.

A European scheme for energy rating of fridges and freezers has been in place for some time although no meaningful parallels could be drawn with a building energy disclosure scheme.

In Denmark, the existing scheme has generated some interest in the domestic sector. The schemes administering body is considering relaxing a key requirement, viz. annual energy assessment in large buildings, which has generated negative response.

#### **CANADA**

Energy information is disclosed at an aggregate level to ensure that confidentiality issue is respected. No information at the respondent level has been disclosed.

#### **DENMARK**

Denmark has had a building energy disclosure scheme since 1997. The requirement for annual assessments of large buildings has generally been seen as negative, as buildings do not vary greatly over a year. Some interest was perceived in the small buildings (domestic) sector.

#### **FRANCE**

No.

**KANSAS, USA**

Disclosure of energy performance was required prior to House Bill 2131 which only added a third route to compliance, i.e. minimum 80% rating under HERS.

**NORWAY**

An existing voluntary Government programme offers funding to incorporate energy efficient technologies in new buildings. 8% to 10% of the existing building stock has joined this programme, mostly non-domestic buildings. Under this scheme, energy consumption is publicly reported on a regular basis. The energy consumption of participating buildings is 5% to 7% below comparable non-participating buildings.

**PORTUGAL**

No previous experience.

**THE NETHERLANDS**

Voluntary and subsidised EPA schemes have been in place since 2001 for existing domestic buildings and 2003 for existing non-domestic buildings. The schemes have greatly helped to raise awareness of energy issues and the advice function of the schemes has been very well received.

**UNITED KINGDOM**

The British Government is a strong supporter of Corporate Social Responsibility (CSR) reporting. However, the reporting quality varies greatly. A European energy rating scheme for fridges and freezers has been in place for some time. However, the impact of buildings is a lot more significant and the issues at stake a lot more complex.

**EUROPROSPER**

Not applicable or within the scope of the project.

### ***E4 Have any trials or tests been undertaken? If so, can you provide overall results and conclusions?***

With the exception of Denmark, only informal and very localised trials (i.e. one or two buildings at a time) were identified. No substantial trials were identified which may have informed the development and implementation of national energy disclosure schemes.

The trials provided some insights into the practicalities of the assessment and certification process at the individual building level and informed some of the options preferred for the schemes currently being developed.

**CANADA**

Not applicable.

**DENMARK**

See E3.

**FRANCE**

Local, small scale trials had been undertaken under a European research best practice programme.

**KANSAS, USA**

Relevant information not obtained.

**NORWAY**

See E3.

**PORTUGAL**

Informal and limited trials have been undertaken or are currently underway. Results were not available at the time of this interview.

**THE NETHERLANDS**

See E3.

**UNITED KINGDOM**

Ad-hoc, informal trials have been undertaken at the local level. Some European research has also been undertaken (e.g. Europrosper).

**EUROPROSPER**

Not applicable or within the scope of the project.

## ***E5 Have the main barriers and difficulties, perceived and actual, to the approach considered been identified? If so, can you provide overall results?***

The following difficulties have been identified to date.

- Achieving national consistency across the schemes. Ensuring assessments and advice provided by assessors with various backgrounds and experience are consistent. Quality assurance is expected to be a major cost in administering a disclosure scheme.
- Confidentiality of information disclosed.
- The availability of competent individuals to qualify as accredited assessors.
- The complexity of calculation software to give sufficiently accurate results may be beyond the skills of users.
- Accessibility of the advice provided to building owners with no technical background or knowledge of buildings. Denmark is devising a series of straightforward advice options for assessors to choose from in an attempt to remedy this issue.
- Defining requirements that stakeholders can easily adopt highlights the significance of consulting interested parties at the earliest stages.
- Public response to the schemes' requirements mainly in the domestic sector. Public consultation is perceived as more problematic than industry consultation, therefore leading to greater uncertainties.
- Market and public response to the certification costs.
- The overall limited experience of such schemes and associated uncertainties e.g. costs of administering a national scheme.
- The necessary switch from the historical thinking that energy is unimportant because costs remain relatively low to ensure the success of the schemes.

### **CANADA**

Most of the barriers identified during our focus group were related to the confidentiality issue. Once respondents are ensured that confidentiality will be respected most of them are willing to participate to our surveys.

### **DENMARK**

- Annual renewal of assessments for large buildings under the current scheme.
- Consistency of assessments and advice provided by assessors.
- Language used when providing advice is too technical for building owners.

### **FRANCE**

At the time of the meeting, key barriers anticipated were

- the additional costs associated with the certificates and
- the difficulty to generate the cultural change required to ensure the success of the scheme in a generally traditional industry.

### **KANSAS, USA**

Training and education is seen as "the single biggest factor affecting public attitudes about energy". Training on IECC 2003 has been provided to the public, builders, etc.

### **NORWAY**

- The building industry is concerned that the proposed scheme will require significant additional input, e.g. documentation.
- The availability of skilled experts to verify existing buildings assessments is of concern.
- The calculations methods developed to date may be too complex for building development teams and verifiers. It is anticipated that simplification may be required and beneficial.

### **PORTUGAL**

As relevant stakeholders including the building industry were extensively consulted during the development of the scheme, no major difficulties are expected. However the public's response to new requirements for domestic buildings is expected to be a more significant issue.

### **THE NETHERLANDS**

The following are seen as major issues.

- The need to education the public into the benefits of the proposed scheme, e.g. better comfort levels, energy cost savings, added value to the building.
- Ensuring that the quality systems functions as intended.
- The short time frame available to implement necessary changes to ensure EPBD compliance.

### **UNITED KINGDOM**

Some of the key difficulties anticipated are:

- the costs of the certificates and administering the scheme.

- the availability of skilled auditors and the quality assurance system.
- limited experience of trials in the UK, which will have an impact on the scheme

What will make a difference is achieving a change in historical habits. However energy is not considered a major issue primarily because its cost is currently relatively low. The location and looks of buildings are very important. The public image of some corporations and public bodies is important and energy can have a role in this context. Naming and shaming may be an option. The market impact of such a scheme is unknown.

**EUROPROSPER**

Not applicable or within the scope of the project.

## F. ANY OTHER COMMENTS

*Please provide any additional information or comments that you feel may be of interest.*

- A disclosure scheme should not be an end in itself and could be used to improve knowledge of building stocks and inform policy makers and markets.
- In countries where the building sector is rapidly evolving it is hoped that the scheme will be more readily adopted.

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### CANADA

Canada is under a mandatory greenhouse gas reporting system in the industrial sector. Natural Resources Canada (Large Final Emitters Group) and Environment Canada are responsible for this mandatory reporting.

### DENMARK

The certification scheme is seen as a platform for developing other activities e.g. using geographical statistical data to improved building stocks, stimulate building-related markets.

### FRANCE

No further comments.

### KANSAS, USA

Void.

### NORWAY

An additional concern is the lack of standardisation at the European level to implement the EPBD. It is believed that standardisation would help cross European trade.

### PORTUGAL

The national controlling body will undertake random check of certificates issued by accredited certifiers. A target 10% of issued certificates will be checked to ensure consistency of the accredited certifiers' work.

### THE NETHERLANDS

Energy calculation methods should remain easy to use to help the assessors community "buy in" to these methods as well as helping assessments be more consistent.

### UNITED KINGDOM

Public owners might be shamed into addressing energy issues. The building sector is changing very rapidly, which might be beneficial to the scheme.

### EUROPROSPER

Background to Europrosper.

*The SAVE funded Europrosper project has been working in the context of the EPBD since April 2002 to develop an energy certification methodology for occupied office buildings based on actual (measured) energy consumption. The prototype method that has been developed by the Europrosper project represents a solution for just one circumstance viz. occupied office buildings in the UK. However, its structure is deliberately designed to enable it to be applicable in other Member States and to be extended to other non-residential building types and sectors, including mixed-use buildings.*

## 6. CONCLUSIONS



## 6. Conclusions

The disclosure of energy consumption data for both new and existing buildings is both possible and receiving much attention in various countries across the world. Clearly many countries are considering their options. Where schemes have been implemented our contacts appeared to believe that the schemes were there to stay and to be extended. The requirement to comply with the EPBD in Europe has stimulated considerable activity.

Development of schemes in different countries varies greatly and reflects historical precedents and experience, government policies, national characteristics, levels of sophistication of energy awareness and many other factors. We are not able to determine why the variation in approach and schemes is so important. We conclude that it may be due to the individuals or groups given the responsibility for developing the schemes.

All countries providing information for this project are putting considerable resources and effort into designing and operating their disclosure schemes and the introduction of such schemes is no small matter. Significant changes to existing legislation or new legislation is required. Schemes must be developed and energy modelling and auditing systems put in place. Auditors and modellers must be recruited and trained, the public must be wooed and cajoled into acceptance of the requirements as significant costs will fall on building owners, users and governments in order to implement the schemes.

Schemes will require on-going input in terms of

- training and reviewing auditors
- checking of audits and calculations
- quality control
- reviewing standards and benchmarks
- policing
- databases maintenance on building characteristics and audit results
- inevitable revisions and improvement of initial schemes

There is some technical consistency between most schemes. This includes the need to consider all building types and uses for both new and existing buildings. Different systems may be required for each. Registered modellers, assessors or auditors and approved calculation models are needed. Regular reporting over a building's life is required - when selling, letting and at 5-10 year intervals.

Several technical issues are unresolved or at least there is great variation between routes currently being proposed including

- how to measure or record the energy performance
- how to incorporate specific energy conservation measures into modelling and benchmarking
- whether it is possible to use operational, measured energy data rather than modelled results for disclosure
- how to incorporate building fittings and use information
- what level of disclosure is best and the issue of confidentiality
- whether third party assessment is required

Whilst we must assume that governments introducing energy disclosure can foresee benefits, it does not appear that many have tried or have been able to identify let alone quantify these benefits. While the effort and costs of introducing a mandatory disclosure system are recognised to be high, we have not been able to gather much information on this subject.

As the majority of the schemes identified and investigated are still under development, no further general conclusions have been drawn. Issue specific conclusions are drawn under each sub-sections of the analysis section of the report (Section 6).

## 7. APPENDICES



## 7. Appendices

1. EXPERTS' DETAILS
2. EUROPEAN UNION ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE
3. NOTES ON CANADA OEE PROGRAMS
4. KANSAS ENERGY EFFICIENCY DISCLOSURE FORM
5. RESPONSES TO AUSTRALIAN FEEDBACK

## 1. Experts' details

### CANADA

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### FRANCE

Ministere de l'Equipeement, des Transports, de l'Amenagement du territoire, du Tourime, et de la Mer  
 Direction Generale de l'Urbanisme, de l'Habitat, et de la Construction  
 Arche Sud  
 92055 La Defense, Paris  
 France

### KANSAS, USA

Kansas State University <http://www.engext.ksu.edu>  
 State Environmental Resource Centre <http://www.serconline.org>  
 Kansas Legislature <http://www.kslegislature.org>  
 US DOE Energy Efficiency and Renewable Energy <http://www.eere.energy.gov>

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 PO Box 123 Blindern  
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### PORTUGAL

University of Porto  
 Rua Dr. Roberto Frias  
 s/n 4200-465 Porto, Portugal

### THE NETHERLANDS

VROM, Ministry of Housing, Spatial Planning and the Environment  
 Directorate of Policy Development  
 Rijnstraat 8, PO Box 30941  
 2500GX Den Haag, Internal PO Box 220,  
 The Netherlands

### UNITED KINGDOM

FaberMaunsell Ltd Sustainable Development Group  
 23 Middle Street  
 London EC1A 7JD, United Kingdom

### EUROPROSPER

**EURO**pean **PR**ogramme for **O**ccupant **S**atisfaction, **P**roductivity and **E**nvironmental **R**ating of buildings: certification of existing building energy performance.

*The SAVE funded Europrosper project has been working in the context of the EPBD since April 2002 to develop an energy certification methodology for occupied office buildings based on actual (measured) energy consumption. The prototype method that has been developed by the Europrosper project represents a solution for just one circumstance viz. occupied office buildings in the UK. However, its structure is deliberately designed to enable it to be applicable in other Member States and to be extended to other non-residential building types and sectors, including mixed-use buildings.*

[http://europrosper.energyprojects.net/links/grading\\_buildings\\_IEECB\\_Apr04\\_finalpaperC.pdf](http://europrosper.energyprojects.net/links/grading_buildings_IEECB_Apr04_finalpaperC.pdf)

## 2. European Union Energy Performance Of Buildings Directive

Available at:

HTML document:

[http://europa.eu.int/smartapi/cgi/sga\\_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=32002L0091&model=guichett](http://europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexapi!prod!CELEXnumdoc&lg=EN&numdoc=32002L0091&model=guichett)

PDF document:

[http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l\\_001/l\\_00120030104en00650071.pdf](http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_001/l_00120030104en00650071.pdf)

## 3. Notes on Canada OEE Programme

### 3.1 ENERGUIDE FOR HOUSES

On October 15, 2003, the Government of Canada launched a grant program to encourage homeowners, particularly those who have older homes that are in need of energy efficiency upgrades, to retrofit their homes to make them more energy efficient. By using less energy from fossil fuels, the greenhouse gas emissions that contribute to climate change will be reduced. Only homeowners who have had the EnerGuide for Houses evaluation and have followed up on recommendations will be eligible for a grant. The house must also achieve a minimum energy performance improvement.

Upon receiving a call from a homeowner, an EnerGuide for Houses advisor will make an appointment to assess the home and tell them their energy-using characteristics. The evaluation includes the following:

- A "blower door" test to identify air-leakage points.
- A comprehensive walk-through of your house to collect data for modelling the home's energy use using simulation software.
- An EnerGuide for Houses Report with customized energy upgrade recommendations for the home.
- An estimate of annual energy consumption along with an EnerGuide for Houses rating and label.

When the homeowner has carried out the recommended improvements, they can request a follow-up visit, often for free, to re-evaluate the home and update their EnerGuide for Houses report and label. If they have done a number of the recommendations, they could be eligible for a grant.

As the EGH evaluation, valued at between C\$400 (USD 320) and C\$450 (USD 360), is subsidized in part by Natural Resources Canada, the service often costs much less. Homeowners are told to check with their local service organization for exact pricing.

The program was developed to address specific concerns in the Canadian housing sector.

- The need to improve the efficiency of "existing houses" (about 8 million housing units in total) as a part of the Housing Sector's response to meeting Canada's climate change commitments.
- The need to provide Canadians with personalized and objective advice on how to improve the energy efficiency of homes
- The absence of a pool of qualified experts in the field of energy efficiency housing retrofits.

### 3.2 ENERGY INNOVATORS INITIATIVE

The **Energy Innovators Initiative (EII)** helps commercial businesses and public institutions increase energy efficiency in existing buildings. Organization can lower operating costs, increase comfort and reduce greenhouse gas emissions that contribute to climate change.

As part of Natural Resources Canada's Office of Energy Efficiency, the EII works with a network of partners across the country to provide tools, publications, opportunities for national recognition and other services. By becoming a member of the EII, an organization can also apply for **Energy Retrofit Assistance (ERA)** funding.

### 3.3 COMMERCIAL BUILDINGS INCENTIVE PROGRAM

Natural Resources Canada's Commercial Building Incentive Program (CBIP) assists commercial and institutional building owners and designers build more energy efficient buildings. CBIP offers a financial incentive for the incorporation of energy efficiency features in new commercial / institutional building designs. The objective of this new incentive is to encourage energy-efficient design practices and to bring about lasting changes in the Canadian building design and construction industry. A financial incentive of up to \$60,000 (USD 48K) will be awarded to building owners whose designs meet CBIP requirements. The program requirements are based on two documents: the [Model National Energy Code for Buildings](#) and [CBIP Technical Guide](#). An eligible building design must demonstrate a reduction in energy use by at least 25% when compared to the requirements of the MNECB. The duration of the program will be from April 1, 1998, to March 31, 2007.

### 3.4 ADMINISTRATIVE DETAILS OF HOUSING PROGRAM

The housing program requires:

- A tool to accurately assess the energy efficiency of a house and provide a rating label and report for the homeowner
- A pool of contracted service delivery providers with employees who acted as energy efficiency advisors (delivery agents and advisors) and a mechanism to support their service contracts

- An electronic deliverable product upon which contractual payments could be made (e-house files produced by the simulation software), and
- An efficient mechanism to deliver, quality assurance, and manage the files and the administration surrounding them.
- Enough capacity to accommodate a minimum of 1.2 million files.

It was anticipated that the program would start slowly as service organisations came on board and became accustomed to the methodology. The program would need to be capable of increasing intake of files following a sharp bell curve as the demand for the service grew.

Specification requirements for the comprehensive computer-based infrastructure include:

- to be fully scalable to enable proactive management decisions
- to be capable of verifying the integrity of the information, identifying field data errors and rejecting such files with email notification of the error to the sender
- to be capable of processing invoices and payments electronically within specified timelines
- to be capable of quantifying and tabulating CO<sub>2</sub> reductions/savings (using energy savings calculated by the simulation software)
- to be capable of providing wide variety of reports for statistical and trend analysis
- to be capable of being expanded to support the administration of an incentive activity should such a program be funded by Parliament

Existing NRCan software was modified to serve program requirements and regional contractors selected through an open competitive process.

The challenge was the automated management infrastructure. The objective was to create a comprehensive computer-based system (the "EGH database") that would allow for growth, adaptability and sustainability. The system had to be easy to use on a daily basis and to minimize "red-tape". The system had to be robust enough to be fully scalable to allow for growth without any (or only minor) increase in staffing. The goal was an electronic system that would increase productivity while minimizing errors and administration.

#### **File submission and verification**

The simulation software had to generate an electronic "export" file containing all the information needed for optimum administrative efficiency. The database receives house files by e-mail from service organisations. This automated verification uses coded content parameters to verify each of the 117 data fields in each file. If content does not comply with any parameter, the file is rejected and an email is automatically sent to the service organisation with an explanation of the reason for rejection. Service organisations receive notification within 5 minutes of the file submission, enabling them to immediately rectify problems. The speed of response facilitates ease of administration. By all parties automatic field data verification has reduced error rates to 1% (as determined by the average percentage of rectifications required to date after completion of a separate quality assurance process).

Electronic date stamping of files ensures proper tracking and appropriate payment timelines. The system allows NRCan to override the system to accept non-compliant files in special cases.

#### **Data modelling**

The system also allows the generation of statistics, such as energy and CO<sub>2</sub> reductions by fuel and geographical zone for evaluated houses or recording key recommendations made to homeowners. Over 70 reports are automated but NRCan can create new reports at will. This allows daily tracking enabling accurate performance reporting to Management.

#### **Announcement**

In August 2003, the Government of Canada announced a \$73M (USD 58.4M) grant program for homeowners undertaking energy retrofits with EGH advice. The program had 3 months to prepare to launch this initiative. The database now became key in the management and verification of grant submissions and as a tool to track

- personal information for the purposes of creating and mailing cheques.
- dates applications are received
- dates and dollar value of payments sent

The requirements of the new incentive were accomplished within a few weeks. Additional functions were added to allow both administration of the incentive program and to meet the requirements imposed by the Privacy Act. The majority of <http://www.kcc.state.ks.us/energy/energyform.pdf> applications are processed and paid within 60 days, accommodating the 90-day payment framework for cheques, a delivery commitment made on the launch of the program.

## 4. Kansas Energy Efficiency Disclosure Form

Available at:

<http://www.kcc.state.ks.us/energy/energyform.pdf>

## 5. Responses To Australian Feedback

The Australian Greenhouse Office undertook a limited preliminary consultation on the study's outputs. Feedback was provided in an email dated 08/03/2005 and following are Faber Maunsell's responses.

*1. Do any countries specifically dealt with peak demand issues. (not really relevant to the study but your comment would be interesting. Peak demand is becoming a big issue in Australia)*

No country appears to be addressing peak demand. It is not mentioned in the Energy Performance of Buildings Directive. We believe the reason is that whilst it is a major issue for electricity suppliers, it is not so important from an overall carbon emissions reduction point of view.

*2. Whether appliances were individually considered i.e. hot water systems and all-of-house heating systems etc (any 'quick' audit of existing houses here would presumably focus on these initially)*

No, in general the move is towards whole building energy use disclosure and away from elemental performance disclosure.

*3. Some idea of the amounts of time and money for publicity/ training for industry and the public i.e. are the targets that have been set here realistic.*

We were able to gather virtually no information on this subject. The reason may be that this has not been planned in advance of legislation or that countries do not wish to publicise how much money they think will be necessary to make the system work.

*4. Some idea of the training and preparation costs for any mandatory reporting system.*

Similar to the above. It is agreed that much training of assessors/auditors will be required to implement new disclosure requirements. Since assessors will make business out of their new activities we believe that countries may assume that they will pay their own training costs. Preparation costs again have not been given and we assume that these will be assimilated as part of normal Government activity. The question was asked of respondents but no information was available. (see question C12)

*5. How the issue of measured vs calculated energy was handled with the public - there is an ongoing issue with this from some academics - it is therefore likely to be a major publicity issue in South Australia at least at the time of any launch.*

The use of measured versus calculated energy use is much debated and not necessarily resolvable to satisfy academics. The solution adopted by some countries will be to use both, the calculated use based on the actual building occupancy alongside the meter readings. Whilst this is a more expensive option it does give a good picture of the energy use. In other countries we assume the decision to use either one or the other has been made on practical grounds. We do not know of any particular efforts that have been made yet to persuade the public of the benefits of one system or the other.

*6. Were these mandatory disclosure practices tied into any minimum standards, e.g. any associated government regulatory initiatives such as requiring minimum levels of wall and roof insulation for example.*

No, mandatory disclosure on existing buildings will not include standards for individual energy use items, according to the proposals given so far

*7. In case of on-site measurement of energy using a house energy rating system type equivalent, how was this achieved? This would suggest a fairly thorough site investigation, and possibly a 'default' protocol for such things as complex composite construction and a 'deemed to' set of principles for out-of-the-ordinary examples.*

On site measurements normally have to be carried out by an accredited surveyor. The audit should be quite thorough but will need some default and internal assumptions where aspects cannot be surveyed in detail, e.g. wall construction. There are systems of self auditing using a proforma, but if this is not completed by a "competent person" (phrase used in UK) it would be difficult to use it legally. Some countries will consider qualified engineers and others as automatically certified assessors, so that they could "self certify" their buildings.

*8. The cost of undertaking an investigation into energy disclosure will be an issue, particularly in states where some rentals properties will be comparatively low compared to the other states. In any of the examples, were various levels of disclosure information used within a country to compensate on the basis of social equity?*

No examples of different levels of disclosure for buildings with different rent levels have been proposed to our knowledge. Since the idea of the legislation is to reduce energy use across the board this should apply to all buildings especially as old low rent buildings may well be poor in energy efficiency.

*9. Can we also discover what social research, if any, has been undertaken in these overseas programs to identify the form of disclosure that best motivates current owners and potential purchasers/renters to take desirable energy efficiency actions. Do people respond to Mj/m2 for example?*

We do not know of any research that has been carried out to determine what form of disclosure best motivates people to make energy improvements. It seems likely that the cost of energy use might be the simplest indicator.