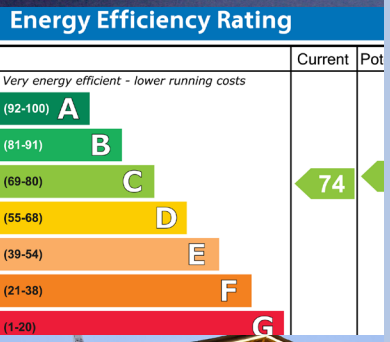

Energy Labelling and Efficiency Requirements for Existing Buildings

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Matt Horne

January 2010

the PEMBINA institute
Sustainable Energy Solutions

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The Pembina Institute is a national non-profit think tank that advances sustainable energy solutions through research, education, consulting and advocacy. It promotes environmental, social and economic sustainability in the public interest by developing practical solutions for communities, individuals, governments and businesses. The Pembina Institute provides policy research leadership and education on climate change, energy issues, green economics, energy efficiency and conservation, renewable energy, and environmental governance. For more information about the Pembina Institute, visit www.pembina.org or contact info@pembina.org. Our engaging monthly newsletter offers insights into the Pembina Institute's projects and activities, and highlights recent news and publications. Subscribe to Pembina eNews: http://www.pembina.org/enews/subscribe.

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Energy Labelling and Efficiency Requirements for Existing Buildings

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1. Summary

A common approach to reducing energy consumption and greenhouse gas (GHG) emissions from existing buildings is energy labelling. The theory being that providing better information about a building's efficiency will facilitate owners and occupants to make decisions that reduce energy consumption. Energy costs can be more easily factored into purchasing decisions, and over time the demand for energy efficiency homes and buildings will become a stronger market driver.

Energy labelling requires an energy audit to assess the building efficiency. Audits can range from a simple walk-through to ensure equipment meets minimum energy efficiency levels and that weather stripping and minimum insulation have been installed, to more comprehensive investigation of air tightness and other energy performance elements. Following the audit, the building is rated on its energy performance and a label is provided to help compare the building to other buildings.

In our review, initiatives have been grouped into three categories: a) initiatives where labels are voluntary, b) initiatives where labels are mandatory but taking action to improve energy performance is voluntary and c) initiatives where minimum energy efficiency levels are mandatory (following the building audits and rating). All three types of initiatives are often linked with incentive programs and low-interest loans, and the energy ratings are typically accompanied with recommended actions to reduce energy consumption.

Our review did not produce any evidence that voluntary labelling programs led to higher levels of energy efficiency in existing buildings. Evaluations of programs where labelling was mandatory, but efficiency and conservation actions were voluntary have been inconclusive. For example, Denmark's energy labelling requirements has not had a significant effect on reducing energy consumption on its own. On the other hand, analyses of initiatives in the Australia Capital Territory have shown that houses with a higher Energy Efficiency Rating are more valuable that comparable, but less efficient, properties.

Mandatory approaches, which are growing in the US, require existing buildings to meet a prescriptive list of energy conservation measures at the point of sale or when a major renovation is undertaken. Long running examples are the City of Berkeley's residential and commercial energy conservation ordinances. These approaches are essentially building codes for existing buildings, and they seem to be more effective than voluntary models. Estimated reductions in energy consumption when retrofits are conducted at the point of sale or major renovations were 10%. Some of these long-running models are considering a transition from prescriptive to performance-based approaches.

2. Voluntary Energy Labelling

Energy labelling generally involves conducting an energy audit and reporting a building's level of energy consumption in an easy to understand fashion. Labelling enables building purchasers and renters to factor energy costs and greenhouse gas emissions into their decisions when evaluating different properties. If the building's operating costs or environmental impact is an important factor in those decisions, then energy labels have the potential to increase demand for buildings and homes with smaller environmental footprints.

In most Canadian examples, energy labels for homes or buildings are voluntary. This section discusses voluntary initiatives such as EnerGuide; the labelling pilot in Oak Bay, BC, and ASHRAE's upcoming Building EQ labelling program. A Further example of voluntary labelling, not covered here, is RESNET (Residential Energy Services Network) and its HERS (Home Energy Rating System) for residential buildings in the US.[1,2]

2.1 EnerGuide: A Canadian Example

EnerGuide is a voluntary energy labelling program in Canada that applies to both new and existing homes. The EnerGuide label is based on a buildings performance relative to a calculated benchmark building of the same size in the same climate. This ratio is normalized onto a scale of 0 to 100, with100 being a net-zero energy home. The EnerGuide rating accounts for the efficiency of the building shell and its heating system. It does not account for the energy use patterns of the actual occupant (e.g. thermostat settings, preferences to leave windows open, or length of showers), using average figures instead. This allows similar homes to be compared with each other.[3] Figure 1, below, shows an example of an EnerGuide label.

[1] For more info see RESNET, www.natresnet.org.

[2] RESNET has partnered with the City of Shanghai to develop a HERS type rating for Shanghai's residential buildings. More info on energy labelling in Shanghia available from: RESNET, RESNET - Shanghai Real Estate Science Research Institute, http://www.natresnet.org/about/affiliates/shanghai.htm (accessed August 24, 2009).

[3] Natural Resources Canada, Office of Energy Efficiency, 2005, *EnerGuide for New Homes: Administrative and Technical Procedures* (Ottawa, ON: Natural Resources Canada, 2005) Appendix A, 47.

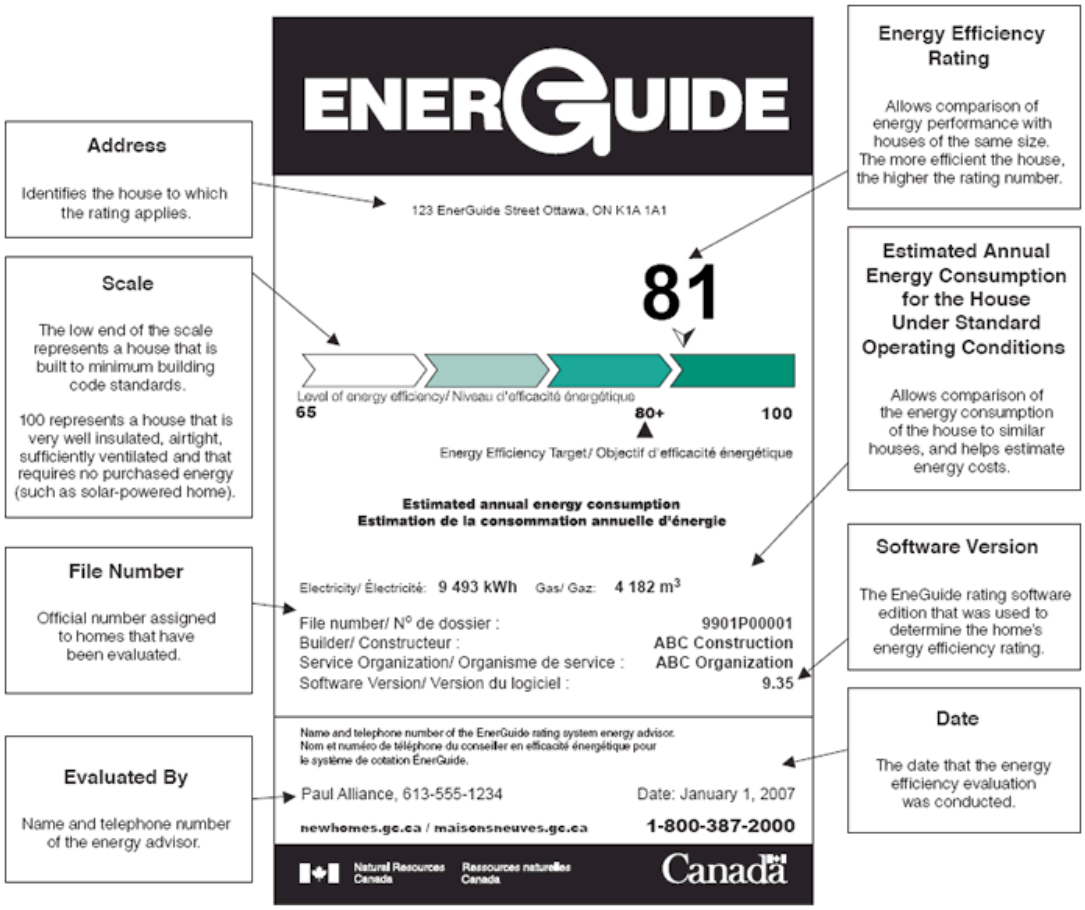

Figure 1 - Example EnerGuide Label[4]

2.2 Oak Bay: A BC Example

The Oak Bay energy labelling pilot project is part of a wider project, involving the Electricity and Alternative Energy Division[5] (EAED), Salt Spring Island, Prince George and Tsawwassen.[6] In Oak Bay homeowners who put their homes for sale through the Re/Max Camosun Oak Bay office are eligible to receive a home energy audit for half price ($75) through a rebate from BC Hydro. Participants must share the results of the audit, including the EnerGuide rating. Energy information will be included in the listing when it is put up for sale.[7]

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[4] NRCan, EnerGuide Rating Label, http://oee.nrcan.gc.ca/residential/personal/new-homes/upgrade-packages/label.cfm?attr=4 (Accessed August 20, 2009).

[5] EAED is a division of BC's Ministry of Energy, Mines and Petroleum Resources (MEMPR).

[6] Provincial (ENGO) Forum, June 10, 2009, http://www.empr.gov.bc.ca/MACR/communities/ProvincialForum/Documents/Provincial%20Forum%20Notes%20June%2010%202009%20(FINAL)2.pdf, 6. (Accessed August 20, 2009).

[7] Victoria Real estate Voice, Time of Sale Home Energy Labelling Pilot, http://victoriarealestatevoice.com/archives/2009/7 (accessed August 19th, 2009).

2.3 ASHRAE's Building EQ Program

Currently, ASHRAE (American Society of Heating, Ventilating, Refrigerating and Air Conditioning Engineers) is developing an energy labelling program in the anticipation of the introduction of energy labelling requirements in North America.[8] The program is called the Building Energy Quotient (EQ), and it is intended to apply to commercial buildings and high-rise residential buildings. The Building EQ is being designed so that the general public easily understands it.

In addition to the label, an energy certificate will be provided to the building owner. This will contain technical information for the building owner, potential owners and tenants, utility companies, as well as maintenance and operations staff. Further documentation will be available for architects and engineers and other technical people to provide insight into possible improvements to the building's performance. ASHRAE intends to provide both "as designed" and "in operation" labels. This will enable the comparison of energy models to actual construction.[9] ASHRAE anticipates that this comparative data will be very useful for future research and development of higher performing buildings.[10]

The Building EQ program was developed by an international committee, which included representatives from Canada, the European Union (Greece), Singapore, the California Energy Commission, and the US Environmental Protection Agency. ASHRAE also collaborated with the Building Owners and Manager's Association (BOMA), the US General Services Administration and other building owners. The Building EQ program intends to initiate a pilot program in 2010. The pilot will issue labels to selected high performance buildings and provide opportunities to refine the process prior to the full launch.[11] Figure 2 (next page), shows the proposed label.

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[8] ASHRAE, 2009, *Building Energy Quotient - ASHRAE's Building Energy Labeling Program: Promoting the Value of Energy Efficiency in the Real estate Market,* http://buildingeq.com/files/Presentation.pdf (accessed June 23, 2009).

[9] Ibid.

[10] Ibid.

[11] Bruce Hunn, ASHRAE Director of Strategic Technical Programs, e-mail communication, August 21, 2009.

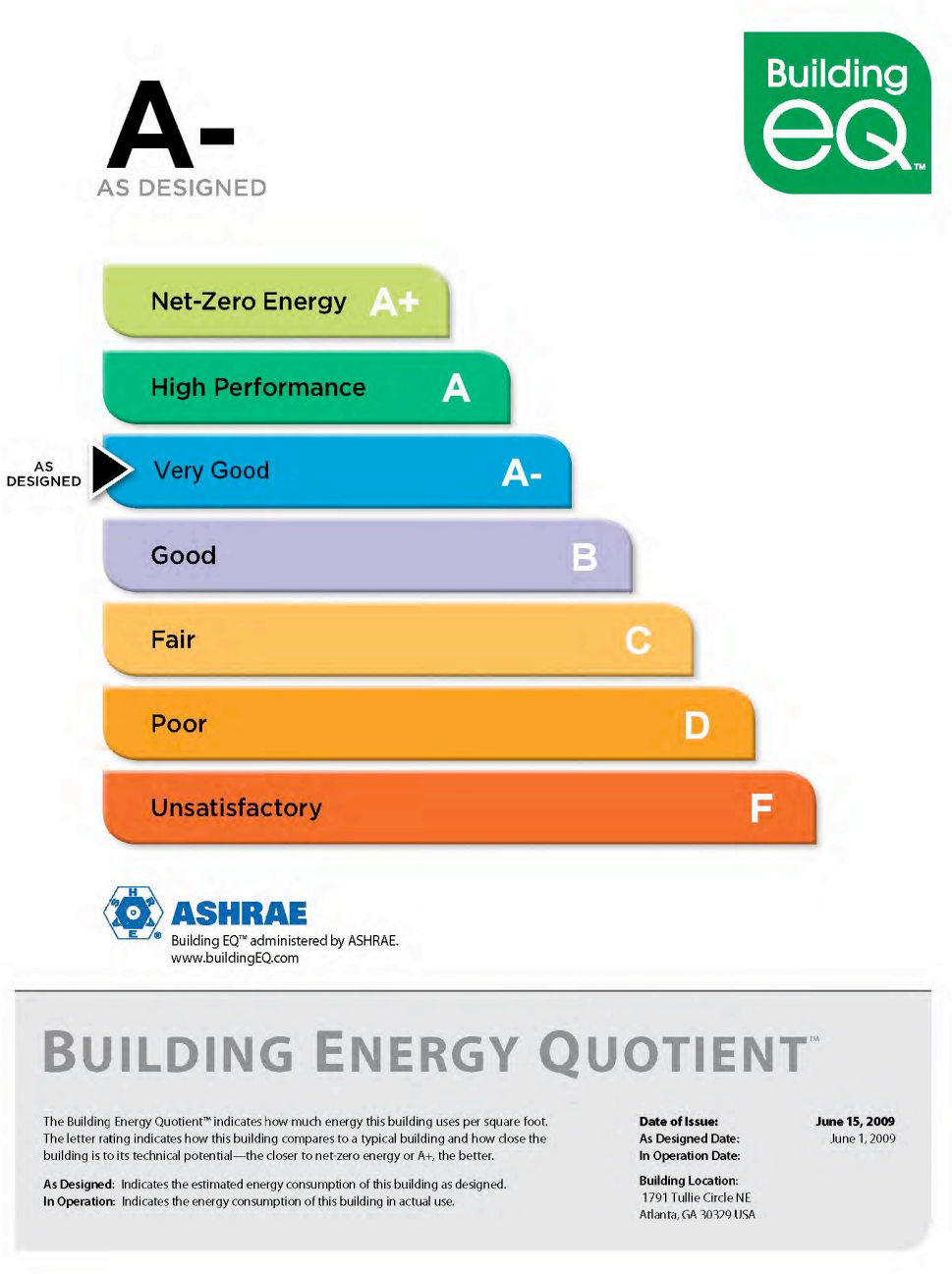

Figure 2 - ASHRAE's Building EQ Label[12]

2.4 Effectiveness of Voluntary Energy Labelling

The effectiveness of voluntary energy conservation and efficiency measures, including labelling, has been questioned by many experts. They likely play an important role by increasing

[12] ASHRAE, ASHRAE Building Energy Quotient Program, http://buildingeq.com/ (Accessed August 20, 2009).

awareness and build support for stronger, more effective policies.[13] Overall changes in energy consumption are likely to be small unless regulatory standards or financial mechanisms are in place to require or put a premium on higher levels of energy efficiency.[14] In short, reliance on a voluntary measure alone, such as energy labelling, is unlikely to achieve significant changes in building energy performance on its own.

[13] Mark Jaccard, *Sustainable Fossil Fuels*, (New York: Cambridge University Press, 2005), 281-282.

[14] W.L. Lee and F.W.H Yik, "Regulatory and Voluntary Approaches for Enhancing Building Energy Efficiency," Progress in Energy and Combustion Science 20 (May 19, 2004), www.elsevier.com/locate/pecs (accessed September 18, 2009).

3. Energy Labelling Requirements

While most Canadian experiences with energy labelling have been voluntary, they can also be implemented as mandatory requirements. Denmark's Energy Labelling Scheme serves as a good case study of energy labelling requirements – being one of the first of such policies and having been studied significantly. It is the focus of this section, which includes its history, implementation and evaluation. A few other mandatory labelling programs (from Europe, the United States and Australia) are described in less detail at the end of the section. The Australian experience in particular appears to have produced more positive outcomes than the Danish experience.

3.1 History

Denmark is considered one of the leaders in energy labelling. Its mandatory Energy Labelling Scheme,[15] which has been in place since 1997, inspired the European Union (EU) to introduce labelling requirements (see section 3.10).

3.2 Objectives

The main objective of Denmark's Energy Labelling Scheme is to encourage energy and water efficiency and conservation in the building stock. It is intended to inform new owners and potential buyers about the future energy costs and potential energy and water saving strategies that could be applied to a given property.[16]

3.3 Application and Eligibility

The Danish Energy Labelling Scheme applies to residential, public, and commercial buildings. It applies to both existing and new buildings. Existing buildings require labelling prior to their sale and new buildings require labelling prior to their occupation.[17] Small buildings (less than 1500

[15] Denmark's Energy Labelling Scheme is part of its "Act to promote energy and water savings in buildings"
[16] Kjærbye, 7.

[17] Act to Promote Energy Savings in Buildings: Danish Act no. 585 of 24th June 2005 (unofficial translation), http://soeg.ekn.dk/Afgorelser/L_585_Act_to_promote_energy_savings.pdf (accessed September 18, 2009).

m^2) are required to have up to date energy labels[18] when they are put on the market for sale. Large buildings need to update their energy labels every five years.[19]

3.4 Exemptions

Factory buildings and identified by the Danish government to have cultural and historical significance, are exempt from labelling requirements.[20]

3.5 Implementation Process

For small buildings, Denmark's labelling requirements include an energy performance rating and an energy plan. The rating is calculated using standard conditions for occupant consumption and weather,[21] a similar approach to the EnerGuide rating. The intent of this approach is to provide a rating that is independent of each occupant's habits and variation in annual weather.

The building sellers are responsible for the costs of having up to date energy labels.[22] For single-family homes, costs are typically 2,000 to 3,500 DKK ($440 to $760 CND).[23] This includes the cost of hiring an approved energy consultant to do the labelling.

The energy plan includes information on the condition of the building, heating system, current energy use, expected energy use, and typical conditions such as energy pricing, temperature settings, and household size. The energy plan also includes information on energy and water use reduction measures that can provide positive financial returns.[24]

For large buildings, the requirements are similar and include: energy rating, energy management, registration of consumption[25] and energy planning. The energy planning includes

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[18] Energy Labels remain valid for five years. Source: International Energy Agency (IEA), Action Plan for Renewed Energy Conservation, (IEA Policy Database, 2008), http://www.iea.org/textbase/pm/?mode=pm&id=2313&action=detail (accessed September 15, 2009).

[19] Danish Energy Agency, Energy Labelling, http://ens.dk/EN-US/CONSUMPTIONANDSAVINGS/BUILDINGS/ENERGY_LABELLING/Sider/Forside.aspx (accessed August 25, 2009).

[20] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

[21] Danish Energy Agency, Energy Labelling, http://ens.dk/EN-US/CONSUMPTIONANDSAVINGS/BUILDINGS/ENERGY_LABELLING/Sider/Forside.aspx

[22] Kjærbye, 7.

[23] Value given in 2002 DKK. Source: Kjærbye, 8. Value in Canadian Dollars based on conversion from www.xe.com, July 6, 2009.

[24] Profitability is defined as: annual savings in DKK * estimated technical lifetime)/estimated necessary investment in DKK) >1.33 (Kjærbye, 8).

[25] NOTE – More information on these terms is needed. What are the energy management requirements, who registers consumption (is it actual or modlled consumption).

recommendations for improvements, and anticipated investment costs, annual energy and cost savings, and pay-back potential. The Danish Energy Label is shown below in Figure 3.

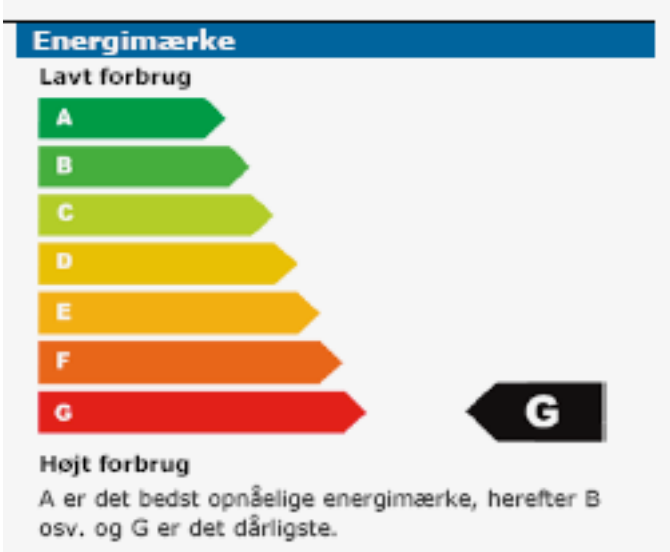

Figure 3 - Danish Energy Label[26]

3.6 Connections to Other Policies

The Danish Energy Labelling Scheme has no strong connections to other Danish polices. This is considered on of the weak points of the policy and is currently being reviewed. [27]

3.7 Development and Consultation Process

This policy followed Denmark's standard development and consultation process which involves making the proposed policy public then allowing time for community and stakeholder input prior to releasing the final policy. [28]

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[26] Source: Weis, Tanja. 2008. Energy Certificates for Buildings in Denmark – Danish lessons learned, Slideshow presentation available at: http://www.ambwarszawa.um.dk/NR/rdonlyres/405C1285-4F86-4375-81FE-234001A9DE0A/0/EnergyCertificatesforBuildingsinDenmarkDanishlessonslearned051208.pdf (accessed August 27, 2009).

[27] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

[28] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

3.8 Enforcement

According to a study conducted by Kjærbye (2008) on the effectiveness of the Danish Energy Labelling Scheme, the consequences for not labelling a house are insignificant. [29] If a building is sold without a label, the buyer has a right to have the building labelled at the sellers cost. [30] Although the Danish Government can issue fines to building owners who do not comply with the labelling requirements, this has never occurred. Currently stricter enforcement is being considered.[31]

3.9 Evaluation

The Danish Institute for Governmental Research evaluated the effect of the Danish labelling requirements for small buildings for up to four years after they were purchased. Each year 45,000 to 50,000 single family homes are labelled in Denmark, at an annual cost of approximately 20 million Canadian dollars.[32]

It was found that there was no significant change in residential energy consumption due to the energy labelling on its own.[33] Only 50% to 60% of houses that were required to have labels, actually had labels.[34] More recently compliance has been estimated to be in the range of 25% to 50%, with the disappointing results largely attributed to the lack of enforcement. [35] On average, the recommended energy efficiency and conservation measures were enough to reduce energy consumption by 20% for each single family home if implemented. More than 45% of the owners of labelled homes implemented some energy savings measure in the first year after their purchase; however, this was not necessarily due to the labelling alone.[36] On balance, the Danish

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[29] Vibeke Hansen Kjærbye, *Does Energy Labelling on Residential Housing Cause Energy Savings?* Working Paper (Nyropsgade, Copenhagen: AKF, Danish Institute for Governmental Research, 2008), 8. http://www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf (accessed June 25, 2009).

[30] Act to Promote Energy Savings in Buildings: Danish Act no. 585 of 24th June 2005 (unofficial translation), http://soeg.ekn.dk/Afgorelser/L_585_Act_to_promote_energy_savings.pdf (accessed September 18, 2009), **§ 6.**

[31] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

[32] Value based on 2002 DKK. Source: Kjærbye, 6, conversion from www.xe.com, July 20, 2009.

[33] Kjærbye used Propensity Score Matching to evaluate the significance of the energy conservation measures taken by home owners, the effect of labels on home buying decisions was not evaluated.

[34] Kjærbye, 8.

[35] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

[36] This was determined by telephone interviews with homeowners. Source: Laustsen, Jens and Kirstine Lorenzen, 2003. *Danish Experience in Energy Labelling of Buildings in Denmark.* http://www.eva.ac.at/publ/pdf/forum_experience_dk.pdf (accessed July 6, 2009).

Energy Agency considers the current labelling requirements ineffective and they are evaluating potential changes.[37]

Occupancy and usage are important factors to consider when assessing a building's energy performance.[38] This should be taken into account when determining the energy label for a building, as it is important for existing buildings to be used rather than increasing the demand for new buildings. Higher usage and occupancy should not be penalized because it promotes a lower overall energy and material consumption. Occupancy and usage becomes more of an issue when comparing commercial and institutional buildings which have a variety of uses.

3.10 Other examples of mandatory labelling

As evidenced by several other examples in Europe and North America, mandatory energy labelling is becoming more and more commonplace.

The European Union's directive on Energy Efficiency of Buildings, introduced in 2002, requires that all member states introduce energy certification requirements for both new and existing buildings at the point of sale or rent.[39] The EU expected energy certification policies to be implemented by 2006, however due to concerns from some member states regarding a lack of a trained workforce to carry out certification the period was extended to January 2009.[40] While the degree of compliance with the extended deadline is not clear, several other member states provide positive examples.

Portugal introduced a "System of Energy Certification" in 2007, which came into full effect 2009. The energy certificates work in a similar manner to the Danish Energy Labels. Unlike the EnerGuide rating system, the rating does depend on the size of the buildings – for example, large buildings will likely receive a lower energy efficiency rating because they generally consume more energy than smaller buildings.[41] Tax incentives are available for buildings that achieve high

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[37] Jesper Ditlefsen, Civilingeniør, (Danish Energy Agency Contact for Labelling Scheme), e-mail communication, September 21, 2009.

[38] Andrea Frisque, Green Building Professor, University of British Columbia, personal communication, June 19, 2009.

[39] Vibeke Hansen Kjærbye, *Does Energy Labelling on Residential Housing Cause Energy Savings?* Working Paper (Nyropsgade, Copenhagen: AKF, Danish Institute for Governmental Research, 2008), 5. http://www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf (accessed June 25, 2009).

[40] International Energy Agency, Directive on the Energy Performance of Buildings, (IEA Policy Database, 2008), http://www.iea.org/textbase/pm/?mode=pm&id=933&action=detail

[41] *Casa certificada - Do you have the „energy certificate" for your house?,* 2009, http://www.portu.ch/portugal/news/casa-certificada-do-you-have-certificado-energetico-energy-certificate-your-house/100860/ (accessed July 20, 2009).

See Also:
http://www.erec.org/fileadmin/erec_docs/Projcet_Documents/RES2020/PORTUGAL_RES_Policy_Review_09_Final.pdf
https://www.uktradeinvest.gov.uk/ukti/fileDownload/AlexandreFernandesADENE.pdf?cid=424729

levels of efficiency.[42] Certificates are required prior to the sale or rental of a building. Leases signed prior to 2008 are exempt.[43] Germany has also been a leader in energy labelling, introducing its labelling program in 1995.[44]

Austin Energy, the Austin City owned electricity utility, developed the Energy Conservation Audit and Disclosure Ordinance (ECAD) which came into effect June 2009.[45] It applies only to residential buildings that are customers of Austin Energy. The objective of the ordinance is to reduce Austin's GHG emissions and is part the city's Climate Protection Plan. The ordinance requires audits to be carried out at the point of sale of existing buildings that are older than 10 years. A copy of the audit report is also provided to the potential home buyer.[46] Exemptions are provided for homes that have participated in other Austin Energy conservation programs, or are transferred under inopportune circumstances such as foreclosure sale.

Washington, DC is another North American jurisdiction with energy labelling requirements.[47] This recent policy applies to all public buildings and private buildings greater than 50,000ft^2. The labels are now required for public buildings and will be implemented gradually for private buildings, starting with the largest buildings.[48]

The Australia Capital Territory introduced its Home Energy Rating Scheme 1999, which requires residential buildings to receive an energy audit and Energy Efficiency Rating (EER).[49] The EER provides a list of possible energy efficiency upgrades (similar to other programs reviewed in this report) and a "Star Rating" to indicate the level of thermal performance of the

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[42] Quinta Properties, Ten things you need to know about the energy certificate, http://www.quintaproperty.com/guide/ten-things-you-need-to-know-about-the-energy-certificate-36.html (accessed September 15, 2009).

[43] *Casa certificada - Do you have the „energy certificate" for your house?,* 2009, http://www.portu.ch/portugal/news/casa-certificada-do-you-have-certificado-energetico-energy-certificate-your-house/100860/ (accessed July 20, 2009).

See Also:
http://www.erec.org/fileadmin/erec_docs/Projcet_Documents/RES2020/PORTUGAL_RES_Policy_Review_09_Final.pdf
https://www.uktradeinvest.gov.uk/ukti/fileDownload/AlexandreFernandesADENE.pdf?cid=424729

[44] Germany has not been centrally collecting data for evaluation of their labelling policy (Kjærbye, 5), so although it was implemented earlier than Denmark's, less information is available.

[45] Austin Energy, Energy Conservation Audit and Disclosure Ordinance, http://www.austinenergy.com/about%20us/environmental%20initiatives/ordinance/ecadOrdinanceHomes.pdf

[46] Ibid.

[47] ASHRAE, 2009, *Building Energy Quotient - ASHRAE's Building Energy Labeling Program: Promoting the Value of Energy Efficiency in the Real estate Market,* http://buildingeq.com/files/Presentation.pdf (accessed June 23, 2009).

[48] Council of the District of Columbia, *Clean and Affordable Energy Act of 2008*, http://www.dccouncil.washington.dc.us/images/00001/20080819161530.pdf (accessed September 18, 2009), 17 -18.

[49] Australian Bureau of Statistics, *Energy Efficiency Rating and House Price in the ACT* (Canberra, Australia: Department of Environment, Water, Heritage and the Arts, 2008).

building shell. The Star Rating ranges from zero starts to ten stars, with the latter being close to net zero heating or cooling demand.

The Australian Bureau of Statistics carried out a statistical model of the relationship between house price and the Energy Efficiency Rating.[50] They found that houses with a higher Energy Efficiency Rating receive a higher sale price. On average a home's value will increase 3% with each additional star. [51] It was also found that the additional value added to the house price from energy efficient upgrades was generally far greater than the cost of such upgrades. For example, the addition of R4 ceiling insulation in a relatively inefficient home will often be enough to gain one additional star for the EER. This would cost approximately AUD$1,200, and would add AUD$8,979 for an AUD$365,000 house.[52] While the evaluation concluded the rating system had a positive impact on energy efficiecy outcomes, it also found that other factors such as location and house size have a more significant impact on house price. [53]

[50] Ibid.

[51] Ibid.

[52] Ibid.

[53] Australian Bureau of Statistics, *Energy Efficiency Rating and House Price in the ACT* (Canberra, Australia: Department of Environment, Water, Heritage and the Arts, 2008), 8.

4. Energy Efficiency Requirements

Even if energy labels are mandatory, the labels themselves only provide information and help justify or encourage energy efficiency investments if potential buyers care about the information. To ensure greater levels of investment in energy efficiency, some jurisdictions have decided to impose energy efficiency requirements for existing buildings. In effect, these are similar to the way new building codes apply to new construction.

This section discusses prescriptive policies that aim to increase energy efficiency of existing buildings. The main example discussed is Berkeley, which developed the first residential and commercial energy conservation ordinances (RECO and CECO). Under these policies, Berkeley has defined a list of basic energy efficiency improvements that need to be implemented in homes or buildings at the point of sale or a major retrofit.

As noted in section 4.10, Berkeley is moving away from the current prescriptive list of measures towards a performance based requirement. Berkeley's polices combine mandatory labels and energy conservation requirements.

4.1 History

The City of Berkeley, California originally implemented its Residential Energy Conservation Ordinance (RECO) in 1980 and its Commercial Energy Conservation Ordinance (CECO) in 1979.[54] It has been replicated in California and beyond.

4.2 Objectives

The objectives of Berkeley's RECO and CECO include reducing energy use, greenhouse gas emissions, and water consumption in existing buildings.[55] The program also aims to protect

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[54] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance" (presentation at Sonoma County RECO meeting, February 24, 2009), available at http://www.ecoleader.org/assets/downloads/RECO/Berkeley%20RECO%20for%20Sonoma%20County.pdf (accessed July 14, 2009).

[55] City of Berkeley, *Residential Energy Conservation Ordinance (RECO): A Compliance Guide for Berkeley's Residential Property Owners, Buyers, and Sellers,* (Berkeley, California: City of Berkeley Planning Department, 2008) Available at http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=16030 (accessed July 9, 2009).

residents from increasing energy costs[56], reduce operating costs for owners and tenants, and increase the market for energy efficiency related jobs.[57] RECO policies also aim to increase occupant comfort and reduce air pollution.[58]

4.3 Application and Eligibility

The RECO and CECO requirements are applied at the point of sale, transfer, or major renovations (i.e. those costing more than $50,000). CECO also applies to buildings that undergo additions greater than 10% of the conditioned area.[59] For both ordinances, either the seller or buyer may assume responsibility for compliance. The responsibility to implement the measures can only be transferred once for any given property.[60] The required investments are usually minor in cost relative to the purchase price and are often incorporated into the mortgage. [61]

RECO requires that the following list of prescriptive measures be implemented prior to property transfer or building inspection:

- Low-flow plumbing fixtures
- R-12 insulation wrapping around hot water tanks
- R-30 ceiling insulation
- Weather stripping for exterior doors
- Replacement of incandescent with compact fluorescent lighting

CECO Measures include:

- Checking thermostats on Heating Ventilating and Air Conditioning (HVAC) Equipment
- Adding air economizers for HVAC systems (a piece of equipment which draws in outside air for cooling rather than relying on mechanical cooling)

City of Berkeley, *Commercial Energy Conservation Ordinance (CECO),* http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=15474 (accessed July 9, 2009)

[56] San Francisco Department of Building Inspection, What You Should Know About The Residential Energy Conservation Ordinance (RECO), (San Francisco, California: Department of Building Inspection), 2007), http://www.sfgov.org/site/uploadedfiles/dbi/Key_Information/19_ResidEnergyConsBk1107v5.pdf (accessed July 10, 2009).

[57] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance"

[58] Reiss, 1.

[59] "City of Berkeley CECO," http://www.caleep.org/docs/resources/greenbuildings/Berkeley_CECO_Ordinance.pdf (accessed July 14, 2009).

[60] City of Berkeley, *Residential Energy Conservation Ordinance (RECO): A Compliance Guide for Berkeley's Residential Property Owners, Buyers, and Sellers,* 2.

[61] Reiss, 2.

- Repairing leaky air ducts
- Insulating pipes
- Tuning and cleaning furnaces and boilers
- Repairing hot water and steam leaks
- Installing low flow fixtures[62]

4.4 Exemptions

The City of Berkeley does not require conservation investments in excess of the following spending thresholds:[63]

- 0.75% of the final property sales price when a single structure of two housing units or less is sold or transferred;
- 0.75% of the final property sales price for each structure when a property with more than one structure of two housing units or less is sold or transferred;
- $0.50 per square foot when any *one structure with three or more housing units is sold*; or
- 1% of renovation costs when a property is undergoing a renovation of $50,000 or more.

For CECO, exemptions can be granted either for specific measures or for the entire policy. The auditor grants exemptions for measures that are not cost effective (meaning a payback period greater than five years), are not applicable, or would cause financial hardship.[64] The building owner may be granted an exemption if:

> *"at the time of sale of or major renovation to a commercial building the owner provides conclusive evidence that, (1) financing is unavailable to pay for the cost of the energy conservation measures, or (2) that the cost of the energy conservation measures causes the market rate of return for the property to be less than that of returns of comparable properties, over comparable time frames, based upon current market conditions."*[65]

Exemptions from the entire ordinance can be granted by the City Manager on a case-by-case basis, if the owner can make a case of financial hardship (as defined in the ordinance). Exemptions are also given for low energy use buildings (less than $2000 annual energy cost, or less than 50kBTU per square foot).[66] When energy efficiency upgrades have been undertaken

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[62] City of Berkeley, *Commercial Energy Conservation Ordinance (CECO): A Guide to Performing a Self Audit for CECO,* (Berkeley: 2005), 6.

[63] City of Berkeley, *Residential Energy Conservation Ordinance (RECO): A Compliance Guide for Berkeley's Residential Property Owners, Buyers, and Sellers,* 2.

[64] "City of Berkeley CECO"

[65] "City of Berkeley CECO," 2.

[66] A conversion factor of 10 kBtu per kWh of electricity and 100 kBtu per therm of natural gas is used to incorporate the inefficiency of generating electricity "City of Berkeley CECO", 4.

within 3 years prior to the audit – 10% of the capital costs of such upgrades can be credited towards the maximum required expenditure of CECO. [67]

4.5 Implementation Process

For buildings being sold or transferred, RECO relies on auditors from a non-profit organization to indicate which measures need to be undertaken.[68] The audits cost $100 for the first inspection, with subsequent inspections costing $25 to $50. Subsequent inspections are carried out if a building fails to comply with RECO or CECO to confirm that the measures have been implemented. Because of the prescriptive approach, audits can be done quickly and a relatively low cost that is not subsidized.[69]

For major renovations, building inspectors check for RECO requirements as part of the building inspection at no additional cost.[70] If RECO responsibilities are transferred, funds are expected to be set aside in an escrow account and RECO upgrades must be completed within a specified time period. Berkeley allows one year, whereas, in Davis, California, buyers have only 90 days after the sale to meet the RECO requirements.

The required measures can either be contracted out or can be completed by the owner. Berkeley requires that the measures be maintained, and buildings cannot be sold again unless all measures are in place. Ann Arbor has a program similar to RECO, however it checks energy efficiency features along with periodic safety inspections that occur every three to five years. Other cities have decided against taking this approach due to the additional training and resources required for safety inspectors.[71] In Berkeley, subsidies are in place to reduce the cost of meeting several of these measures. These include attic insulation and low flow water fixtures.[72]

Many energy conservation measures required by CECO are eligible for rebates from the local utility company (up to 50% of the implementation cost can be covered by rebates). Low interest loans are also available at 5% from a state-owned small business assistance agency.[73]

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[67] City of Berkeley*, Title 19: Buildings and Construction*, http://www.codepublishing.com/CA/Berkeley/html/pdfs/Berkeley19.pdf (accessed September 16, 2009), 101.

[68] Community Energy Services Coorporation, www.ebenergy.org

[69] Alice La Pierre, personal communication, August 11, 2009.

[70] City of Berkeley, *Residential Energy Conservation Ordinance (RECO): A Compliance Guide for Berkeley's Residential Property Owners, Buyers, and Sellers*, 3.

[71] Reiss, 2.

[72] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance" (presentation at Sonoma County RECO meeting, February 24, 2009), available at http://www.ecoleader.org/assets/downloads/RECO/Berkeley%20RECO%20for%20Sonoma%20County.pdf (accessed July 14, 2009).

[73] City of Berkeley, *Commercial Energy Conservation Ordinance (CECO): A Guide to Performing a Self Audit for CECO,* (Berkeley: 2005), 5.

4.6 Connections to Other Policies

RECO and CECO connect to the City of Berkeley's greenhouse gas reduction goal of 80% below 2000 levels by 2050.[74,75] RECO and CECO are also linked with the Berkeley FIRST program, through which the City of Berkeley provides loans for solar photovoltaic installations.[76] Prior to participating the solar financing program, the participants need a RECO or CECO certificate.

4.7 Development and Consultation Process

RECO and CECO were developed with community and stakeholder input, and using data from the energy utility and from the California Energy Commission.[77,78] RECO and CECO gained support from occupants, owners, and other stakeholders because benefits to occupants are very clear, measures are easy to implement and audits and paperwork can be completed quickly at low cost.

4.8 Enforcement

Title companies ensure that all of the RECO paperwork is in place prior to completing a sale. Sale information is filed with the County office, which the city can access for enforcement purposes. Failure to comply with RECO can result in a $500 fine (issued to the buyer) or a halt on the property transaction.[79] The city can put a lien on a property if it fails to comply; this however, has never been required. [80]

Failure to comply with CECO will not result in a halt of the building sale, however anyone who wilfully or negligently fails to comply is liable for the damages resulting from not complying.[81]

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[74] City of Berkeley, *Residential Energy Conservation Ordinance (RECO)* http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=16030

[75] City of Berkeley, Climate Action Plan, 2008, http://www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Commissions/10-15-08_Item10_1_FINAL%20Exe%20Summary.pdf (accessed August 28, 2009).

[76] City of Berkeley, *Berkeley FIRST Financing Initiative for Renewable and Solar Technology*, http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580

[77] Alice La Pierre, Building Specialist, City of Berkeley, personal communication, August 11, 2009.

[78] Alice La Pierre, Building Specialist, City of Berkeley, personal communication, August 11, 2009.

[79] City of Berkeley, *Residential Energy Conservation Ordinance (RECO)* http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=16030

[80] City of Berkeley, *Berkeley FIRST Financing Initiative for Renewable and Solar Technology*, http://www.ci.berkeley.ca.us/ContentDisplay.aspx?id=26580

[81] City of Berkeley, *Title 19: Buildings and Construction*, http://www.codepublishing.com/CA/Berkeley/html/pdfs/Berkeley19.pdf (accessed September 16, 2009), 107.

4.9 Evaluations

RECO type policies have been very effective in the rental sector because landlords often do not have direct financial incentive to invest in energy savings.[82] Approximately 30% of Berkeley's housing stock (12,000 residences) has undergone retrofits as a result of RECO.[83]

RECO type policies have been found to reduce energy consumption by 10% on average.[84] The City of Boulder predicted that it could achieve average energy savings of between 10 and 20% with the introduction of a RECO type policy. The exact figure would depend on how stringent the policy's requirements are.[85]

4.10 Future Direction of RECO

Berkeley intends to update RECO to use performance-based requirements by June of 2010.[86] As of August 2009, Berkeley was in the preliminary stages of developing the updated ordinance. Some of the issues needing to be addressed include developing an auditing process for multifamily housing and mitigating the additional costs of the audit (especially for low income housing).[87] Preliminary cost estimates for performance-based audits are in the range of $300 to $700. One option being considered is using federal stimulus funding to introduce the new RECO on a voluntary basis for low-income housing. The City is encountering mixed responses from the real estate community, with some concerned with additional costs and requirements and others seeing added value in RECO compliance.[88]

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[82] City of Boulder, *Climate Action Plan,* http://www.bouldercolorado.gov/files/Environmental%20Affairs/climate%20and%20energy/cap_final_14aug06.pdf (accessed July 10, 2009), 35.

[83] The Apollo Alliance, *New Energy for Cities*, 2006, http://www.apolloalliance.org/downloads/resources_new_energy_cities.pdf (accessed July 10, 2009), 15.

[84] San Francisco Planning and Urban Research Association, *Update the Residential Energy Conservation Ordinance,* 2009, http://www.spur.org/publications/library/report/critical_cooling/option1 (accessed July 10, 2009).

[85] Reiss, 4.

[86] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance" (presentation at Sonoma County RECO meeting, February 24, 2009), available at http://www.ecoleader.org/assets/downloads/RECO/Berkeley%20RECO%20for%20Sonoma%20County.pdf (accessed July 14, 2009).

[87] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance" (presentation at Sonoma County RECO meeting, February 24, 2009), available at http://www.ecoleader.org/assets/downloads/RECO/Berkeley%20RECO%20for%20Sonoma%20County.pdf (accessed July 14, 2009).

[88] Alice La Pierre, "Berkeley's Residential Energy Conservation Ordinance" (presentation at Sonoma County RECO meeting, February 24, 2009), available at http://www.ecoleader.org/assets/downloads/RECO/Berkeley%20RECO%20for%20Sonoma%20County.pdf (accessed July 14, 2009).

4.11 Other Examples

San Francisco also has a RECO, which has been in place since 1982.[89] In addition to San Francisco and Berkeley, there are at least four other jurisdictions in the United States with RECO type policies including Burlington, VT; Ann Arbor, MI; Davis, CA: and the State of Wisconsin.[90] These examples apply only to rental properties, with Burlington and Ann Arbor's further restricted to rental properties for which the tenants must pay the energy bills.[91] The Europeans Union's Directive on the Energy Performance of Buildings (introduced in 2002) requires the implementation of minimum energy performance standards for existing buildings that undergo major renovations.[92,93]

[89] San Francisco Department of Building Inspection, What You Should Know About The Residential Energy Conservation Ordinance (RECO), (San Francisco, California: Department of Building Inspection), 2007), http://www.sfgov.org/site/uploadedfiles/dbi/Key_Information/19_ResidEnergyConsBk1107v5.pdf (accessed July 10, 2009).

[90] Rachel Reiss, City of Boulder, Consideration of a Residential Energy Consumption Ordinance (RECO) for Boulder, CO, Draft Report, June 20, 2007, available from Laura Tam, San Francisco Planning and Urban Research Association, ltam@spur.org, 1.

[91] *Reiss,* 2.

[92] International Energy Agency, Directive on the Energy Performance of Buildings, (IEA Policy Database, 2008), http://www.iea.org/textbase/pm/?mode=pm&id=933&action=detail

[93] The EU's Directive on the Energy Performance of Buildings has a target of 3465 Petajoules, or 3465×10^{15} Joules, Ibid.

5. Next Steps

To be in a good position to make informed decisions about the potential application of these types of policies in BC, the following next steps in research have been identified:

1. Broaden the research to better understand the range of experiences on mandatory labelling policy. In addition to the examples already included, good candidates include: Ontario, New York, Germany, the UK, and the European Union. Closer to home, it will also be useful to understand Vancouver's energy retrofit requirements and the energy labelling pilots being conducted by the province.
2. Broaden the research to better understand how similar approaches have been applied in the commercial sector. For example, commercial buildings can benefit from scheduled public disclosure of operational energy performance.
3. Conduct more research on prescriptive mandatory retrofit policies such as Berkeley's program. Areas of interest include: the full list of Berkeley requirements and its evolution over time, and a better understanding of policy experiences in Burlington (VT), Ann Arbor (MI), Davis (CA), Wisconsin, and the European Union.
4. Conduct more research on the ways performance based requirements are being applied to existing buildings. Particular areas of interest are: getting an update on Berkeley's plans to transition to a performance-based system, looking for other jurisdictions using this approach or considering a switch to it, and reviewing potential liability issues associated with inaccurate ratings.
5. Scan for research into the effectiveness of different label styles and communication channels.