Northeast Energy Efficiency Partnerships

VALUING BUILDING ENERGY EFFICIENCY THROUGH DISCLOSURE AND UPGRADE POLICIES

A ROADMAP FOR THE NORTHEAST U.S.

A **DUNSKY ENERGY CONSULTING** REPORT

in collaboration with VERMONT ENERGY INVESTMENT CORPORATION

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For **NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS**

under the direction of Ed Schmidt, Director of Regional Initiatives

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DUNSKY ENERGY CONSULTING

Dunsky Energy Consulting provides top-level analysis, strategic counsel and design of highly-effective energy efficiency and renewable energy programs and policies. Our clientele is comprised of dozens of leading utilities, government agencies and non-profit organizations throughout North America. Known for its experience, integrity, and dedication to quality and customer satisfaction, DEC is committed to developing balanced strategies for a sustainable energy future. For more information, please visit www.dunsky.ca.

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DUNSKY ENERGY CONSULTING remains solely responsible for any errors or omissions.

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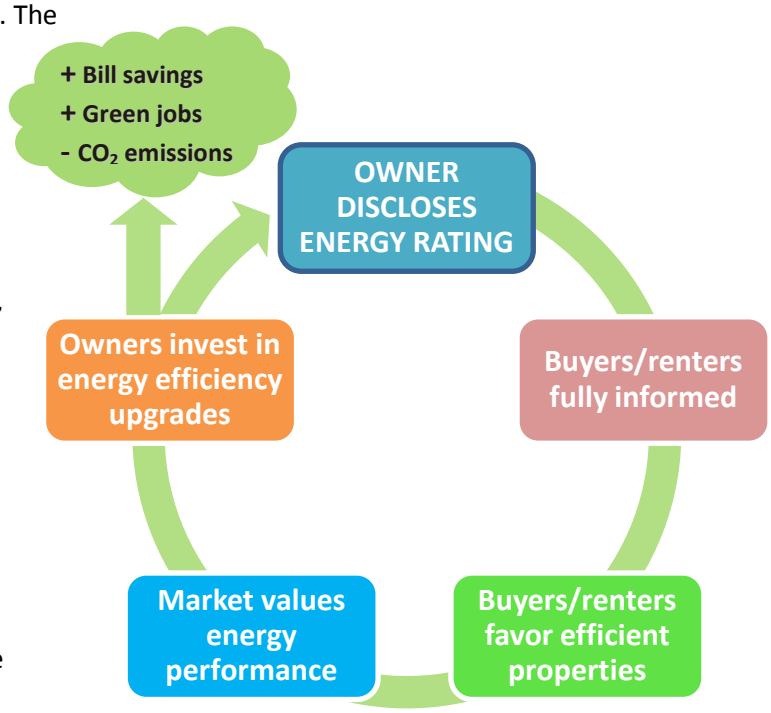
A ROADMAP FOR THE NORTHEAST

EXECUTIVE SUMMARY

As states ramp up their energy and carbon savings goals, energy efficiency leaders must find new and innovative ways to improve energy efficiency in the stock of existing homes and buildings. One key tool – mandatory building energy ratings – seeks to transform markets by requiring that meaningful information about building energy performance be disclosed to potential buyers, renters and the public. A sister tool – mandatory upgrades – would require adoption of certain cost-effective energy efficiency measures.

Though mandatory building energy rating disclosure policies involve a wide array of specific policy and design choices, they coalesce around a few key concepts:

1. **TIME OF SALE TRIGGERS.** When selling a home or building, owners must disclose a valid energy rating to potential buyers. The rating indicates current performance and potential improvements, providing meaningful information to consumers and empowering them to consider energy performance in their decision-making. Armed with information, some consumers will give preference to more energy efficient homes, enabling markets to value energy performance, and providing a greater return on investment to projects aimed at improving building energy performance.



How "triggered" disclosure leads to energy savings

2. **TIME OF RENTAL TRIGGERS.** The same process applies at the time of rental (this requirement may be phased in at a subsequent stage).

3. **SCHEDULED DISCLOSURE (OPERATIONS).** Commercial building owners must obtain a simplified, standardized rating, indicating their annual "operating" performance. This enables owners *and building managers* to measure their performance annually, to institute continuous improvement practices, to benchmark against other buildings (within or outside of their own fleet), and to establish performance targets in their annual plans and objectives. Policies can also require that ratings be displayed in prominent locations within the building or published in a publicly-available database.

These variations create additional drivers to improved energy monitoring and performance: renters may ask owners to address energy performance, utility incentive programs (or recognition programs) may be marketed more effectively at owners with poorer (or higher) performance, energy service companies can more effectively identify high-value potential customers, and owners can gain market recognition and other added value from their efforts.

First adopted over a decade ago in Australia and Denmark, mandatory building energy rating policies are now in place in more than 30 countries worldwide. They are also increasingly being considered, adopted or implemented in the U.S., in states like California, Nevada, Washington, Oregon and New Mexico, and in cities like Austin, New York and Washington, D.C. Indeed, the past year has seen a flurry of activity around this policy opportunity in the U.S., including landmark legislation currently being debated in both houses of Congress.

Against this backdrop, the Northeast Energy Efficiency Partnerships (NEEP) commissioned Dunsky Energy Consulting to prepare a white paper for northeast states. In so doing, we examined the international and domestic experience with disclosure and upgrade policies, pinpointed key success factors, identified the issues, distinguished between critical and non-critical facets, and assessed the variety of options available. Key findings include:

MANDATORY DISCLOSURE POLICIES

- **Disclosure policies can be effective** in getting markets to value energy efficiency, and act as a powerful complement to more conventional incentive programs.

- To be effective, **disclosure must be *mandatory*.** Indeed, the effectiveness of these policies rests on the premise that ratings are ubiquitous – that buyers and renters can compare the energy performance of *all* of the homes and buildings they are considering. Similarly, effectiveness depends on **disclosure early in the process**, i.e. in all advertising. If ratings need only be presented after purchase offers are made, for example, they will forfeit their value to inform buyers and influence the market.

- To be politically acceptable, **rating costs will have to come down**. This can be achieved in part through economies of scale (following adoption of enabling legislation), though additional effort will likely be required (several key stakeholders have recently begun work in this regard). In the meantime, states and utilities can consider incentives to buy down a part of the rating costs.

- The system for **homes should use an "asset" rating**. An asset rating is a rating such as the Home Energy Rating System (HERS) that assesses the modeled efficiency of the home's envelope and key components under standard conditions.

- The system for **commercial buildings should use both an asset and an "operational" rating** (such as the EPA's Portfolio Manager – based on actual consumption). Asset ratings should be valid for 5-10 years and be disclosed to prospective buyers and renters;

operational ratings should be renewed annually and be displayed in the building (where applicable) and loaded into a publicly-available database.

- Asset rating reports should **provide recommendations** on cost-effective energy efficiency measures, as well as links to utility or other incentive programs.

- **Enforcement should be a priority.** A combination of strong fines, robust controls and market-based enforcement mechanisms should be considered.

- Legislation should **phase in the requirements**. Disclosure of operational ratings can apply to public buildings almost immediately. Disclosure of operational *and asset* ratings can be required shortly thereafter of all large building owners (private and public), expanding gradually to smaller buildings as well. Disclosure of asset ratings for homes can be phased-in in roughly the same timeframe. See page 41 for details.

- **States, utilities and others can collaborate to build market demand** and supply in advance of legislation. For example, access to certain funding or incentives can be conditional upon production of a valid rating report. Similarly, states and utilities can encourage financial institutions to provide preferred mortgages for homes that produce strong ratings. Incentives to obtain ratings prior to legislation should also be considered.

- Though not necessary for statewide adoption, municipalities can collaborate with states and utilities by using **municipal pilots to test mandatory disclosure policies**.

- States (or their regional representatives) will need to **engage DOE, EPA and other national players** (e.g. ASHRAE, COMNET, RESNET), to ensure that the foundational systems they are currently working on – rating systems, data registries, auditor certifications, rater training and quality control mechanisms – are consistent with and supportive of the requirements of a *mandatory* disclosure policy.

WHO BENEFITS?

By enabling markets to value energy efficiency, disclosure policies can unleash a broad array of added value for both society and individual stakeholders.

- ✓ **Property owners** are informed of cost-effective energy savings opportunities, and benefit from a more secure return on investment, even if they sell early.

- ✓ **Buyers and renters** can make more informed purchase decisions, and avoid costly surprises.

- ✓ **Commercial building** owners and managers can benchmark their facilities' performance, enabling continuous improvements.

- ✓ **Energy auditors** gain a substantial, sustained new business opportunity, and an incentive to innovate.

- ✓ **Contractors** will see sustained growth in market demand, providing a stable stream of renovation jobs.

- ✓ **Developers** gain added value for building to and beyond energy codes.

- ✓ **Realtors** can provide their clients with credible information to distinguish high-performing buildings from their peers.

- ✓ **Energy services companies (ESCOs)** can market directly to owners of buildings with the biggest savings opportunities.

- ✓ **Utilities** will see greater uptake in energy efficiency programs, and will be able to target-market incentives in the commercial building sector.

- ✓ **Society** as a whole will benefit from decreased energy dependence, lower utility bills, reduced greenhouse gas emissions, and an upsurge in "green" and local jobs associated with energy efficiency retrofits.

MANDATORY UPGRADE POLICIES

Beyond mandatory disclosure policies, this report also addresses **mandatory *upgrade* policies.** As with disclosure, upgrade policies already exist in a number of regions, including in Burlington (Vermont), Berkeley (California) and in the state of Wisconsin (groundbreaking legislation addressing commercial building upgrades is also currently pending in New York City).

With proper enforcement, mandatory upgrade policies can be a powerful tool in advancing building energy efficiency. States aiming for deep and timely energy savings should give serious consideration to such policies. To this end, upgrade requirements can be triggered by property sales (as in Berkeley) or by major renovations; can use "smart" prescriptive protocols to determine which measures would be required in which homes or buildings, and access sufficient resource for robust enforcement.

For others, we urge an initial focus on improving enforcement of existing codes. Indeed, many states have adopted IECC codes that already require – on paper – improvements to building systems and areas during major renovations. Yet compliance is lackluster throughout much of the region. For many, investment in more robust enforcement offers the "low-lying fruit" of potential energy savings.

MOVING FORWARD

The pace with which individual states choose to move these policies forward will depend on their own needs and objectives. Some will prefer a gradual phase-in of disclosure policies alone, while others may want to move disclosure and upgrade policies forward aggressively and simultaneously. States may also want to tailor specific policies and legislation to local market conditions.

Ultimately, both policies offer an exciting new opportunity that, when combined with other strategies (including voluntary incentive programs), offer the prospects of transforming markets to value and secure energy savings. They also offer at least a part of the pathway to a more efficient and low-carbon energy future.

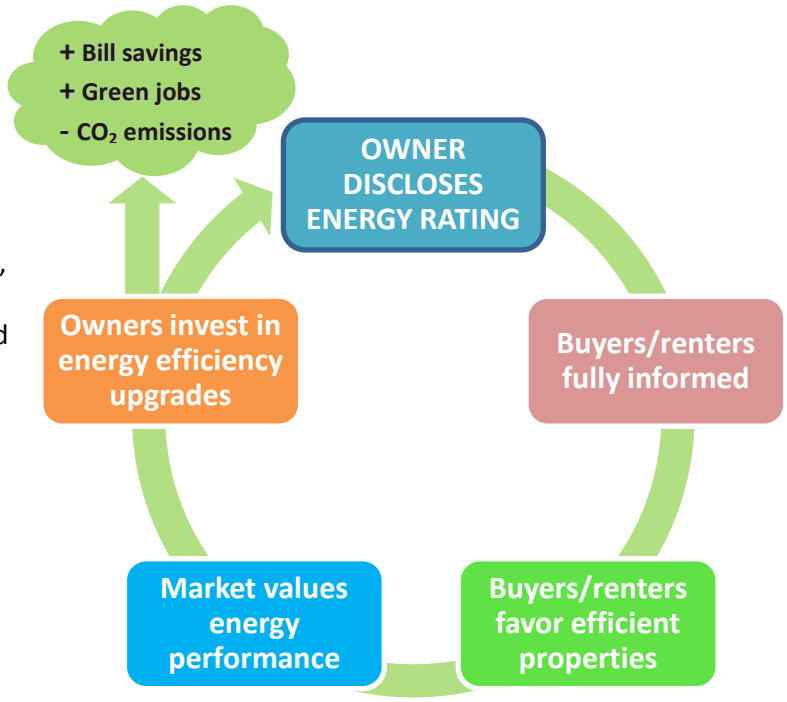
REPORT OBJECTIVES

CONTEXT

At the time of writing, states and other entities throughout the Northeast are working to strengthen their economies, create jobs, reduce greenhouse gas emissions and achieve greater energy efficiency and independence. In this context, new opportunities to improve the energy performance of existing buildings are generating considerable interest in the region, as elsewhere in the U.S. and abroad.

This paper was commissioned by the Northeast Energy Efficiency Partnerships. It is meant as a guide for Northeastern states and other jurisdictions that are considering adoption of two key policy tools for advancing building energy efficiency: mandatory energy performance disclosure policies (also known as building energy labeling), and mandatory energy performance upgrade policies.

Mandatory disclosure policies require home and building owners to obtain and disclose their energy performance ratings to interested parties, be they potential buyers, renters or the public. Performance ratings are presented as a standardized and easily understood labeling scheme showing the energy performance and costs of the building. Disclosure is aimed at informing consumers and ensuring transparency in the marketplace, such that the market can attribute appropriate value to energy efficiency, and owners can reap the full benefits of cost-effective energy savings measures. Mandatory disclosure policies are in many ways similar to existing miles-per-gallon labels on cars and trucks.[1]



How "triggered" disclosure leads to energy savings

Mandatory upgrade policies go a step further, requiring that owners undertake energy efficiency retrofits in existing buildings, with a view to ensuring that buildings meet minimum performance standards or other energy efficiency criteria. These policies are similar in many respects to security or fire safety standards.

REPORT STRUCTURE

This paper is broken into three parts:

1. **Roadmap for the Northeast:** This constitutes the main report. It provides the requisite background and context to energy disclosure and upgrade policies, describes the issues and options, summarizes the international experience and emerging initiatives, addresses the most recent developments, recommends preferred approaches for Northeastern states, identifies the actions interested states will need to take to move forward, and proposes a timeframe – a roadmap in other words – for moving from concept through full policy implementation.

2. **Backgrounder – International Experience and Emerging Policies:** We present case studies of three established international policies and nine emerging and established U.S. studies, as well as some early results drawn from statistical studies of disclosure policy impacts.

3. **Backgrounders – Issues and Options:** These two backgrounders provide an in-depth review of design options and preferred approaches, distinctly for mandatory disclosure and mandatory upgrade policies. They address key design, administration and implementation issues that states need to grapple with, suggest preferred approaches, and point to the rating systems, audit tools and supporting systems most suited to the region.

Ultimately, this report is meant to facilitate adoption of these policies by ensuring that implementation runs smoothly, and that the policies themselves are designed in such a way as to be effective in adding real value to consumers, in achieving cost-effective energy savings, and in avoiding needless costs and disruptions.

VALUE PROPOSITION

In 2007, residential and commercial buildings accounted for approximately 40% of U.S. greenhouse gas emissions and total energy consumption.[2] Yet potential energy savings from building retrofits are known to be substantial: a 2005 study conducted for NEEP suggested that cost-effective retrofits of existing buildings and equipment could reduce total electricity use in New England by 17%.[3] Indeed, efforts towards improving building energy efficiency have increased dramatically in the United States over the last five years, in reaction to the economic potential as well as energy security needs and the climate change challenge.

Energy efficiency programs, coupled with improved codes and standards, have had some impact on the performance of *new* homes and buildings, as well as on the efficiency of new appliances and other manufactured goods. Yet despite years of voluntary programs, the biggest opportunity for energy savings – improving *the energy performance of existing homes and buildings* – remains largely untapped relative to its enormous potential. This is the fundamental driver for adopting mandatory energy disclosure and/or upgrade policies: generating energy savings by providing the market with the information and impetus needed to understand and, most importantly, to value energy savings opportunities in existing buildings.

MARKET BARRIERS

Despite the immense potential of energy efficiency upgrades, experience with voluntary building retrofit programs has shown that it can be extremely difficult to convince building owners to undertake upgrades, even when incentives and project management services make retrofits relatively simple and cost-effective.[4]

Economists generally describe these difficulties in terms of **market barriers**. The building retrofit market faces many such barriers, with the most important being:

- **Lack of information**: owners and other market actors lack information about both building performance and opportunities for improvements. They may also lack information on contractors.
- **Hassle or transaction costs**: obtaining building audits, finding good, reliable contractors and accepting and overseeing disruptive retrofits create significant transaction costs.
- **Access to capital**: many retrofits can involve substantial costs, and may often have long payback periods.
- **Performance uncertainty:** Even when consumers understand and see an opportunity for energy savings, they are usually unable to adequately assess the costs and, more acutely, the precise long-term bill savings that could accrue from a given investment. In the face of such uncertainty, consumers discount future savings significantly.
- **Split incentives**: In rented homes or apartments, owners are typically responsible for investing in energy-related retrofits, while the benefits of such investments – namely lower bills and comfort – often accrue to tenants. In commercial buildings, standard lease agreements often include a variable portion for operating costs, but not for capital projects that can reduce operating costs. In both cases, landlords are unable to capture the savings from potential energy retrofits, and therefore have little incentive to invest in them.
- **Misplaced incentives and market recognition:** Investments to produce some of the deepest energy savings often pay themselves back over long periods of time. But home and building owners may reasonably expect to sell their property before the payback period ends. Since they are acutely aware that the market fails to fully value energy savings, they are likely to discount the future savings and the likelihood of retrieving their initial investment.
- **Other barriers**: retrofits face many other barriers not directly addressed by disclosure and upgrade policies (ensuring quality installation, contractor unavailability).

Many of these barriers are systemic, and cannot be entirely overcome with a single policy, however well-designed and effective. Yet others can be addressed and at least partially overcome by mandatory disclosure policies, especially insofar as they are applied in conjunction with voluntary programs.

BREAKING THE BARRIERS

Mandatory *disclosure* policies act on several barriers, depending on the trigger point and audience for disclosure. In fact, there are two key options for disclosure: **"triggered disclosure"** policies, where the requirement occurs when owners sell or rent their properties, and **"scheduled disclosure"**, where the building's performance is regularly disclosed, either to owners/renters or to the public at large.

TRIGGERED DISCLOSURE: The most important effect of triggered disclosure policies is to allow the market to value energy efficiency. When disclosure is required at the time of transaction, it allows buyers and others (e.g., lenders) to understand and value the energy performance of the buildings they are considering. Analysis of Australia's experiment with mandatory disclosure strongly suggests that, when disclosure of energy performance ratings is required at the time of sale, buyers begin to value energy efficiency, providing sellers of energy efficient homes with a significant price premium and return on investment in energy efficiency upgrades.[5] This eliminates split incentives and indirectly addresses hassle costs and the expense of upgrades, by giving owners a natural financial incentive.

SCHEDULED DISCLOSURE: The most important effect of scheduled disclosure policies (primarily relevant for commercial buildings) is to facilitate continuous improvement in building energy management by providing owners and building managers with standardized, benchmarked reporting data. An additional – and potentially market transforming – effect of scheduled disclosure policies is the use of *public* disclosure to enable the market to dynamically leverage energy performance metrics. By making ratings available in a public registry, as Washington, D.C. now requires, for example, utilities can use this information to target market their energy efficiency programs; energy service companies can use it to more efficiently and effectively market their value-added services to those who need them most; and stakeholders can support (or pressure) owners to improve performance over time.

Both types of disclosure policies also address market barriers in other ways:

1. **They attack information barriers**. Well designed disclosure gives owners, buyers, renters and lenders a good sense of a building's performance relative to peers and best practices. Mandatory building audits (when required to produce the disclosed rating) provide information on opportunities for action.

2. **They can spur participation in voluntary programs** that address remaining capital, transaction, hassle and others barriers. Indeed, voluntary programs, like those offered by many utilities and government agencies, can leverage ubiquitous performance ratings to tie into their own initiatives, much as they already leverage Energy Star branding on appliances and other products. Financing initiatives and building codes can also leverage the information provided by disclosure policies.

3. **They create a *sustained* market for audits and retrofits**: energy auditors and retrofit contractors have historically relied on ratepayer-funded efficiency programs for market demand, leading to "booms and busts". Mandatory disclosure provides the foundation – certainty and long-term predictability – to build a robust and high-quality industry.

WHO SHOULD IMPLEMENT DISCLOSURE AND UPGRADE POLICIES?

Both mandatory disclosure and mandatory upgrade policies should ideally be implemented by states, but can also be successfully implemented by municipalities. In both cases, implementing jurisdictions can reduce costs and development times by building on tools and systems developed by others, such as the federal government or third party organizations.

For simplicity, we refer to states throughout this report, but readers should keep in mind both the potential for adaptation by municipalities, and the roles that other parties may play.

4. **They close the feedback loop with building design**. The high performance building community faces a disconnect between energy performance as anticipated at the design stage, and buildings' actual performance when operated.[6] Paradoxically, there is a lack of information on actual performance of many new buildings, making it difficult to adjust designs based on real world feedback. This issue becomes increasingly important as states set ambitious goals for efficiency in new construction. Mandatory disclosure policies can close the loop by requiring all buildings to track actual energy use.

5. **They protect consumers**. Like similar, non-efficiency policies, energy performance disclosure gives consumer the tools to make informed choices and protect themselves against poor buildings and building components, higher-than-anticipated energy bills, discomfort, or unplanned renovation needs.

Disclosure policies can be a powerful tool to addressing – if not entirely overcoming – many of the barriers that hold consumers back from investing in cost-effective energy efficiency improvements.

MANDATORY UPGRADES: Unlike disclosure policies aimed at *incenting* greater efficiency, *mandatory upgrade policies* "simply" require it. These requirements are similar in many respects to health and safety, fire code and many other requirements made of existing buildings. Enforcement of upgrade policies, however, is a challenge, and will remain so as long as the market undervalues energy efficiency. As such, disclosure and upgrade policies need not be considered as competing approaches; rather, mandatory disclosure policies create a market environment in which the costs of upgrades – whether voluntary or mandated – may be offset by a greater value proposition.

A BROAD VALUE PROPOSITION

By enabling markets to value energy efficiency, energy performance disclosure policies unleash a broad array of added value for both society as a whole and for individual stakeholders.

- **OWNERS**: Home and building owners gain the knowledge needed to improve their energy performance through renovations, retrofits or improved building management practices. Just as importantly, owners obtain greater certainty that they will secure a return on investment even if they choose to sell before utility bill savings have a chance to pay back the full initial costs.

- **BUYERS AND RENTERS**: By receiving timely and meaningful information, prospective buyers and renters can make more informed decisions, and avoid the "surprise" of higher-than-expected energy bills that comes with poorly-performing homes and buildings. Beyond consumer protection, they will also benefit over time from a broadly improved building stock.

- **BUILDING MANAGERS**: Under scheduled public disclosure, commercial building managers obtain additional information on their performance, enabling benchmarking with other buildings and encouraging continuous improvements.

- **REALTORS**: Realtors benefit from increased consumer understanding of the building stock and the opportunity to distinguish high-performing buildings from their peers. Mandatory disclosure also increases the value of listing aggregation sites by giving consumers more information to compare.

- **ENERGY AUDITORS**: Energy auditors gain a substantial, sustained new business opportunity. Furthermore, as standards for energy raters are established, the profession as a whole will benefit from a uniform framework for comparing services, which should in turn drive cost containment and innovation.

- **CONTRACTORS**: Renovation and retrofit contractors will see sustained market demand for energy efficiency retrofits, creating a stable, long-term demand for their services that is insulated from energy efficiency programming cycles.

- **DEVELOPERS**: Developers receive added value for building to and beyond energy codes, as well as an additional opportunity to distinguish and up-sell their homes and buildings.

- **ENERGY SERVICES COMPANIES (ESCOS)**: In the commercial market, scheduled public disclosure will allow ESCOs to identify and market to owners of buildings with the biggest opportunities for savings.

- **UTILITIES**: utility energy efficiency programs will benefit from increased participation due to the powerful natural incentives created by mandatory disclosure. As with ESCOs, they will also gain valuable information to target-market their voluntary incentive programs in the commercial buildings sector.

- **SOCIETY**: As market valuation of energy efficiency takes hold, society will benefit from decreased energy dependence, lower utility bills, reduced greenhouse gas emissions, and an upsurge in "green" and local jobs associated with energy efficiency retrofits.

SYNERGIES WITH OTHER POLICY TOOLS

As a standalone policy, mandatory disclosure can have a powerful impact on building markets and owner behavior. Just as importantly, however, disclosure policies work synergistically to improve the performance of other policy tools.

Building Codes: Disclosure policies encourage compliance with energy codes, by rewarding higher performance buildings. They also facilitate code enforcement, since most or all new buildings will receive energy ratings. This is particularly useful where states have adopted a performance-based compliance track for energy codes.

Disclosure policies alone will neither overcome all barriers nor magically transform all markets. But they are a powerful complement to other efforts aimed at improving the energy efficiency of existing buildings.

Voluntary Retrofit Programs: Existing retrofit programs use audits, incentives and 'turn-key' renovation services to make efficiency retrofits as attractive and hassle-free as possible for building owners. Disclosure policies strengthen the attraction of voluntary programs by (a) creating additional value for energy performance and (b) acting as a gateway to voluntary programs.

Financing: Many jurisdictions offer low-interest financing to further reduce the cost of retrofits and facilitate capital outlays. Financing comes in a variety of forms, including "on-bill" (payments are made on the utility bill, providing a clearer link between monthly costs and savings), directly through financial institutions (utilities or others may buy down their interest rates bilaterally), and on municipal tax bills (treating the investment as a local improvement charge, thereby addressing owners' concerns about their ability to recover their investments should they choose to sell their home or building a few years later). All of these financing options are made more attractive by the additional market value for energy efficiency retrofits created by disclosure policies.

Similarly, **mandatory upgrade policies** create a powerful motivation for consumers to participate in retrofit and financing programs, which in turn reduce the burden of compliance by lowering costs. Disclosure policies also reduce the compliance burden via the additional value attributed to energy performance.

Implications for Policy Design: To take advantage of the synergies described above, policy makers need to keep two things in mind. First, they should use all policy tools at their disposal: disclosure and upgrade policies do not make existing programs redundant, and actually depend on them for maximum effectiveness. Second, policy tools should be designed as a whole. In an ideal world, a single energy rating and building audit would be used to ensure code compliance, allow disclosure, and lead to voluntary programs and financing.

CONCEPTS AND OPTIONS

DISCLOSURE POLICIES: BASIC CONCEPTS

Mandatory energy performance *disclosure* policies involve a complex web of legislation, policy decisions and rating system design features. The table below summarizes the nine basic "ingredients" that need to be addressed.

DISCLOSURE POLICIES: BASIC INGREDIENTS	
1. ENABLING LEGISLATION	Enabling legislation mandates the use of building labeling, specifies trigger points and reporting requirements, and establishes administrative authority for defining regulations. A vital companion piece of legislation (for commercial buildings) is the requirement for utilities to provide billing data to rating systems in a common format and on a regular and timely basis.
2. RATING SYSTEM	The rating system is the most complex ingredient – it comprises the choice of a metric for measuring performance, a methodology for calculating the metric, a rating scale that classifies building performance to enable building comparisons, and a building label that clearly communicates performance. Rating systems generally rely on rating and/or energy modeling software to produce ratings; the policy administrator must either develop these tools or approve third-party software. Many rating systems also include building audits that produce reports with detailed recommendations. Rating systems involve an array of design options (see text box below).
3. RATING SYSTEM MANAGEMENT	Developing and maintaining a rating system involves a substantial effort. It will ideally be the responsibility of a regional or national entity rather than that of an individual state or municipality.
4. TRIGGER POINT	The trigger point defines when and how a building owner must disclose his/her building's performance. Triggers can include putting a property up for sale (often referred to as "time of sale disclosure"), advertising spaces for rent, or even prior to obtaining financing. In addition to triggered disclosure, effective policies can also require "scheduled" disclosure (disclosure at regular intervals), as discussed further below.

5. DATA COLLECTION AND REGISTRY	Data collection is essential both for ensuring compliance and for measuring policy effectiveness (and making dynamic adjustments as needed). A central registry (database) is used to track compliance and building data. This registry should also collect all rating results, including reports and energy modeling data where relevant. Note that as the database is populated, it will offer an extraordinary source of information on the evolution of a state's building stock, enabling continuous improvements to rating system designs and a feedback mechanism on the effectiveness of the policy as a whole.
6. ENFORCEMENT	Enforcement is vital to the effectiveness of disclosure policies, as the Danish experience has shown. Policies can be enforced via incentives, fines, market mechanisms, or requiring proof of compliance at a given point within a related transaction, for example registration of a sale.
7. RATER INFRASTRUCTURE	Third-party raters need to be trained and certified, and must be subject to a quality-control process. Although all raters will need to understand basic building science and learn to use rating software, training needs will vary according to the type of rating used. "Asset" ratings require expertise with more complex building energy modeling software, and may (if full-scale audits are called for) require raters to be able to identify and evaluate potential retrofits. "Operational" ratings require less expertise and capabilities (see the text box below for a discussion of asset and operational ratings).
8. PHASE-IN STRATEGY	Disclosure policies may need to be phased in over time. Indeed, in some cases, new rating systems and infrastructure must be tested and refined. Where that is not the case, phased implementation may be required to provide the time to train and certify sufficient number of raters, and thus avoid bottlenecks, especially where the rating system requires significant expertise and capabilities (e.g., asset ratings). Options included phasing in by geographic region, by building type, size or age, or by using a set schedule. 'Triggered' disclosure – e.g., time of sale – also provides a "natural" phase-in approach.
9. LINK TO INCENTIVE PROGRAMS	Building ratings offer a valuable opportunity to inform owners about any incentives that may be available – through their utilities, government agencies or financial institutions – to encourage adoption of energy efficiency measures and otherwise help them to improve their building's performance. Similarly, states and/or utilities may wish to consider subsidizing the cost of the ratings in the early years, both to encourage initial compliance and increase public acceptance.

These nine basic ingredients form the basis of disclosure policies, and are referred to later in this report. Two of these – the rating system (n° 2 above) and trigger points (n° 4 above) – are integrally linked and worthy of additional presentation.

INGREDIENT N^{O} 4: TRIGGER ISSUES

Two, non-exclusive approaches to disclosure policies are possible: "triggered disclosure" and "scheduled disclosure".

Triggered Disclosure Policies: Under a triggered policy, home and commercial building owners are required to disclose their rating results to potential buyers and/or renters at a timely moment in advance of any transaction. Typically, the owner is required to provide the rating in all advertising, and to provide a more detailed rating report (which includes expected energy costs and recommended upgrades) upon request to potential buyers. Ratings are generally (and preferably) "asset ratings" (see inset to the right), to allow potential buyers to easily compare homes or buildings. Since they do not vary with historical energy use, ratings can remain valid until the home or building undergoes significant renovation. Ratings typically include an energy audit, which identifies potential upgrades and provides financial projections, such as payback periods.

Scheduled Disclosure Policies: Under a scheduled disclosure policy (generally applied to commercial buildings only), building owners must regularly obtain and disclose a rating of their *actual* (as opposed to modeled) energy performance, or what is known as an operational rating (see sidebar to the right). For example, building owners can be required to obtain and publicly disclose an operational rating each year, via a publicly-accessible database and/or prominent display in the building (for publicly-used buildings). The rating is relatively low cost, can be completed quickly, and does not include an energy audit.

The diagrams on the following page illustrate, from the consumer's perspective, how both triggered and scheduled disclosure requirements would operate.

INGREDIENT N^{O} 2: RATING SYSTEM DESIGN CHOICES

Regardless of the type of disclosure policy, the core of the policy is the rating system. We discuss four essential design choices below (see page 93 for more details).

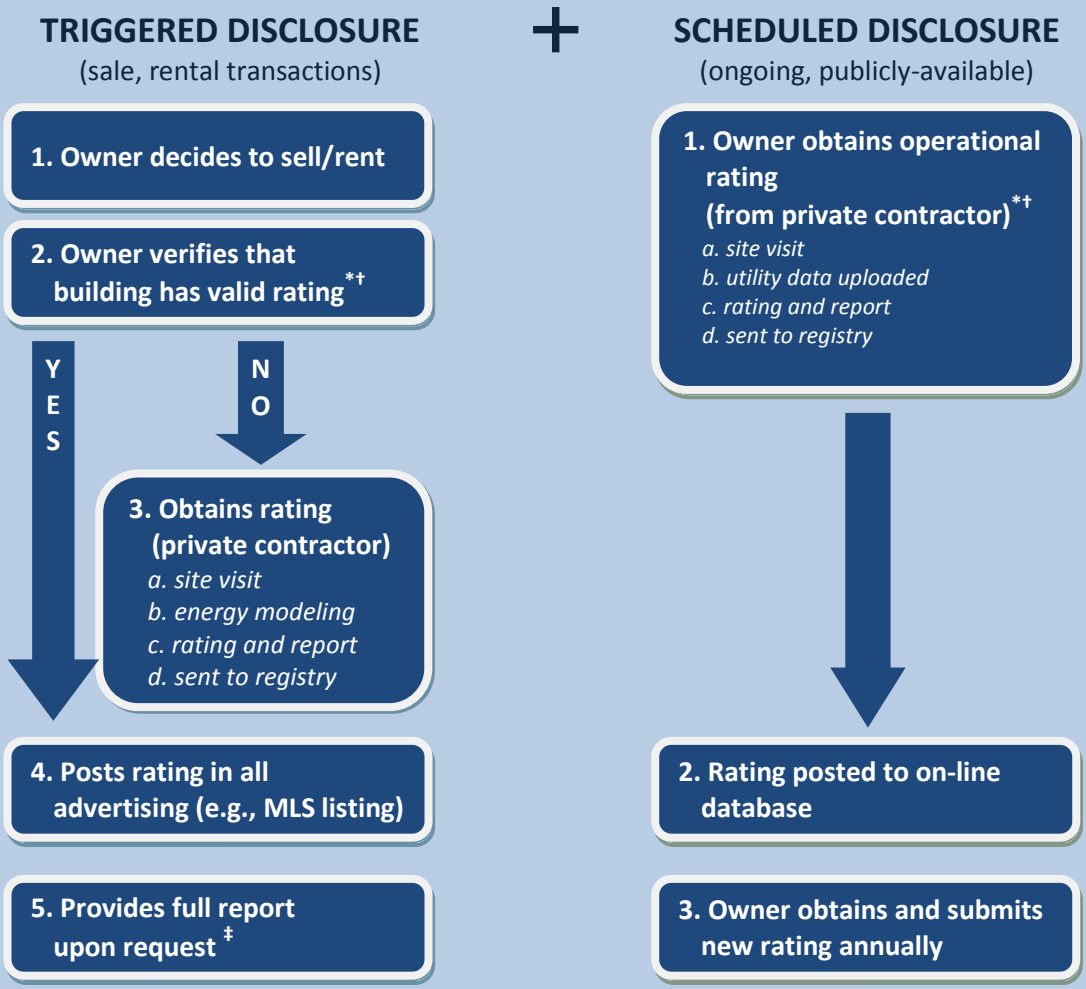
Rating Type: Asset ratings assess the theoretical performance of the physical envelope and major systems of the home or building, using energy modeling software and diagnostic tests. Operational ratings assess the actual performance of the building based on energy bills. Asset ratings are generally more useful for buyers/renters, since they want to compare buildings that will change occupants (and thus occupancy patterns and consumption habits). Operational ratings are more useful for scheduled disclosure, because they allow the real performance of a given commercial building's owner/operator to be measured over time, enabling continuous improvements.

Rating Scale: A 'statistical' rating scale compares a building against its peers, using data about the existing building stock. A 'technical' scale rates a building according to fixed metrics determined by the policy administrator. Technical rating scales can provide a clearer message by emphasizing the goal of achieving high performance. A statistical rating scale, on the other hand, reflects the existing building stock, which by definition performs poorly as compared to best practices. We therefore recommend technical rating scales as preferable where possible.

Choice of Metric: Ratings should ideally reflect efficiency both from the customer's perspective (usually in terms of site energy - the amount of energy used by the building at the site) and from society's perspective - either source energy (the amount of energy used to *produce* the energy consumed at the site) or greenhouse gas (GHG) emissions. We recommend a combination of site energy *and* GHG emissions as the clearest metrics for market actors. If only one rating is possible, either source energy or GHG emissions most clearly reflect the environmental drivers behind efficiency policies.

Inclusion of Audits: Ratings are more effective if combined with a link to action, such as financial analysis of recommended energy efficiency retrofits. This requires an energy audit, which generally includes a site visit and energy modeling, similarly to asset ratings. We recommend including a full audit when the additional cost is relatively low, i.e., only for time of transaction asset ratings.

The diagrams below summarize the basic process from the building owner's perspective.



Notes

* *We assume an "asset"-type rating (preferred option for triggered disclosure). An asset rating may be valid for five to ten years, or until major renovations.*

† *If uncertain, building owner can verify with the online registry.*

‡ *The full rating report (assuming an asset rating) contains energy audit results, including recommended measures and cost-benefit results.*

Notes

* *We assume an "operational"-type rating (preferred option for scheduled disclosure). An operational rating is typically valid for one year.*

† *The rating does not recommend measures.*

UPGRADE POLICIES: BASIC CONCEPTS

While this report focuses primarily on disclosure, we also look at two approaches to mandatory *upgrade* policies: improved enforcement of existing energy codes and broader, prescriptive upgrades, triggered by either renovations or the sale of a building.

Existing state energy codes already contain provisions requiring that major alterations or additions to existing buildings must be built to current code, and that any significantly affected systems must also be brought up to current code. However, enforcement rates vary, and in many states are extremely low for these provisions. Simply improving enforcement can be considered an upgrade policy.

Broader prescriptive upgrades go beyond code to require that owners make improvements to the building. These improvement requirements can be holistic (i.e., performance-based) or prescriptive (i.e., require specific measures be adopted).

The box inset below provides more information about two essential issues raised when designing mandatory upgrade policies: the type of upgrades required, and trigger points.

ESSENTIAL DESIGN CHOICES FOR MANDATORY UPGRADE POLICIES

Mandatory upgrade policies are built on the foundation of two key issues:

Basis for Requirement: Upgrade policies must include a method for identifying which measures must be implemented in a given building. There are three key options for doing so:

i) *Cost-effectiveness* (e.g., requiring adoption of all measures that are deemed particularly cost-effective for a given building, based on the results of an audit);
ii) *Performance* (e.g., requiring that all existing buildings achieve a given performance on a rating scale); or
iii) *Prescriptive lists* (e.g., requiring that all buildings adopt certain measures – typically ones that are commonly cost-effective).

While all approaches are theoretically valid, we recommend against the use of building-specific cost-effectiveness, given the inherent difficulties in arriving at standardized rules for determining the costs involved in a given project (which lends itself to gaming and enforcement problems).

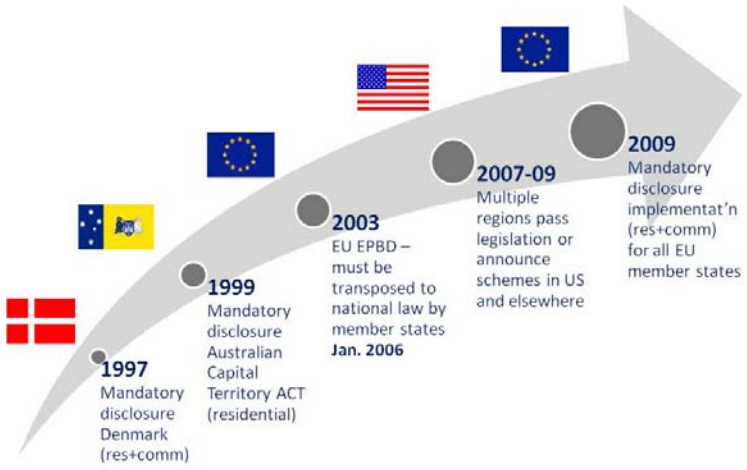
Trigger Points: Like disclosure policies, upgrade policies require a trigger point. Possible trigger points include: major renovations (as is common with many building codes), pre-set intervals (e.g., randomly assigning $1/10^{th}$ of all buildings to a given year within a 10-year implementation period), after a sale (providing new owners a given time – e.g., 18 months after purchase – to implement measures), and pre-sale (requiring that buildings put up for sale already meet minimum efficiency thresholds). While most options come with a balance of strengths and weaknesses, we strongly caution against the pre-sale option, which could significantly delay real estate transactions, and potentially create a perverse incentive for owners to opt for low-cost, low-quality installations.

EXPERIENCE AND LESSONS LEARNED

DISCLOSURE POLICIES: A GROWING TREND

While not entirely new, mandatory energy performance disclosure and upgrade policies have only recently begun their widespread ascent as a significant policy tool.

Figure 1 Historical Milestones



Mandatory disclosure policies were first adopted at a comprehensive level in 1997, in Denmark, where all homes and commercial buildings are required by law to obtain (and disclose) an energy performance rating. Two years later, the capital region of Australia adopted similar legislation, though applied only to the residential sector. Together, these two regions offer nearly a quarter century of experience with real-world, full-scale application of mandatory disclosure policies. The lessons they offer – the value of ratings, the importance of enforcement – are critical to designing an effective policy for the Northeast U.S.

Yet these "early adopters" are not alone. In 2003, the European Union adopted legislation requiring all Member States to design and implement national-level, mandatory energy labeling and disclosure laws. Those laws – and the rating systems that serve as their foundations – came into effect this past year. At the time of writing, nearly all property owners throughout the continent of nearly half a billion residents are required to obtain an energy audit and rating prior to selling their homes or commercial buildings, and to disclose that rating to potential buyers ("triggered disclosure", in the parlance of this report). In some EU states, additional requirements – including scheduled disclosure for buildings used by the public – are also in place. Moreover, a "recast" process is already bringing improvements to the system, in order to build on the lessons learned to date and improve the policy's effectiveness.

The U.S. too has some experience with these policies, though until recently, that was limited to a handful of municipalities, primarily using local ordinances to require energy efficiency upgrades. That is now changing. The past couple of years have seen a flurry of activity in the U.S., from regions as diverse as California, New York, Texas, Maryland, Nevada, Vermont, Washington State, New Mexico, the District of Columbia, Maine, Oregon and Vermont. Nationally, over a dozen states and municipalities have seriously considered disclosure and/or

upgrade legislation, with seven new policies in place as of the summer of 2009. The U.S. House and Senate have also weighed in, and are currently debating legislation that could encourage widespread adoption of disclosure and upgrade policies.

At the time of writing, nearly all property owners throughout the European Union were required to obtain an energy audit and rating prior to selling their homes or buildings, and to disclose that rating to potential buyers.

In preparing this report, we reviewed the experience of three regions with well-designed and fully implemented policies, namely Denmark, Australia and, as an example of the new European system, the United Kingdom. We also reviewed some of the existing and emerging U.S. examples mentioned above, either because of interesting design choices or because they may be particularly relevant to the Northeast. While we did not review all similar policies adopted worldwide (e.g., Canada, Asia), our case studies proved to be of great value in defining the contours of an effective system for the northeastern U.S. – one that learns from others' successes *and* mistakes.

All of our case studies are presented later in this report (see Backgrounder: Case Studies and Emerging Policies).

EARLY ADOPTERS

In the U.S. and abroad, a number of regions have already adopted – or are currently considering – mandatory disclosure or upgrade policies.

UNITED STATES

- ✓ California
- ✓ District of Columbia
- ✓ Maine[♦]
- ✓ Maryland (Montg.Cty)[♦]
- ✓ Nevada
- ✓ New Mexico
- ✓ New York (NYC)*
- ✓ New York[♦]
- ✓ Oregon*
- ✓ Texas (Austin)
- ✓ Vermont (Burlington)[‡]
- ✓ Washington State
- ✓ Wisconsin[‡]

ABROAD

- ✓ Australia
- ✓ Austria
- ✓ Belgium
- ✓ Bulgaria
- ✓ Canada (Ontario)
- ✓ China (Shandong)
- ✓ Cyprus
- ✓ Czech Republic
- ✓ Denmark
- ✓ Estonia
- ✓ Finland
- ✓ France
- ✓ Germany
- ✓ Greece
- ✓ Hungary
- ✓ Ireland
- ✓ Italy
- ✓ Lithuania
- ✓ Luxembourg
- ✓ Malta
- ✓ Netherlands
- ✓ New Zealand*
- ✓ Poland
- ✓ Portugal
- ✓ Romania
- ✓ Singapore
- ✓ Slovakia
- ✓ Slovenia
- ✓ Spain
- ✓ Sweden
- ✓ United Kingdom

[♦] *Bill disclosure only.* * *Enabling legislation still pending.* ‡ *Mandatory upgrade (not disclosure) policies.*

WHAT HAVE WE LEARNED?

While the history of disclosure policies is not voluminous, experience to date, coupled with lessons learned from several decades of North American energy efficiency policies and programs, provide two critical lessons: first, disclosure policies *can* be effective, and second, decisions around a few key issues can prove critical to the success or failure of these policies.

DISCLOSURE POLICIES CAN BE EFFECTIVE

The most important statistical study to date was conducted for the Australian Capital Territory (ACT). *Energy Efficiency Rating and House Price in the Australian Capital Territory* is of particular interest because the ACT has one of the longest running disclosure policies, and has, from the beginning, required disclosure *early* in the sales process (in all advertising), an essential design feature. The Australian system also has a smart, market-based enforcement process, encouraging a high degree of compliance.

The in-depth study used regression analysis on some 5,000 home sales (all sales within a given year) to assess the impact of the energy asset rating on housing prices. To do so, it isolated 13 other independent variables more commonly associated with sales price (size, location, etc.). The study found that the market now attributes approximately $11,000 Australian dollars – roughly $9,000 USD – to every additional star on a 6-star scale. In practice, this equates to a price premium of 3% per star improvement, and an improved return on investment.[7] After a decade of experience with mandatory, enforced, pre-sale labeling, buyers in the ACT region are valuing energy efficiency, thus presumably providing a return to owners who invest in the efficiency of their homes.

On the commercial buildings side, a 2008 U.S. study used CoStar data on commercial building rentals and sales to analyze whether or not voluntarily labeled 'green' buildings (Energy Star and LEED buildings) were preferred by buyers and lessors. It found a premium for Energy Star buildings (though not for LEED buildings) on the order of 3% for rents and a surprising 16% for sales. The authors found that every dollar invested in efficiency could bring a return of up to $18 in rental and sale price premiums when performance was disclosed to prospective buyers.[8]

A third study, also discussed on page 62, looks at the case of Denmark, which has had a time of sale labeling requirement in place since 1996, but limited enforcement and therefore low compliance and awareness rates (barely 50%). The study focused on the energy consumption of labeled homes *after the sale*, and was unable to conclude that labels influence *post-sale* consumption. The study failed to test for energy consumption changes *prior* to the sale, i.e., improvements undertaken by owners in the hope of increasing resale value when they do decide to sell – the likeliest scenario when, as in Australia's case, the market begins to value efficiency. Unlike the Australian study, this study did not examine the impact of label results on housing prices, and took place in a context of lackluster enforcement and compliance.[9]

While few in number, these analyses provide empirical support to the theory that markets can be brought to value energy efficiency through labeling and rating schemes. They clearly also underscore the importance of "getting it right" by adopting some key policy ingredients.

"TOP 5" KEYS TO SUCCESS (DISCLOSURE)

Our review of existing and planned policies points to several keys to ensuring success in the Northeast U.S. Indeed, when considering either triggered disclosure (required at the time of sale or lease, for example, of homes or commercial buildings) or scheduled disclosure (required at regular intervals; applicable to commercial buildings only), an effective policy will require, above all else, five key ingredients:

After a decade of experience, buyers in the ACT region of Australia are valuing energy efficiency, providing a return to owners who invest in the improved efficiency of their homes.

1. **A Trusted Rating System:** At a minimum, market actors must believe that ratings reflect the relative performance of homes or buildings, and trust that these ratings have been produced honestly. This does not mean that energy audit models need be perfect, but that the system as a whole is considered a meaningful indication of the relative performance of buildings.

2. **Clear Messaging:** The information disclosed, especially the overall building rating, must be clearly and easily understood by the average consumer. It must also allow prospective homes and buildings to be easily compared or, in the case of scheduled disclosure (commercial buildings), must allow building owners and operators to measure their performance over time.

3. **Strong Enforcement:** Mandatory disclosure policies are predicated on the ratings being ubiquitous; as such, high compliance rates are considered key to the policy's effectiveness. Both the Danish and Australian experiences strongly suggest that information campaigns and light penalties are insufficient; rather, a combination of strong incentives, credible enforcement and dissuasive penalties are essential to ensuring success.[10]

4. **Timely (Early) Disclosure:** For triggered disclosure policies, such as time of sale, ratings must be displayed early in the process, i.e., in all advertising. If buyers only receive the information toward the end of the process – after having made an offer, for example, or when notarizing a sale –, they will not be able to use that information effectively, and the policy will have forfeited its opportunity to influence the marketplace. Europe is in the process of correcting its initial error in this respect. Fortunately, MLS systems in the Northeast are already beginning to offer this option.

5. **Link to Action:** Mandatory disclosure policies are an important tool in the toolbox to incent cost-effective energy savings, but are only a means to an end. To lead to action, the rating or audit report should assist consumers by recommending appropriate energy efficiency improvements, providing financial analyses, referring to government or utility incentives, referencing financing opportunities and providing options for more detailed analysis, such as investment grade audits for commercial buildings.[11]

OTHER SUCCESS DRIVERS (DISCLOSURE)

In addition to the key success drivers listed previously, the following considerations will either improve the effectiveness of policies or make them easier to implement.

- *Public Availability:* For scheduled disclosure policies (commercial buildings only), we believe there is great value in ensuring, as some regions have begun to do, that ratings are made public (e.g., in an online registry, or in a visible area of the building). As discussed on page 11, this approach can leverage market forces and public sentiment to encourage building owners to continuously improve their performance, while simultaneously allowing utilities and ESCOs to market directly to high-use customers.

> *The moment at which ratings must be disclosed can make the difference between success and failure. If only provided at the tail end of the buying process, they will forfeit their ability to influence decisions.*

- *Eye on the Prize:* Disclosure policies are part of a long term strategy of moving the building stock as a whole toward high energy performance. Keeping our eye on this prize means ensuring that buildings can be benchmarked not only against their peers ("statistical" rating scales), but also against society's efficiency goals ("technical" scales). Metrics and ratings should also, to the extent possible, be consistent or compatible with existing and planned energy codes, which are increasingly looking towards achieving high performance and even zero-net-energy buildings.

- *Low Development Costs:* To ensure that development of disclosure policies is not prohibitive, policymakers need to give due consideration to using existing tools and support infrastructure (building evaluator training and certification, software certification, modeling protocols, etc.), and to adopting simple and complementary approaches wherever possible.

- *Low Consumer Costs:* While the benefits of a mandatory disclosure policy should far outweigh its costs, consumer acceptance will depend on keeping rating costs to a minimum. For both homes and businesses, an effective policy will strike an appropriate balance between requirements (e.g., level and frequency of audits), and associated costs.

- *Keep Transactions Fluid:* In addition to keeping consumer costs low, disclosure requirements linked to the time of sale need to minimize unnecessary delays or obstacles to the sale process. Doing so requires giving careful thought to issues such as the moment, during the sales process, at which disclosure is required, and to ensuring a sufficient volume of raters able to respond quickly to market demand.

- *Broad Coverage and Phased Implementation:* An effective policy will eventually apply to a significant share of building types. To get there, however, requires phased implementation. Effective phasing of *triggered disclosure* can be done in a number of ways: by building type, as in Australia; by size, as in Washington and California; by age, as

in Austin; and by ownership (public vs. private), as in Washington D.C. and California. The U.K.'s experience suggests that phased implementation and pre-implementation training of raters is essential to avoid bottlenecks during the initial demand pulse.

DRIVERS FOR MANDATORY UPGRADE POLICIES

While the focus of our international and U.S. policy review was squarely on mandatory *disclosure* policies, it is worth noting here several keys to successful mandatory *upgrade* policies. Specifically:

- *Enforcement cannot be an afterthought:* Trigger points should be designed to make enforcement and tracking as simple and, as a result, as realistic as possible.

- *Minimize gaming opportunities*: Upgrades tied to cost estimates are open to manipulation. Policies should use straightforward prescriptive lists (or possibly building rating thresholds).

- *Ensure consumer acceptance* that required upgrades are worthwhile, via a focus on cost-effective measures.

- *Timely triggers:* the earlier policies can induce upgrades (for example, by setting an upgrade schedule rather than a long-term deadline), the better in terms of achieving related energy, economic and environmental savings targets**.**

- *Keep transactions fluid*: This can be done by carefully considering trigger points and other key issues, with a view to ensuring that upgrade requirements do not inadvertently block fluid rental and sales transactions.

POLICIES FOR THE NORTHEAST

INTRODUCTION

The following sections provide summary guidelines for the most critical components of disclosure and upgrade policies, designed with the northeast U.S. in mind. These guidelines are rooted in our review of both the experience of – and emerging policies in – the U.S. and around the world (see previously and pages 53 through 87); in our careful review of the issues and determination of preferred options that, in principle, can ensure an effective and successful policy (pages 89-100); and in our consideration of those options in light of the resources, experience and infrastructure that are already available to the region as a whole (see pages 101-110).

Critically, as this project was nearing completion, a significant agreement was reached between the Environmental Protection Agency (EPA) and the Department of Energy (DOE). We have made every attempt to integrate this agreement – and the commitments it lays out – in both our discussion and recommendations, despite some uncertainty about how these commitments will roll out over time.

In the following sections, we begin by discussing the contours of the EPA-DOE agreement, and its implications for states interested in adopting mandatory building energy performance disclosure policies. We proceed to discuss the rating systems that are likely to emerge – or the features that states should seek – in the process. We then outline the tasks – grouped into three areas – which states will need to take on to make disclosure policies a reality. Finally, we propose a roadmap for implementation of both disclosure and upgrade policies.

THE ENHANCED NATIONAL BUILDING RATING PROGRAM (NBRP)

On September 30th, 2009, the EPA and DOE announced details of a new energy efficiency partnership, including the development of an enhanced National Building Rating Program (NBRP) by the DOE. [12] Under the NBRP, DOE will essentially take ownership of several of the nine basic ingredients of a disclosure policy, as outlined earlier on page 15). NBRP functions directly relevant to state disclosure policies include:

- **RATING SYSTEM:** A comprehensive, whole-building "asset" rating system and software tool, for both residential and commercial buildings, which will also include some form of operational rating. The rating tool will also provide some degree of energy audit, by offering retrofit recommendations based on energy modeling. DOE will also develop a label for presenting rating results to consumers.

- **TRAINING AND CERTIFICATION:** Certification standards and training programs for the *residential sector* (home contractors and other home improvement professionals), including an audit program for quality control of building ratings. Although the memorandum does not mention commercial rater certification, it is likely to be included.

- **UTILITY DATA STANDARDS:** Work with utilities to develop a common format for automatically uploading utility bills into the rating tool.

- **DATABASE:** A new database on energy usage and building characteristics from all buildings receiving federal efficiency funding (e.g., Weatherization Assistance Program funds, Energy Efficiency Block Grants, others).

The NBRP will also put into place additional elements that will be useful to voluntary retrofit programs complementing state disclosure policies, notably the ability for the rating system and database to track costs and energy savings from retrofits; a DOE/EPA directory of funding sources; and free online software tools for analyzing energy bills by end-use.

At the time of writing, most details about the NBRP design were still unknown. The DOE has committed to announcing a timeline in January 2010, but full availability of the rating system will depend on available resources and the degree to which DOE builds on existing systems and infrastructure (the EPA/DOE Memorandum does indicate that the NBRP will "build upon existing systems").

Regardless of uncertainty about final design and timelines, however, the advantages of a freely-available, federally-maintained rating system make the NBRP the most likely foundation for state disclosure policies. Most significantly, a national rating system reduces state costs, and avoids redundancy and market confusion that can arise from multiple, state or regional rating systems.

Given these strengths, **this report assumes that states will adopt the NBRP rating system for both residential and commercial buildings**, unless serious delays or design flaws make this impossible. Our recommendations, therefore, focus on three areas:

- **State engagement with the DOE and other organizations**: States will need to engage with the DOE early on in their policy development process, both to understand the NBRP development timeframe and to ensure that the system as a whole – both the rating system and associated functions – meets state needs and fully supports their intentions to require energy performance disclosure. Simultaneously, states should engage with other alternative national rating system developers to ensure that their designs meet state needs as well. Both efforts should likely occur via a collaborative process to minimize costs and maximize state impact.

- **Developing disclosure policies and legal frameworks beyond the NBRP**: While the DOE works to develop its rating and associated systems, states will need to enact enabling legislation, create an administrative body, determine trigger points and other key issues, prepare enforcement systems, ensure rater training and certification, plan the phase-in strategy, and see to leveraging utility and other voluntary programs.

- **Developing the market**: States will need to leverage existing resources to increase industry capacity, market demand for ratings and retrofits, and market awareness of rating systems. This will reduce bottlenecks once mandatory policies are implemented and will hasten market transformation.

The table below summarizes how states can build on the NBRP to create mandatory disclosure policies.

DISCLOSURE POLICIES: NBRP (DOE) AND STATE ROLES		
BASIC INGREDIENTS	**NBRP (DOE) Role**	**STATE Role**
1. ENABLING LEGISLATION	---	**Lead**
2. RATING SYSTEM	**Lead**	Engage and monitor to ensure system fully supports state needs
3. RATING SYSTEM MANAGEMENT	**Lead**	
4. TRIGGER POINT	---	**Lead**
5. DATA COLLECTION AND REGISTRY	**Lead**	Engage and monitor
6. ENFORCEMENT	---	**Lead**
7. RATER INFRASTRUCTURE	**Residential - Lead** Commercial – TBD	Residential – engage **Commercial – TBD**
8. PHASE-IN STRATEGY	---	**Lead**
9. LINK TO INCENTIVE PROGRAMS	Facilitate	**Lead**

IMPACTS OF PROPOSED FEDERAL CLIMATE CHANGE LEGISLATION ON THE NBRP

The U.S. Senate is currently (November 2009) considering several pieces of historic climate change and energy legislation, notably:

- HR 2454, the American Clean Energy and Security Act (ACES) (aka "Waxman-Markey"), passed by the House of Representatives June 26th 2009;
- S.1733, the Clean Energy Jobs and American Power Act (CEJAPA) (aka "Kerry-Boxer")
- S.1462 the American Clean Energy and Leadership Act of 2009 (ACELA)

All three bills address building energy performance labeling. HR2454 requires the EPA to develop a model label for both residential and commercial buildings, including both an achieved (operational) and designed (asset) rating. It also mandates improvements to building stock databases, and offers funding to states that would implement rating or labeling policies (although a last-minute amendment would limit such policies to new construction).

S.1462 uses similar language to mandate the development of a model building rating system (not limited to new construction), while S.1733 allocates projected revenue from emissions trading to state energy efficiency programs, including specifically building labeling.

As of this writing, it is uncertain if any of the bills will become law, or how energy labeling provisions may be changed during the legislative process. The final outcome may support the DOE and EPA's new National Building Rating Program effort (see p. 27), supplant it with new requirements (for example, by returning responsibility to the EPA), or cause delays.

PARALLEL RATING SYSTEM DEVELOPMENT EFFORTS

As discussed in State Task #1 (see below), we recommend that, while prioritizing work with the DOE on the NBRP, states should also monitor and support other efforts to create a national rating system, including:

- **RESNET's Building Energy Labeling Committee**: RESNET has recently (October 2009) created a committee to investigate adapting the HERS rating for mandatory disclosure policies.
- **Oregon's Energy Performance Score (EPS) Pilot**: Oregon has recently (2009) invested substantial effort in developing a new residential rating system and testing associated rating tools. A pilot project, described in more detail on page 81, has garnered a great deal of attention, in particular for results that suggest cost savings and accuracy improvements are available from a new prototype rating tool. This research is being followed in Seattle by a 5000-home voluntary pilot in 2010.
- **ASHRAE's ABEL Label**: As profiled on page 31, ASHRAE continues to develop its Advanced Building Energy Label for commercial buildings.
- **Commercial Energy Services Network (COMNET)**: Created by the New Buildings Institute, COMNET aims to create the foundation of a commercial asset rating by providing energy modeling protocols and rater certifications. RESNET has recently announced plans to take on responsibility for this initiative.

At a minimum, these parallel efforts will contribute to and spur DOE's development of an effective national model rating system. In the worst-case scenario, wherein DOE faces long delays and/or serious design constraints, these rating systems can act as a "back-up plan", allowing states to adopt an alternative system.

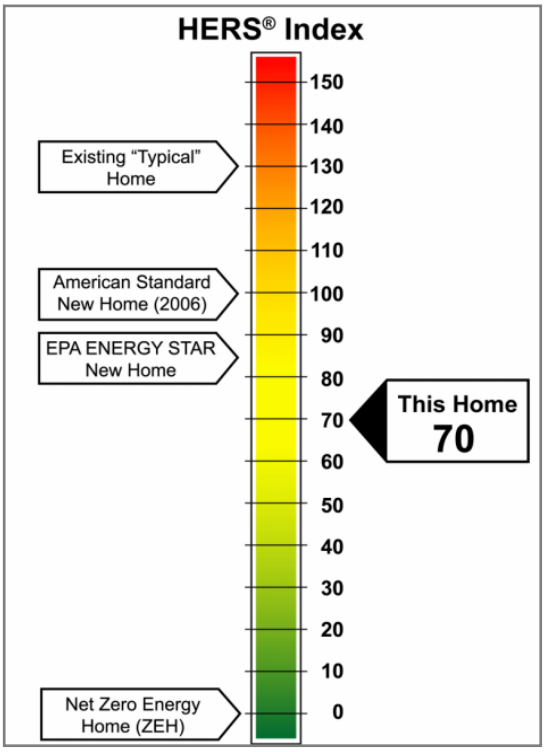
CONTEXT: POSSIBLE CANDIDATES FOR THE NBRP

The EPA/DOE Memorandum indicates that the NBRP will build on existing work by the building rating community.

Although no details are known to date, below we present the most developed *existing* rating systems, and briefly address their strengths and weaknesses.

RESIDENTIAL SYSTEMS

Asset Rating: Although many energy audit tools exist, there is only one existing, widespread asset rating system for homes: the Home Energy Rating System (HERS). HERS is backed by a national, consensus-based standards body (RESNET), which also maintains a complete support infrastructure, including rater training and certification and a centralized database (under development). While HERS does not meet *all* of our preferred design choices, and is primarily aimed at new, not existing homes, it nonetheless meets many of our criteria and constitutes a solid foundation to build upon.



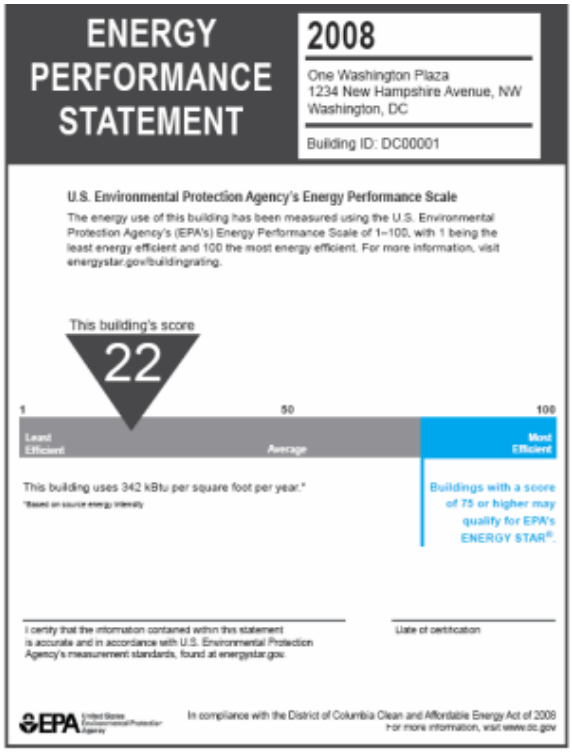
Indeed, the substantial expertise and infrastructure that RESNET brings make it the natural choice for developing an improved rating system. However, RESNET will benefit from addressing two related challenges: improving the accuracy of approved modeling software (used to generate the rating), and reducing the cost of the rating itself (from the current $600-$1 000 to roughly $300 or less). A third issue is an inherent bias in favor of larger homes.

The DOE's existing asset rating label, the "E-Scale", is based upon the HERS rating, as are several federal energy efficiency initiatives, and the DOE collaborates closely with RESNET on issues such as modeling accuracy. On the other hand, existing DOE software such as the Home Energy Saver tool is being used in early NBRP pilots. Although RESNET's firmly established market presence and training/certification infrastructure make it a key player in residential rating, there is no certainty that the HERS rating will be the basis for a national system.

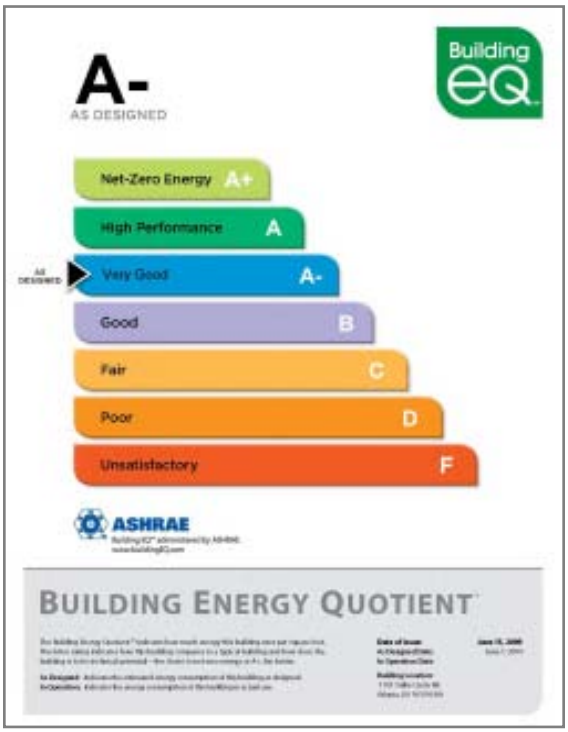
Operational Rating: Operational ratings are, in our view, much less relevant for the residential sector – in fact, we do not recommend a mandatory operational rating for homes. Opportunities for savings are lower than the commercial sector, and privacy issues greater. Insofar as the NBRP may include an operational rating, the principal existing system is the EPA's Home Energy Yardstick. A more interesting alternative may be to require operational rating information on energy bills, currently proposed by several organizations in the Northeast.

COMMERCIAL SYSTEMS

There are two rating systems that could potentially serve as building blocks for the NBRP: the EPA's existing Energy Star Portfolio Manager (E*PM) tool, an operational rating system; and ASHRAE's proposed Advanced Building Energy Label (ABEL), currently under development. The DOE may also create a completely new system using in-house expertise.



E*PM is a fully developed and already widely-used rating system, with almost 17% of U.S. commercial floor space benchmarked in 2008. It has a well recognized brand and robust, field tested methodology. It also entails very low costs both to administer and to use. It is an *operational* rating only, but a complementary asset rating could be developed by building on the E*PM rating scale, energy modeling protocols under development by a new standards group (COMNET) and a building energy modeler certification under development by ASHRAE. The most significant issue with the E*PM rating scale is that it reflects the existing building stock ("statistical" rating scale) rather than best practice, making it relatively likely that buildings that perform poorly relative to achievable best practices – including new buildings – could obtain a relatively high score. As with some other scales, E*PM also uses a single metric (source energy) that does not necessarily reflect site-level efficiency.



ASHRAE's ABEL system is a well conceived rating system that *could* provide significant value relative to other systems: it would provide both operational and asset ratings, they would be comparable, the label design itself is intuitive, and the system as a whole would benefit from the support and credibility of ASHRAE – the American Society of Heating, Refrigeration and Air Conditioning Engineers. Unfortunately, the ASHRAE system is still in its infancy: it will not be fully developed before 2011, and development funding does not seem to have been secured at the time of writing.

STATE TASK #1: ENGAGE WITH DOE AND OTHERS

To effectively leverage DOE's commitments and facilitate adoption of mandatory disclosure policies, states will need to engage with DOE to ensure that the rating system, building database and rater training programs are fully supportive of state-level needs.

While states should focus on engaging DOE, they should simultaneously monitor and, if possible, support the development of other national rating systems (see earlier text box). Although somewhat redundant, independent efforts may be able to act more quickly and nimbly than DOE, and may be less vulnerable to changes in political priorities. Competition between rating system developers can spur innovation and ensure all parties move aggressively. As more disclosure policies are put into place, we assume the market will mature, and a single rating system will come to dominate, incorporating the best aspects of earlier systems.

Given the substantial resources required for extended, in-depth engagement, states will likely want to collaborate to form a single front for working with DOE and other groups. A regional or national organization would be a natural conduit for these efforts.

Specifically, states or their representatives will want to ensure that the DOE system and other efforts meet four key needs.

[1] Timely development: The availability of the NBRP rating system will dictate timelines for state implementation of disclosure policies – avoiding delays is therefore essential. In particular, ramping-up rater infrastructure will require timely access to NBRP training and certification processes. If the DOE system cannot be operational in a timely manner, states can work with DOE toward transitional approaches (e.g., recognizing rater certifications under existing RESNET/BPI requirements) to minimize delays.

[2] State access to building rating databases: The centralized databases outlined as part of the NBRP will likely be critical for state policy enforcement, but only if states gain full access (to results by building address, for example). Additionally, states should ensure that building owners can inexpensively obtain copies of past ratings, reports and energy modeling files, to simplify compliance and minimize associated consumer costs.

[3] Focus on reducing (home) ratings costs: HERS ratings typically cost between $600 and $1000. Simpler, less costly alternatives are possible (for example, Canada's home rating system currently costs roughly $300), and would go a long way to ensuring consumer acceptance of a *mandatory* disclosure policy. While states can work with utilities to initially subsidize rating costs, they will want to ensure that rating system developers make cost reduction a priority.[13]

[4] Flexibility for states to customize labels: Individual states may wish to highlight specific energy efficiency (or climate change) targets directly on building labels. Some may even want to add an additional, state-specific rating scale tied into state codes, for example. Ideally, national rating systems would allow states to easily build upon and enhance its rating system, without affecting the integrity of the rating system itself.

Beyond these high-level needs, **states will want to ensure that the NBRP and other *rating systems* are designed in such a way as to effectively lead the market to value energy efficiency.**

The NBRP as described in the EPA/DOE memorandum seems likely to address the two essential elements of a rating system used for a mandatory disclosure policy: it must be trusted by the public, and it must provide clear messaging (including allowing for easy building comparisons). Beyond these essential elements are several important design considerations:

Federal initiatives can play a large role in states' ability to implement effective disclosure policies. They need to be designed with that goal in mind.

[5a] Ratings – scale: As discussed on page 14 and later in the Backgrounder, there are two categories of energy label rating scales, 'statistical' and 'technical'. We recommend a technical rating scale because it can emphasize high performance more easily than a statistical rating scale reflecting the existing building stock, which performs poorly compared to best practices. States will want to advocate a technical rating scale that strikes a balance between emphasizing best practices in building performance and rewarding achievable improvements in existing buildings.

[5b] Ratings – metric: As discussed on page 14 and later in the Backgrounder, ratings should ideally reflect efficiency both from the customer's and society's perspective. Most customers are (arguably) most concerned about "site energy" (the amount of energy used by the building at the site). Society, on the other hand, is most concerned about broader efficiency and environmental impacts, which can be reflected by either "source energy" (the amount of energy used to *produce* the energy consumed at the building site,) or greenhouse gas (GHG) emissions. Since GHG emissions by definition reflect source energy, we would argue for a dual metric – site energy and GHG emissions – reflecting both perspectives. If a single rating is used, we would argue for either source energy or GHG emissions.

[5c] Ratings – link to action: As discussed in 'Top 5' Keys to Success, asset ratings (and to a lesser extent, operational ratings) should include actionable, building-specific retrofit recommendations. The DOE/EPA Memorandum indicates that ratings will include this link; states will want to ensure that this is part of the final design.

[5d] Ratings – modeling accuracy: Accuracy issues are significant for both residential and commercial modeling software, with actual energy consumption typically 20-40% above (or more occasionally, below) predicted consumption. DOE and entities like RESNET are actively working on improving accuracy, but states will want to keep abreast of results.

[5e] Ratings – single integrated system: To enhance consumer recognition of energy labeling, a single rating scale should ideally be used for both residential and commercial sectors, for both mandatory labeling requirements and energy code compliance. States could advocate that the NBRP rating system aim for this goal.

STATE TASK #2: ENABLING LEGISLATION AND FRAMEWORK

The Australian model has suggested how residential building markets can benefit from a thoughtful, well-designed, triggered disclosure policy. At the time of sale (and eventually rental), prospective buyers should be see a valid asset rating in all advertising, to allow them to understand the relative energy performance of the homes they are considering. Upon request they should be provided with complete rating reports.

Commercial building markets can benefit from both triggered and scheduled public disclosure policy for commercial buildings. At the time of sale (and eventually rental), owners should be required to disclose a valid asset rating and operational ratings for the last three years of operation, again in all advertising of the offer. Full rating reports should be provided to buyers/renters upon request and at the time of sale. In addition, building owners will have to disclose (or allow utilities to disclose) annual operational ratings to the policy administrator, who will then make them public via a searchable, web-based portal.

As we discussed previously, states will likely be able to rely on the NBRP for a rating system and registry, but will need to work with DOE to ensure they have the access necessary to customize labels and properly enforce their policies. Responsibility for rater training and certification is less clear; although the NBRP will provide national training materials and certification standards, it is not confirmed that they will ensure sufficient training infrastructure to meet demand in each state.

During the policy development phase, states will want to focus on passing enabling legislation, on establishing an administrative body and on developing regulations. Liaising with DOE and working toward ensuring the federal system supports state needs will also be vital. The state may also want to engage with utilities (or other energy efficiency program administrators), both to ensure the report links into existing incentive programs, and to consider partial funding of rating costs at the outset. State policy makers may also want to consider the value of a state-specific rating scale, or other label information.

During the implementation phase, the state administrative body will be publicizing disclosure requirements, enforcing compliance, and providing customer service. Depending on the NBRP's final design, other significant administrator roles may involve developing and maintaining a parallel rating database, as well as playing a role in rater training and certification (this remains unclear at the time of writing). Finally, the policy administrator will need to liaise with DOE to ensure smooth use of the NBRP rating system, and with energy efficiency program providers to maximize leverage from disclosure policies.

The tables below summarize key features of our recommended disclosure policy, as well as state roles in development and implementation, for both homes and commercial buildings.

DISCLOSURE POLICY FOR HOMES: BASIC INGREDIENTS

	Recommended Policy	State Roles
1. ENABLING LEGISLATION	Legislation should define trigger points, broad implementation timelines, and administrative powers. *Note: NEEP has commissioned a separate report on model legislative language.*	**Develop and pass enabling legislation.**
2. RATING SYSTEM	NBRP rating System, possibly integrating state-specific benchmarks and rating scale.	**Advocating preferred design and considering the value of state-specific enhancements.**
3. RATING SYSTEM MANAGEMENT	NBRP responsibility.	**States will need to monitor development and liaise with the DOE on maintenance issues.**
4. TRIGGER POINT	*Rating:* Required in all advertising – initially for property sales, extended to rentals (2nd phase). *Rating Report:* to potential buyers upon request	**Defined in legislation.** ***Note: this is a critical key to success.***
5. DATA COLLECTION AND REGISTRY	Ideally the NBRP database; states may however need to develop a parallel database if they cannot obtain full access.	**Work closely with DOE to meet state needs; if necessary, develop and maintain a parallel system.**
6. ENFORCEMENT	*Incentives*: Default assumption of poor score in absence of rating. *Penalties:* Fines set at multiple of rating cost. *Enforcement:* Cross reference listings with central registry, and random QC on homes for sale (to verify rating validity).	**Set either by legislation or regulations. The state administrative body will need to develop enforcement capacity.**
7. RATER INFRASTRUCTURE	NBRP Responsibility (may be delegated to others).	**Work closely with DOE to ensure timely development of rater capacity. Develop market.**
8. PHASE-IN STRATEGY	Strategy will depend on DOE and market development timelines. Our Roadmap assumes a two-step phase-in of sales trigger, followed by a rental trigger. The criteria for phase-in are not specified – options include building size, age and region.	**Work with DOE to ensure timely development; build up rater capacity; inform public via info campaigns, realtor training.**
9. LINK TO INCENTIVE PROGRAMS	Reference incentive programs in reports; use database to direct market to poorly-rated homes; subsidize ratings in initial years; require rating for incentive program participation.	**Work with energy efficiency program providers to develop a seamless offering that takes advantage of disclosure.**

DISCLOSURE POLICY FOR COMMERCIAL BUILDINGS: BASIC INGREDIENTS

	Recommended Policy	State Roles
1. ENABLING LEGISLATION	As per residential buildings.	**As per residential buildings.**
2. RATING SYSTEM	NBRP, using both the asset and operational rating (depending on trigger point), possibly integrating state-specific benchmarks or rating scale.	**As per residential buildings.**
3. RATING SYSTEM MANAGEMENT	NBRP responsibility.	**As per residential buildings.**
4. TRIGGER POINT	*Triggered Disclosure:* Valid asset rating and last three operational ratings required in all advertising; full report to prospective buyers/renters upon request. *Scheduled Public Disclosure:* Operational rating disclosed annually, to a publicly accessible database. Also prominent posting in publicly-visited buildings.	**As per residential buildings.**
5. DATA COLLECTION AND REGISTRY	As per residential buildings.	**As per residential buildings.**
6. ENFORCEMENT	*Penalties:* As per residential buildings. *Enforcement – triggered disclosure:* As per residential. *Enforcement – scheduled disclosure:* Cross reference central registry with certified ratings annually.	**Set either by legislation or regulations. The state administrative body will need to develop enforcement capacity.**
7. RATER INFRASTRUCTURE	*Training and Certification:* Ideally NBRP. If not, states will need to step up. ASHRAE or COMNET's proposed building energy modeler certifications could be used as a requirement for asset modeling, complemented by a short state-provided training. *Quality Control:* Ideally provided by NBRP (or other); if not, state random QC on % of ratings.	**Advocate NBRP provision of training/certification; if not possible, work with others as indicated, and prepare appropriate state training.** **If necessary, sponsor training and certification.**
8. PHASE-IN STRATEGY	*Triggered disclosure:* Annual phase-in by size (>200,000 ft^2; >100,000 ft^2; >50,000 ft^2; >5,000 ft^2). *Scheduled disclosure:* As per triggered, but with 12-month grace period before making rating public.	**As per residential buildings.**
9. LINK TO INCENTIVE PROGRAMS	As per residential buildings.	**As per residential buildings.**

STATE TASK #3: MARKET DEVELOPMENT

In parallel with the policy development phase, states will want to develop the energy rating market in three ways:

1. **Industry capacity**: states will want to increase the number of trained and experienced building energy raters and energy efficiency retrofit contractors in the state, so that a lack of capacity does not create bottlenecks once the policy is implemented.
2. **Market demand**: states will need to increase the market demand for both rating and retrofits, even before a mandatory disclosure policy takes effect. This increased demand is vital to encouraging the development of industry capacity, and will also serve to reduce bottlenecks (by increasing the number of already rated buildings).
3. **Market awareness**: states will want to increase general awareness by building owners and others of the value and use of rating systems. This will make mandatory disclosure implementation occur more smoothly and will hasten market transformation once mandatory disclosure is in place.

States and utilities can collaborate to build market capacity – and demand – in advance of legislative requirements.

Practically, states can accomplish these goals in several ways:

- **Leading by example**: States can lead by example, by rating all state-owned or operated buildings and making ratings public. States can also encourage municipalities, utilities and other stakeholders to take this voluntary step.
- **Leverage other programs**: states can make rating a participation requirement for other state building-related incentive programs, and encourage municipalities and utilities to do the same. Similarly, states can join DOE and utilities in encouraging financial institutions to make rating a requirement for loan qualification and account for energy efficiency in loan terms.
- **Incorporate into building codes**: states can make rating a requirement within building codes – there is already a similar, more limited requirement in the 2009 IECC model code, which could be expanded to require full rating.
- **Conduct pilot projects**: states can participate in pilots of rating systems by DOE and other organizations, and encourage utilities and municipalities to do the same.
- **Work with realtors**: states can encourage forward-thinking realtors to provide space in listings for voluntary ratings (already available in some states) and to otherwise participate in pilot programs.

As well as preparing the market for a smooth transition to mandatory disclosure, these efforts as a whole will also effectively bring mandatory rating (and to a lesser degree, disclosure) to a large portion of the market.

UPGRADE POLICIES

Our review of options for state upgrade policies identified two key options for states interested in pursuing mandatory upgrade policies. We present these options below, in the form of two policy tiers:

TIER 1 **At a minimum, states should improve enforcement of state energy code provisions.** All states in the Northeast have already adopted the IECC and ASHRAE 90.1 model codes, or have equivalent energy codes, with *time of renovation* provisions to bring additions and affected systems up to code. Improving compliance with these poorly-enforced provisions represents the low-hanging fruit of upgrade policies.[14] One effective approach to improving enforcement is to move towards performance based code compliance where building heat loss and build quality are more explicitly inspected and rated. The informative appendix approach developed by NEEP is an excellent vehicle for this approach.

TIER 2 **States aiming for deep and timely energy use reductions could require broader prescriptive upgrades.** A broader upgrade requirement should be based on a simple prescriptive list of generally cost-effective measures, and be required at both time of renovation and post-sale to ensure timeliness. The costs of the required upgrades will determine exactly how aggressive the policy would be. An upgrade policy limited to relatively low-cost upgrades would limit building owner costs, while ensuring at least some energy performance improvements. States with the resources and momentum to adopt more aggressive upgrade policies can target deeper improvements, either by a more aggressive list of prescriptive measures, or a performance-based requirement linked to the building energy rating. Although our roadmap assumes the use of prescriptive lists for simplicity, we urge the reader to keep in mind performance-based requirements.

The table below summarizes our proposed designs for both upgrade options, for both residential and commercial markets. The reader will note that the categories do not entirely correspond with those presented in our discussion of disclosure policies, given important policy differences.

UPGRADE POLICY FOR HOMES AND BUILDINGS: BASIC INGREDIENTS		
	TIER 1: ENFORCE EXISTING CODES	**TIER 2: BROADER PRESCRIPTIVE**
TRIGGER POINT	Any major alteration to a building, as defined by current code.	Any renovation requiring permitting, involving work valued at over $10,000 (residential) or $50.000 (commercial), involving work identified as a trigger (e.g., opening wall cavities), or occurring within 3 years of the sale of the building.
MEASURES	As defined by IECC code for affected systems and building areas.	'Smart' prescriptive list of generally cost-effective measures. Required measures will vary depending on existing building condition.
ENFORCEMENT	Fines and stop-work orders imposed by municipal codes offices; increased budgets for verification (permits process). Consider use of incentives to increase compliance ('carrot and stick').	Fines and stop-work orders imposed by municipal codes offices. *Renovation verification:* as per code enforcement. *Post-sale verification:* Automatic compliance verification process tied to sales registry. Include periodic reminders and outreach.
CONTRACTOR TRAINING	Recent work on code compliance by NEEP and others suggest that ensuring code compliance requires broad training activities for renovation contractors to ensure awareness and technical skills.	Contractors will need to be trained in new prescriptive requirements.
PHASE-IN STRATEGY	None, although implementation could be staggered if deemed necessary.	To be determined; could follow phase-in strategy for mandatory disclosure.
CENTRAL REGISTRY	N/A	Post-sale upgrades could be tracked via the central registry developed for building energy rating.

THE ROLE OF UTILITY PROGRAMS

Utilities throughout the northeast U.S. have amassed valuable expertise through decades of implementing voluntary programs. They also have a mandate to secure energy savings, and can contribute to disclosure and upgrade policies in a number of ways:

POLICY DEVELOPMENT

1. **Providing expert counsel in the development process**, particularly design expertise and access to market information.
2. **Ensure a seamless fit between mandatory ratings and voluntary retrofit programs** to generate higher levels of retrofitting via synergy between programs.
3. **Supporting the development and piloting of administrative tools**: Utilities can fund the development of key tools such as customized state labels and state databases.
4. **Ensuring free and automatic billing data transfers to operational rating tools**.
5. **Assisting in rater training and certification**: Utilities may have in-house training capacity or existing relationships with training bodies, and can provide funding.
6. **Funding and/or co-managing pilot projects**: Utilities may also fund pilots of *mandatory* disclosure policies, negotiated with interested municipalities and/or within existing utility programs. The utility would likely need to fully fund ratings. Pilots could run while the legislative development process moves forward.
7. **Create complementary mechanisms**, such as including a simple operational rating on all customer bills.

IMPLEMENTATION

8. **Increasing compliance in the initial implementation period via incentives**: The principal barrier to public compliance in the early stages of a disclosure policy will be the cost of audits. **Utilities can play a pivotal role in increasing both acceptance and compliance by subsidizing early ratings.** Incentives can play a similarly pivotal role in upgrade policies.
9. **Funding enforcement efforts**: Utilities can help to fund both public awareness campaigns and enforcement staffing.

CAN UTILITIES CONTRIBUTE TO – AND GET CREDIT FOR – POLICY SUCCESS?

Ratepayer-funded energy efficiency programs are generally closely overseen by public utilities boards to ensure that any energy savings claimed by the program are (a) attributable to the program itself, and not to other factors, and (b) cost-effective. This means that utilities will likely need to demonstrate that any effort they contribute to disclosure and upgrade policies create savings *beyond what would have been caused* by the policies themselves.

Well-established precedents exist for utility contributions to energy efficiency policies. For example, a number of utilities fund development of more stringent energy codes, and receive credit for savings. Indeed, to the extent utilities play a facilitating role – both in assisting states to move policies forward, and in enabling enforcement and compliance – there is reason to attribute a share of associated energy savings to their efforts. Significant utility support will, however, require assurance from regulators that costs will be recoverable.

ROADMAP

INTRODUCTION

This section outlines a timeframe for implementing the disclosure and upgrade policies described previously. More an illustration than a strict recommendation, it is meant as a "straw man" timeline for states to reference as they move forward.

Our roadmap for disclosure policies reflects the fact that the primary driver for phasing in policies will be the need to avoid bottlenecks caused by a lack of qualified raters. To ensure sufficient raters for residential markets, we assume states will develop local training capacity, in collaboration with RESNET and BPI, early on. On the commercial side, we assume that this is not possible, thus requiring a somewhat more gradual phase-in. In both cases, a preliminary analysis of the market in Massachusetts suggests that the NBRP's two to three-year development timeline will provide ample time to develop a complete rater infrastructure.[15]

Our roadmap for upgrade policies reflects two different scenarios, or tiers: a first tier, in which states focus on improving enforcement of *existing* building code provisions aimed at requiring certain energy performance improvements during major renovations, and a second tier in which states go a step further and institute broader, typically prescriptive upgrade requirements.

The reader will note that both upgrade policy options are shown as being designed and put into place simultaneously with disclosure policies. This is feasible but for some may be ambitious; states may prefer to delay implementation of upgrade policies, particularly new legislation (as opposed to beefed up enforcement), until disclosure policies are well established. The ultimate timing and sequence of events will depend on the urgency with which each state views the challenges of energy and climate change.

KEY ASSUMPTIONS

The timelines presented below rest upon several important assumptions, many of which involve the Department of Energy. Specifically:

- **States** have the political will required to pass enabling legislation within roughly one year, to develop regulations and an administrative structure in a timely fashion, and to work on market development and key policy design issues while legislation and regulations are pending.

- **DOE** will have fully developed the NBRP rating system and associated database within 24 months, including any necessary testing and refinements. The system as a whole will adequately address states' most critical requirements, as outlined on page 32 (a label that states can enhance/customize if needed, full stateside access to the database, etc.).

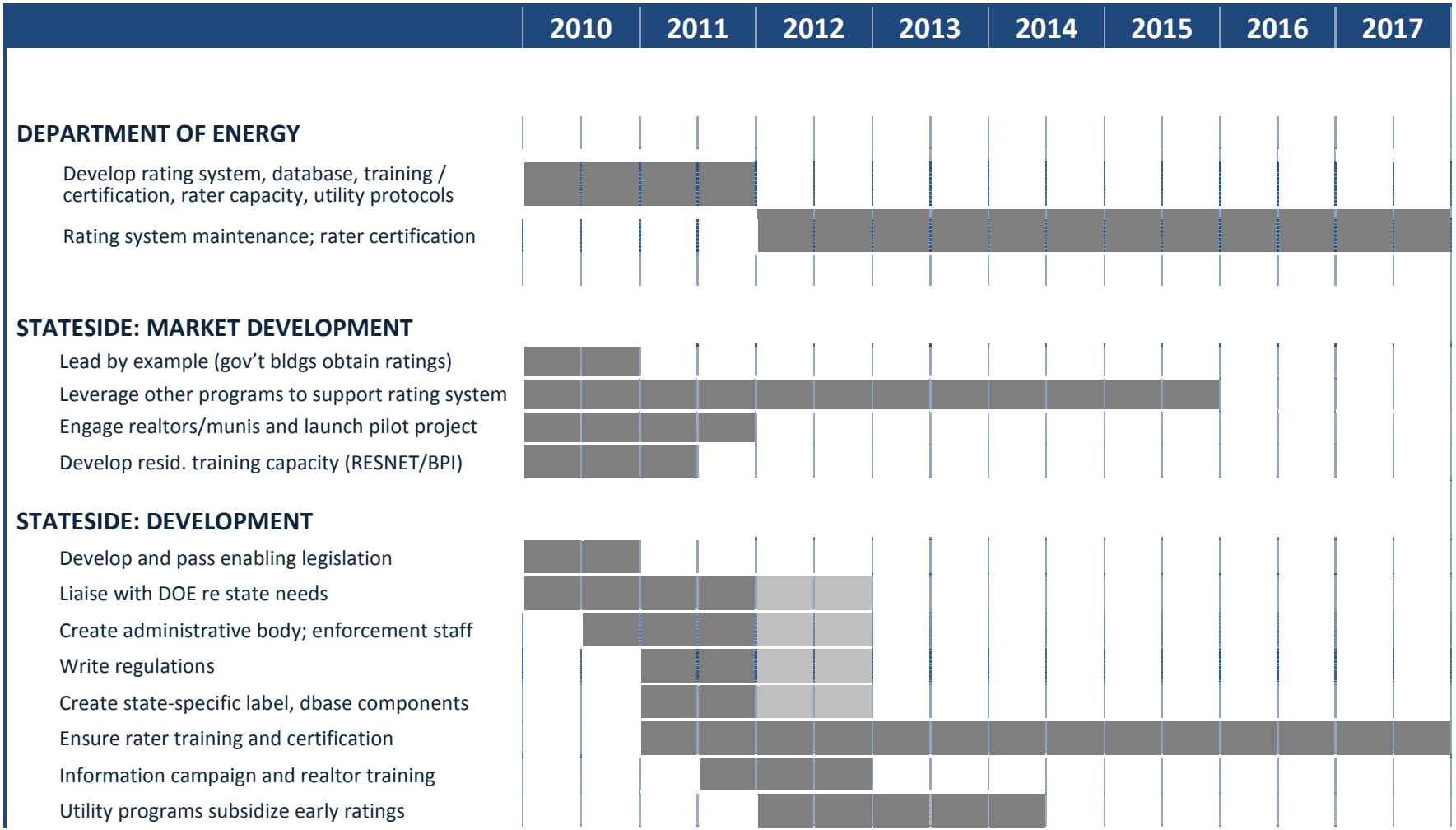
- **DOE** will develop residential training and certification programs in a timely manner. More specifically, we assume that it will develop a full certification program, as well as implementation capacity, within 24 months. We also assume that it will announce early on in the NBRP development process that HERS and BPI certifications will be deemed acceptable. Doing so will allow states to begin training activities immediately for residential markets, and will ensure that the existing rater capacity need not go through a lengthy new training and certification process.

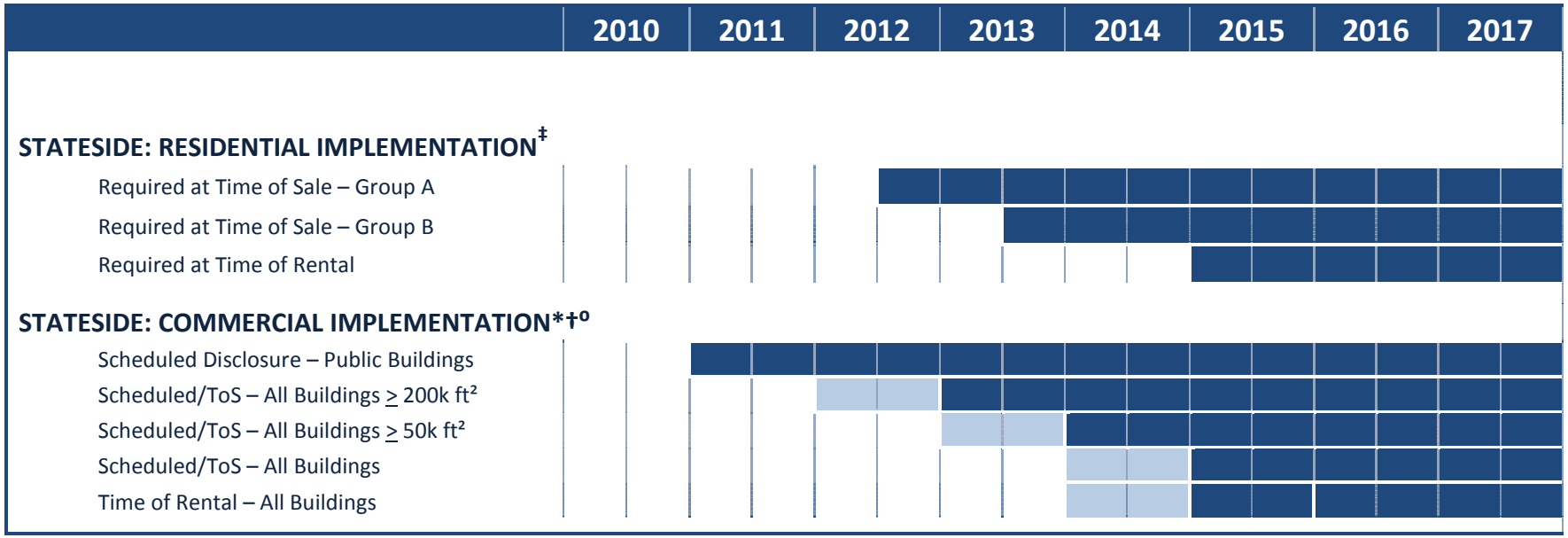
- **DOE** will take on responsibility for commercial rater certification and have a full certification program, as well as implementation capacity, in place in states within 24 months. Furthermore, its commercial rating will be applicable to a wide range of building types immediately. *Of note: if DOE chooses to phase in the development of its rating tool (by building size or segment, for example), our proposed phase in of mandatory disclosure should be rethought accordingly.*

- **Utilities** are able to subsidize energy audits in the initial years of the program, to encourage compliance. They also support the process by ensuring their own retrofit-oriented energy efficiency programs are in line with – and supportive of – the forthcoming disclosure policies.

The reader will note that, for simplicity's sake, we refer to DOE as the implementer of all NBRP tasks. In fact, many of these tasks could be delegated to third parties such as RESNET (and the new COMNET it will house), ASHRAE or others.

ROADMAP: MANDATORY DISCLOSURE





‡ *The phase-in process for homes is assumed to occur in two stages, or groups. Depending on individual states, those groups can be determined by region, by property age, or by other characteristics.*

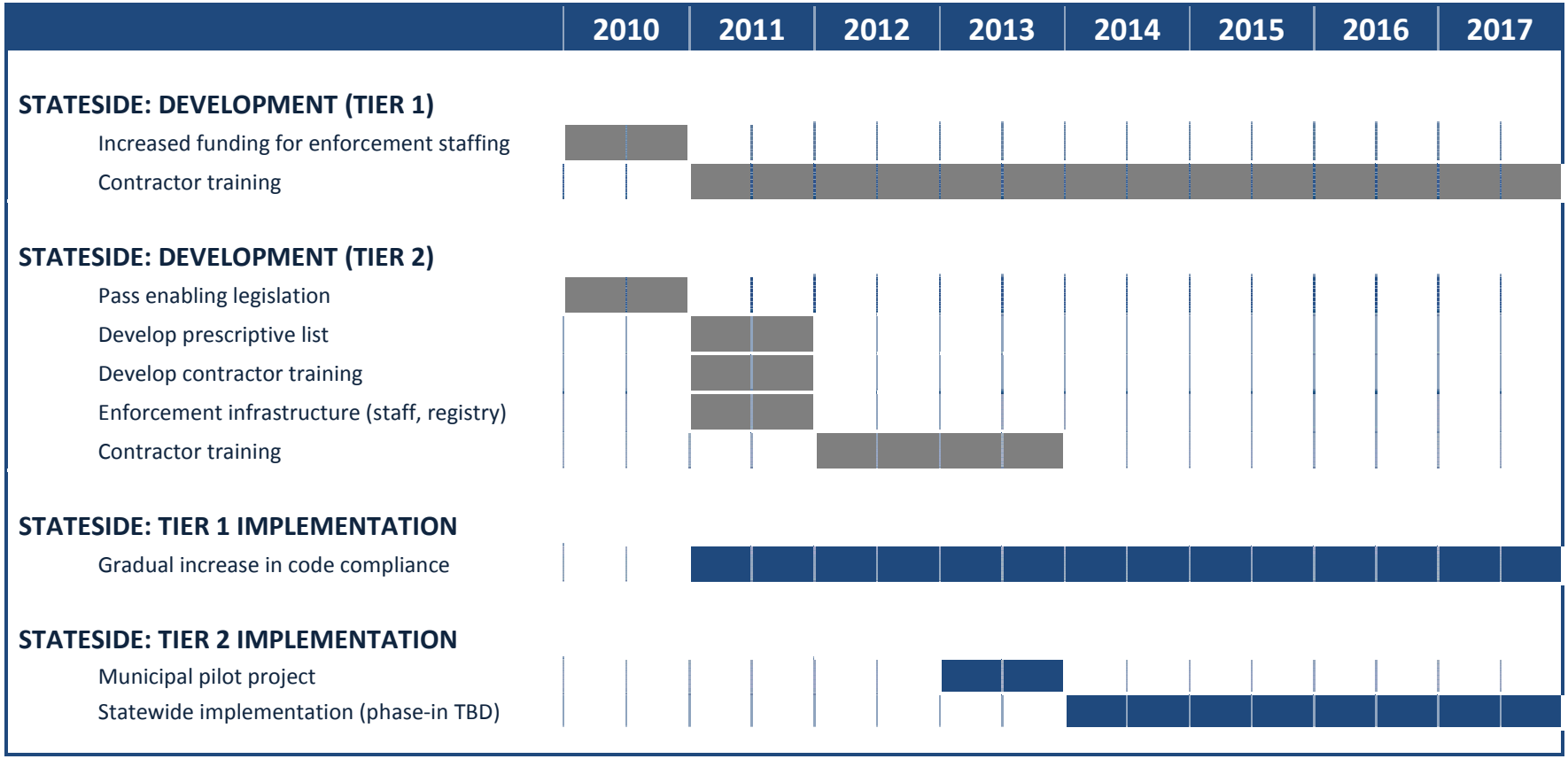
* *In addition to phasing in commercial sector requirements by building size, this timeframe assumes that during the first twelve-month period (the light blue shading at the outset of each time bar), the requirement would be limited to obtaining (but not publicizing) an operational rating. Public disclosure of the operational rating, and disclosure of an asset rating at the time of sale, would only come into force 12 months later.*

† *Only buildings covered by the NBRP system would be subject to the disclosure requirement. Certain types of less common buildings or buildings housing industrial processes may therefore be excluded.*

º *The commercial timeline is similar to the residential timeline, with two exceptions. The start of time of sale implementation is delayed by a year because states cannot begin developing rater capacity before the NBRP certification is available. This gives states more time to develop supporting pieces.*

ROADMAP: MANDATORY UPGRADES

The roadmap for implementation of mandatory upgrade policies is broken into the two tiers discussed previously: enforcing current code (tier 1), and implementing more aggressive, mandatory upgrade requirements (tier 2).



NOTE: LIMITATIONS AND CAVEATS

We urge the reader to take note of several limitations and caveats to this report:

SHIFTING SANDS

Dunsky Energy Consulting developed this paper throughout the spring, summer and fall of 2009. During this short time, a large number of important new initiatives were launched or adopted with the potential to impact states' consideration of these policies. In particular:

- Congress is currently debating several pieces of legislation that would require EPA to develop specific rating systems and a model for mandatory disclosure of energy performance nationwide for new buildings, among other relevant requirements;
- A number of states, cities and towns throughout North America were crafting, finalizing or beginning to implement their own mandatory disclosure and/or upgrade policies, including Oregon, Washington State, Nevada, California, New York City, Washington (D.C.), Austin (Texas), Seattle (Washington) and, in Canada, the province of Ontario;
- New energy rating systems and mandatory disclosure laws came fully into effect in most of the 27 member states of the European Union;
- Australia was putting the final touches on detailed legislation instituting mandatory energy performance disclosure for office buildings throughout the country;
- ASHRAE launched a draft concept comprehensive rating system for commercial buildings;
- COMNET was working to develop standardized protocols for commercial building modeling and software approval;
- RESNET began reviewing its HERS residential rating system, and the State of California pursued work on developing a "HERS II";
- The American Society of Testing and Materials (ASTM) began developing a new standard for commercial building energy data collection and disclosure; and
- The Environmental Protection Agency (EPA) and Department of Energy (DOE) announced a new partnership that clearly delineates each agency's roles and responsibilities with regard to building rating and labeling

This paper was written in the shadow of these events, and while we have made every reasonable attempt to consider and integrate them into our analysis, some – especially the most recent ones – may not have received the full consideration they deserve. By the time of publication, additional developments may also have arisen that merit further consideration.

MANDATORY IS KEY

Given these caveats, some readers may be tempted to conclude that it would be preferable to begin with a *voluntary*, as opposed to mandatory, approach, at least insofar as *disclosure policy* is concerned (mandatory upgrades must by their very nature be firm requirements). **We caution against this.**

While voluntary systems can be used to test the accuracy of a building label, for example, they cannot test the effectiveness of a mandatory disclosure policy. Indeed, the value proposition for mandatory disclosure – the idea that the market would begin to value energy performance in a way it currently does not – is based on the very premise of a mandatory, market-wide approach. This requires that disclosure of the energy performance of homes and other buildings be ubiquitous. If not, homebuyers are unlikely to recognize or value energy performance labels (if only one home in ten they are looking into provides it), and homeowners will not consider improving poorly-performing homes – let alone voluntarily disclosing their performance – if buyers don't value the improvement. Similarly, while some commercial building owners appreciate obtaining an operational rating as a benchmark against which to compare their own performance, poorer-performing buildings are unlikely to share this information with prospective buyers on a voluntary basis.

We believe that *mandatory* is key to the success of a disclosure policy. This need not lead to imprudent experimentation; a stepped implementation approach is both possible and indeed desirable in some cases. But the alternative – a voluntary approach to disclosure – will likely place severe constraints on the policy's key benefits, by:

- **Restricting its ability to incent adoption of energy savings.** If the market does not value energy savings and performance, market participants are less likely to invest limited capital into energy retrofits;
- **Limiting the impetus for improving home ratings and lowering costs.** If neither software and building science firms nor investors can foresee significant growth in the demand for energy performance ratings, they are unlikely to focus time and resources on improving modeling accuracy and reducing rating costs; and
- **Leaving consumers in the dark about future energy costs.** If performance labels are not mandatory, energy transparency in the marketplace will continue to remain elusive, leaving buyers (and renters alike) to discover performance issues – and associated high bills and discomfort – when it's already too late.

For these reasons among others, we urge policymakers to complement current voluntary incentives with a *mandatory* disclosure and/or upgrade policy.

DISCLOSURE: A TOOL IN THE TOOLBOX

As noted previously, despite a significant potential for cost-effective energy efficiency improvements to *existing buildings*, encouraging consumers to invest in energy retrofits remains a daunting task. Indeed, large barriers – information, search costs, transaction costs, access to capital, split incentives, externalities and inefficient pricing, among others – explain why consumers remain either unable or unwilling to tap into the very large potential for cost-effective energy retrofits and savings.

Mandatory disclosure policies address some of these barriers by helping the market to value efficiency improvements. Yet they will not eliminate search and transaction costs, will not address split incentives[16], will not internalize externalities or correct for inefficient prices. **Powerful as they may be, disclosure policies are no silver bullet; they alone will not magically transform all markets to fully consider energy efficiency opportunities.**

Rather, mandatory disclosure policies are a tool in the toolbox; an additional market pull that can complement and indeed support other initiatives like voluntary incentive programs, financing and building codes. For example, incentive programs can leverage "time-of-sale" disclosure of energy ratings by reaching out to new homeowners and offering incentives tied to improvements in the rating. Similarly, lenders – in conjunction with energy efficiency programs – can more easily offer interest rate rebates or higher loan ceilings to customers with high energy performance scores. And building codes can be tied into performance scores, enabling a smart, more dynamic code-setting approach.

Mandatory energy performance disclosure, when combined with voluntary programs and mandatory codes (and/or upgrade policies), can provide a powerful portfolio approach to helping markets achieve the economic, social and environmental goals of Northeast states.

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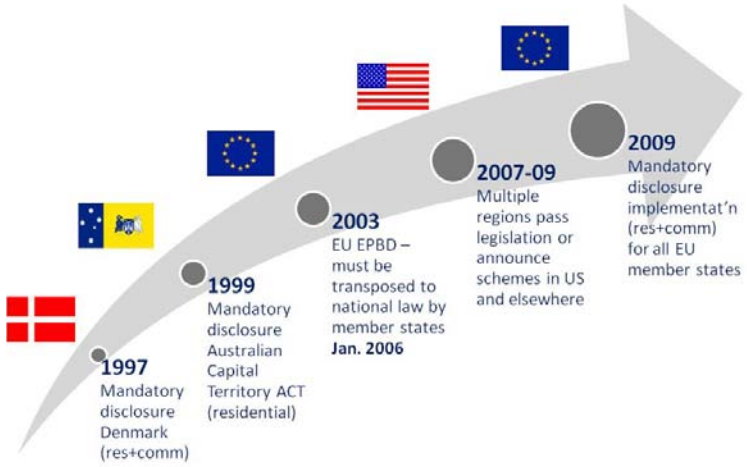
BACKGROUNDER: CASE STUDIES AND EMERGING POLICIES

International and U.S. policies profiled as of June 2009

INTRODUCTION

Mandatory energy performance disclosure and upgrade policies are not a new concept, having been considered at various times in the last 30 years in many US jurisdictions. Despite this, there are only a handful of longstanding policies in the US and abroad. This is rapidly changing, as policy makers responsible for ambitious climate change and energy efficiency goals search for policies that can go beyond traditional, incentive-based programs and transform markets. Internationally, mature policies in Australia and Denmark have been expanded, and joined by recently developed policies across the European Union and elsewhere. Nationally, over a dozen states and municipalities have seriously considered disclosure and/or upgrade legislation, with seven new policies in place as of the summer of 2009.

Figure 2 Historical Milestones



It is beyond the scope of this paper to comprehensively summarize all existing disclosure or upgrade policies, particularly given the rapidly changing landscape in 2009. Instead, we have focused on case studies of jurisdictions with well-designed and fully implemented policies. We have also detailed most US policies that are currently being developed, either because of interesting design choices or relevancy to the Northeastern context. After profiling these policies, we summarize key lessons learned on page 84.

The reader should note that our case studies reflect the status of emerging policies as of June, 2009. In particular, proposed policies in New York City and regulations under development in California were scheduled to advance in the fall of 2009.

The table below summarizes our selection of international and national case studies.

International	National	
• **Australia (ACT and national policies)** • **Denmark** • **United Kingdom (an example of new Europe-wide approach)**	• Austin, TX • Berkeley, CA • Burlington, VT • California • National and State Energy Codes	• New York City • Oregon • Washington • Washington, D.C.

Beyond these case studies, a host of other regions either have or are currently developing similar policies, including:

- **United States**: Maine (residential bill disclosure), Montgomery County, MD (residential bill disclosure); New York (residential bill disclosure), Nevada (residential disclosure) Santa Fe, New Mexico (residential disclosure for new homes), Seattle, WA, and Wisconsin (rental upgrade at time of sale); and

- **Internationally**: Ontario, Canada (residential disclosure); Shandong, China (residential disclosure for new homes); Singapore; and New Zealand.

INTERNATIONAL POLICIES

AUSTRALIA

ACT HOUSE ENERGY RATING SCHEME (ACTHERS)

The Australian Capital Territory (ACT) has one of the longest running and best-studied mandatory disclosure programs for residential property. It introduced minimum energy performance standards for new homes in 1995: houses had to score a minimum of 4 stars on a 6-star energy rating scale, as determined by energy modeling. Four years later, in 1999, the ACT government passed new legislation requiring the mandatory disclosure of the energy performance of all existing homes at the time of sale. Disclosure at time of rental is also required, but only for homes which have already obtained ratings due to a sale.

The Energy Efficiency Rating (EER) must be evaluated by an accredited ACT House Energy Rating Scheme (ACTHERS) assessor at the time a residential property is placed on the market. Ratings are based on a site visit and energy modeling of the building envelope's performance (HVAC is not considered). Ratings are valid indefinitely unless modifications are made. The energy rating, which is paid for by the seller, must be disclosed on all advertisements and marketing materials relating to the sale and the EER recommendations report must be included with the contractual sale documents.

Compliance enforcement is ensured principally by a market mechanism – buyers can obtain financial compensation equal to 0.5% of the sale price if sellers do not provide the EER rating and report as required. Compliance rates are high for time of sale but poor for rental properties, and the ACT is considering increased enforcement and an expansion of rental requirements to all building rentals.

The disclosure policy is complemented by a voluntary incentive program, ACT Energy Wise, which subsidizes audits and energy retrofits.

Figure 5 ACT FirstRate Report

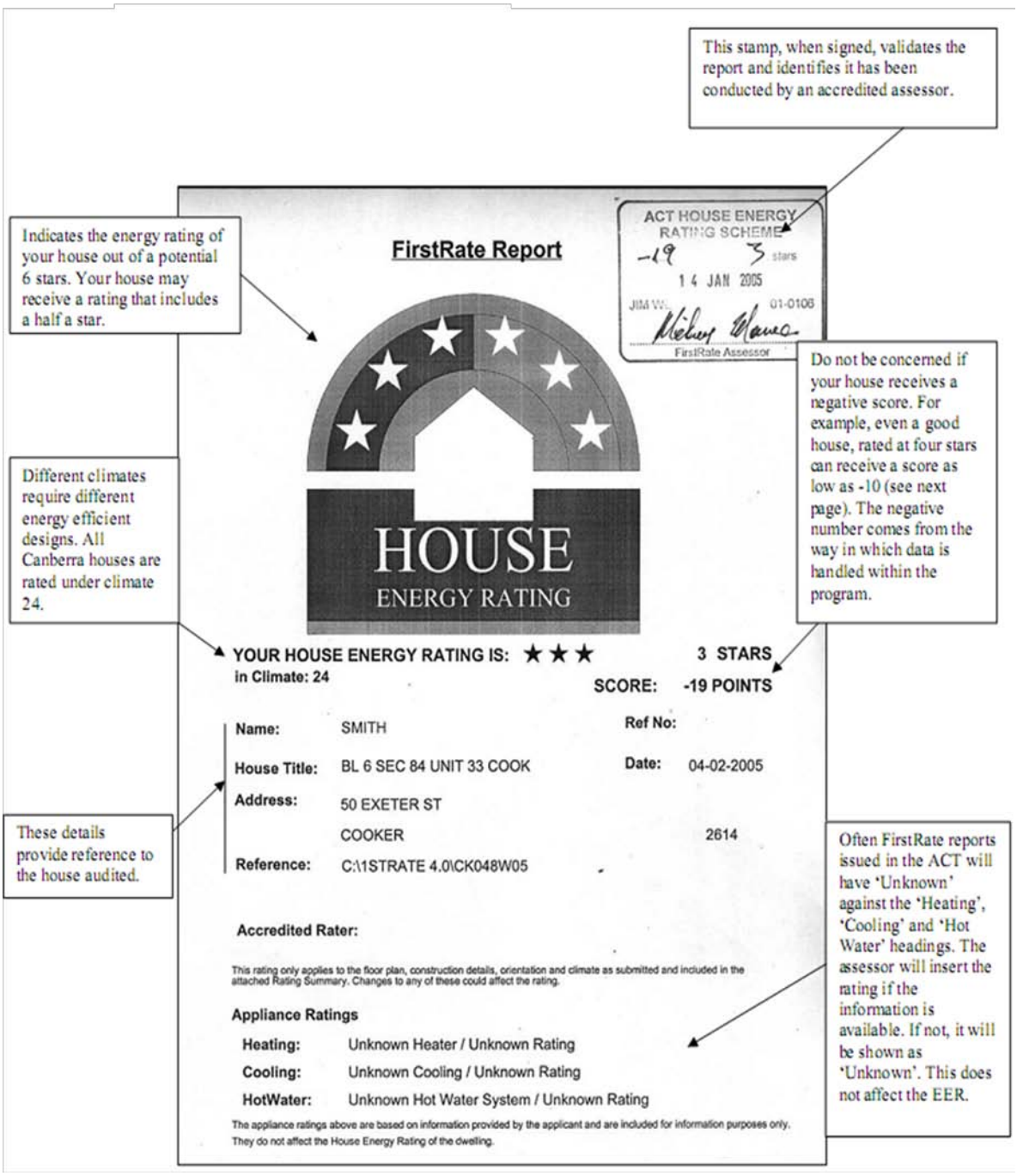
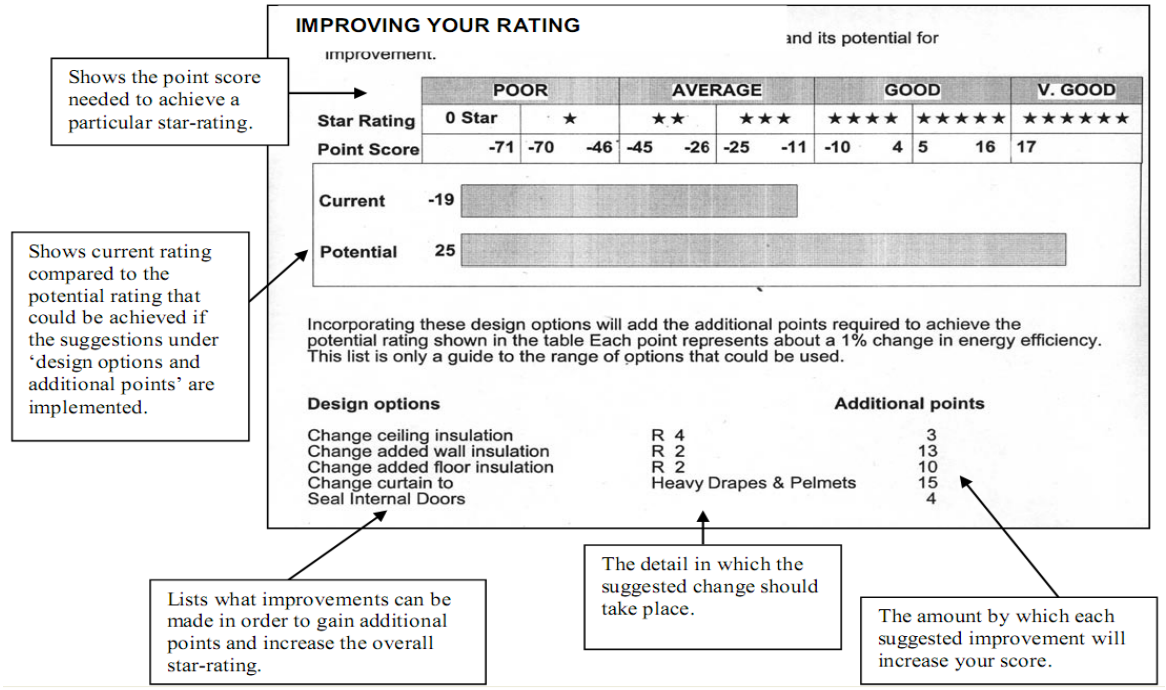


Figure 6 Example ACT EER (cont'd)



RESULTS

The policy underwent an evaluation in 2002 and is currently under additional review as part of expansion plans. The 2002 evaluation found anecdotal evidence that the scheme was inducing sellers to improve homes, and that buyers valued homes with higher ratings more. It also found significant non-compliance and quality control issues:

- ~25% of sellers did not include rating in all advertising
- only 39% of buyers received the audit report prior to signing;
- 52% of homeowners did not find report useful and others were confused about rating coverage;
- ~50% of ratings made by assessors who had not visited property;
- Anecdotal evidence of sellers providing false information to raise ratings

In 2008, the national government conducted an extensive study of rating impacts on home prices, as part of plans to extend the disclosure policy nation-wide. The study, discussed in more detail on page 84, found strong evidence that ratings were positively affecting home prices in the region.

MANDATORY DISCLOSURE SCHEME FOR COMMERCIAL OFFICE BUILDINGS

Australia has been considering a mandatory disclosure policy for commercial buildings since 2004, via the Council of Australian Governments (COAG)'s **National Framework for Energy Efficiency (NFEE)**. A detailed proposal was approved in August 2009, subject to a final regulatory review. The proposed policy is set to take effect as of January 2010 and will initially apply to office buildings or building spaces, with other building types gradually added once an impact study and cost-benefit analysis have been conducted following the first implementation phase.

Disclosure is only required for spaces and buildings over 2000 m² (21500 ft²). The operational rating will be based on a greenhouse gas emissions metric (kg CO2e/m²) and will be valid for 12 months. This rating is calculated using an online tool, similar to the EPA's Energy Star Portfolio Manager, known as National Australian Built Environment Rating System (NABERS).

Owners will also have to provide buyers or renters with an assessment report of the building, which contains retrofit recommendations and financial analysis, and will be valid for 7 years unless the building's physical assets are modified. Both ratings and reports must be provided to a central registry. One element of the scheme that remains to be determined is the provision of tenancy star ratings, which would evaluate specific rental spaces. Scheme enforcement will be complaints based, with a civic penalty for non-compliance. The program administrator will also train, certify and conduct quality control on building assessors.

TRIGGER & REQUIREMENTS

When commercial property owners want to sell or lease all or part of their office building, they will be required by law to:

- Disclose a valid NABERS Energy rating in all marketing materials;
- Disclose a valid *Building Energy Efficiency Certificate (BEEC)* and *Energy Efficiency Assessment Report (EEAR)* to prospective tenants or buyers; and
- Register a valid BEEC and EEAR to a central registry.

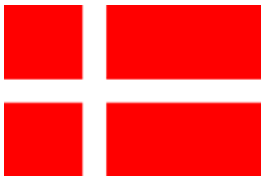
NABERS ENERGY RATING

The National Australian Built Environment Rating System (NABERS) is a voluntary benchmarking system that compares a building's energy use intensity and GHG intensity to other comparable buildings. It was first introduced in 1998, and over 40% of the total office space in Australia obtained a rating in the first ten years of operation. It produces a rating on a technical scale of 1-5 stars, where 1 reflects very poor energy management and outdated systems and 5 reflects exceptional building performance and energy management practices.

There are **three distinct types of NABERS Energy ratings**. Each rating includes quantitative measurements and occupancy information. The scope of each rating is detailed in the table below:

NABERS RATING TYPE	WHAT IS COVERED
NABERS Tenancy Rating	Indoor environment within the leased space, over which the tenant has direct control (air quality, lighting, office layout, etc).
NABERS Base Building	Central HVAC systems and lighting in common areas, both of which are controlled by building management (heating & cooling, air quality, lighting controls, etc.)
NABERS Whole Building	A combination of the tenancy and base building ratings, where the tenant is the owner and/or controls all services within the building.

DENMARK



Following on a long tradition of energy saving policy initiatives, Denmark was one of the earliest adopters of a mandatory energy labeling policy for both residential and commercial buildings, long before the Energy Performance of Buildings Directive was enacted by the European parliament in 2003. The Danish experience was instrumental in providing some of the groundwork for the European Directive. **As such, this section presents the key elements of the original piece of legislation, in place from 1996-2006.** The legislative framework was tightened in 2006 to take EPBD requirements into account, but we will use the UK case study in the next section to provide further insight into the EU approach to energy labeling of buildings.

Note that current policies include a mandatory upgrade policy for publicly owned and operated buildings, which must, every five years, conduct an energy audit and, within five years thereafter, install all measures with a five year or quicker payback period.

MANDATORY LABELING POLICY 1997-2006

Starting on January 1st, 1997, all new and existing Danish buildings used for residential, public, trade, or private services had to obtain a ***Specific Energy Label Certificate*** **that provided information about a building's energy and water consumption as well as its CO_2 emissions**. Buildings used for commercial and energy production and buildings with very low consumption were excluded from the labeling scheme.

The legislation made a distinction between small and large buildings, which carried different obligations with respect to energy labeling requirements.

SMALL BUILDINGS (< 1,500 m² – approx. 16,000 sq. ft.)

Owners of small buildings had to obtain an **energy label at the time of sale**. The main target building category for this scheme was single-family homes or owner-occupied apartments, although small commercial buildings were also covered. Predicted energy consumption was calculated using energy modeling with standardized occupancy and weather assumptions.

LARGE BUILDINGS (> 1,500 m² – approx. 16,000 sq. ft.)

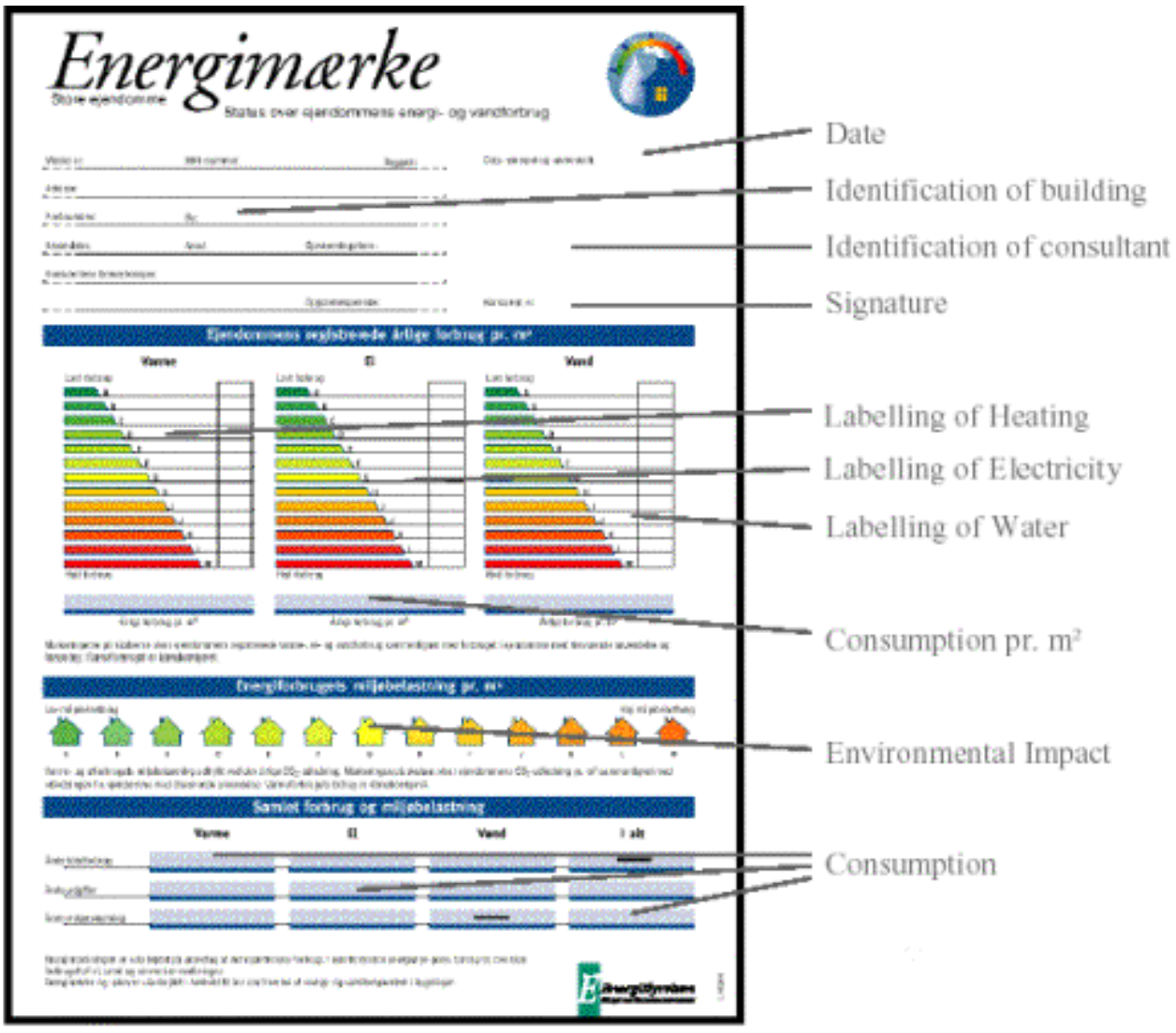
Owners of large buildings had to obtain an operational energy label on a yearly basis. Energy consumption in large buildings was based on monthly consumption data that has been climate corrected to a normal year using degree days, in order to provide the operator with the potential for meaningful year over year data comparisons.

The primary objective of a mandatory disclosure policy for large buildings was to make users aware of their energy consumption**,** to provide benchmarking information for comparison against similar buildings, and to provide the information required to plan and implement cost effective upgrades and to improve building maintenance practices.

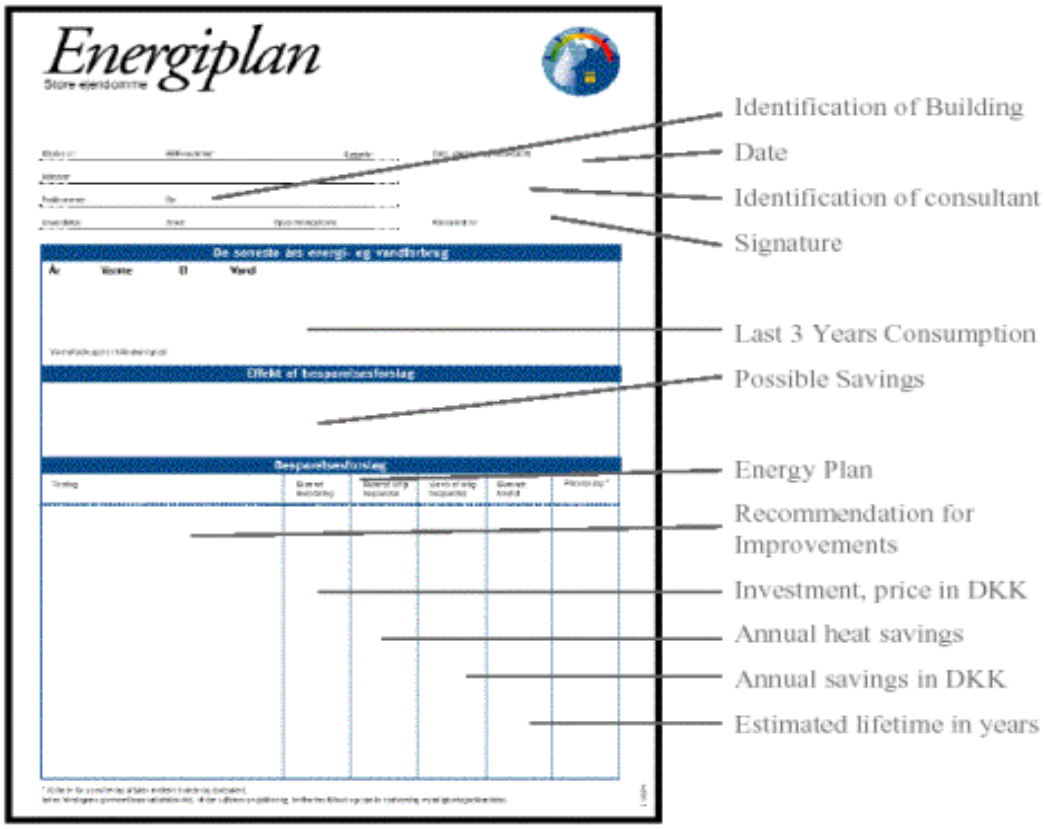
THE DANISH ENERGY LABEL

The former Danish Energy Label was composed of two distinct elements: the Energy Rating and the Energy Plan. The Energy Rating and Energy Plan shown below were used in the large buildings scheme, but the information contained in the small buildings scheme is very similar.

THE ENERGY RATING is the portion of the label that provided the consumer with detailed information about the building's performance including absolute and relative (per m²) consumption data as well as individual ratings for heating, electricity, water usage and environmental impact. The small buildings rating scheme provided predicted data whereas the large building scheme provided actual data. The label provided users with visually intuitive color coded rating scales (A to M) and well laid out, easily understood information.

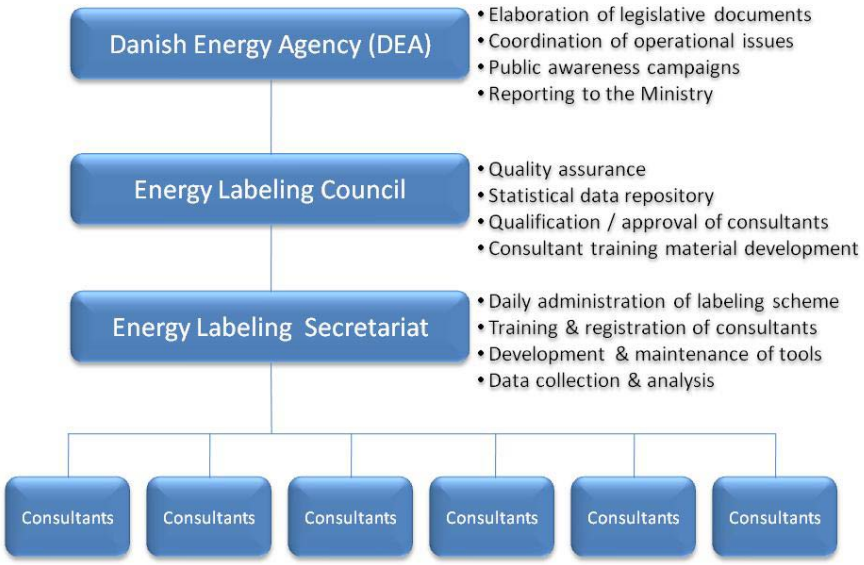


THE ENERGY PLAN was an integral part of the Energy Label that provided data about energy usage for a 3 year period (large buildings only) and proposals for cost-effective efficiency measures. Recommendations included financial analysis. The Energy Plan also included generic recommendations on best practices and low-cost/no-cost operational changes.



ADMINISTRATION & INFRASTRUCTURE

The mandatory labeling program was administered by the Danish Energy Agency (DEA). In 2007, accountability for DEA was transferred to the new Ministry of Climate and Energy. The responsibilities of each of the administrative bodies in the hierarchy of Danish energy labeling are detailed below:



Energy consultants were accredited by the Energy Labeling Council and had to be either engineers or architects. Consultants had to register the contents of the Energy Labels, including all information about building characteristics, ratings and energy plans, with the Secretariat, who is responsible for entering the information into a centralized buildings database. As well as paper audits, quality assurance included random building audits (1 in 500) as well as a review of labeling forms (1 in 100).

RESULTS

The Danish Energy Authority commissioned an evaluation study which was conducted between June 2000 and February 2001. [17] Key results included:

LARGE BUILDINGS

- Low compliance: only 42% of large buildings (52% of floor area) were registered.
- 50% of unregistered large building owners were unaware of the scheme's existence.
- Market penetration was much higher in densely populated regions such as Copenhagen than in remote areas of the country.
- Market penetration was higher among residential buildings, schools, hospitals and institutions than among trade and service companies.
- Substantial potential savings were identified by building audits (3.6 PJ for heating, 170 GWh of electricity and 5 million m3 of water).
- The scheme collected insufficient information on actual implementation of retrofit recommendations.

SMALL BUILDINGS

- Some 45,000 to 50,000 energy labels were issued each year.
- 70% of single-family dwellings were labeled at time of sale.
- 20% of all single-family homes were labeled within the first 6.5 years of the scheme.
- 50-60% of small buildings were registered under the energy labeling scheme, with a very wide variation in compliance between geographic areas (20-85%).
- Less than half of the interviewed building owners were aware of the labeling scheme.
- Convincing home owners to invest money was difficult even if the energy or water improvements made sound financial sense and had short payback periods.
- New home owners planning renovations were more likely to integrate efficiency measures into their plans if their home had received an energy label.

More recently, in 2009 independent analysts conducted a statistical analysis of the impact of residential labeling and audits on post-sale energy use.[18] Because of high levels of non-compliance (almost 50% in the period studied, 1999-2002), the study was able to compare energy use in complying and non-complying homes and found no difference in post sale use.[19] At first glance, this would seem to suggest that receiving information at the time of sale was insufficient to incent new owners to implement recommended retrofits. However, the study contained significant limitations.[20] Moreover, it did not analyze the impact of mandatory labeling on pre-sale improvements by owners, the likeliest impact of mandatory disclosure policies.

EUROPE AND THE UNITED KINGDOM

EUROPEAN CONTEXT

Within the framework of the Kyoto Protocol, the European Union (EU) agreed to reduce greenhouse gases (GHG) by 8% below 1990 levels during the first commitment period (2008-2012). In order to establish a community-wide strategy to meet this objective, the European Commission launched the European Climate Change Programme (ECCP) in 2000 to identify and develop a list of priority actions and cost-effective policies and measures that would help to achieve required GHG reductions.

One of the key recommendations that came out of the first ECCP report was the need to focus on the energy performance of buildings, as the building sector accounted for nearly 40% of the EU's total energy consumption. This recommendation constituted the foundation for the Energy Performance of Buildings Directive.

ENERGY PERFORMANCE OF BUILDINGS DIRECTIVE (EPBD)

Timeline: The Energy Performance of Buildings Directive (2002/91/EC) was adopted by the European Parliament on December 16th, 2002 and came into effect on January 4th, 2003. Member States of the European Union were required to transpose the Directive into national law no later than January 4th, 2006, and to have those laws come into effect no later than January 4th, 2009.

Objectives: The objectives of the Directive are twofold. First, the EPBD aims to promote the improvement of the energy performance of buildings through cost-effective measures without compromising comfort and indoor air quality. Secondly, the EPBD seeks the convergence of building standards throughout the EU towards those of Member States which have already set ambitious levels.

Scope: The Directive covers both residential and non-residential buildings, for both new and existing constructions, but allows for certain exemptions such as buildings with historical or architectural merit, religious buildings, buildings with limited time of use, and buildings with a useful floor area of less than 50 m².

The EPBD legislation is based on five pillars:

1. **Member States must develop and apply a methodology to calculate the energy performance of buildings** according to a general framework that includes specific considerations such as the thermal characteristics of a building, HVAC installations, built-in lighting, passive solar, natural ventilation, local climatic conditions, etc.

2. **Member States must establish minimum energy performance standards (MEPS) for both new and existing buildings.** For existing buildings over 1000 m² undergoing major renovations, energy performance must be upgraded as far as is technically, functionally and economically feasible. For new buildings over 1000 m², in addition to applying MEPS, the feasibility of alternative energy sources must be taken into consideration. Member States must review their MEPS at regular intervals (max. 5 years) in order to reflect technological progress in the building sector.

3. **An energy performance certificate (EPC) must be provided by the building owner to a prospective buyer or tenant at the time of construction, sale or rental.** The EPC must include recommendations for a list of cost-effective improvements of the building's energy performance and should include reference values such as benchmarks to allow consumers and assess the energy performance of the building in comparison with other similar properties. **Furthermore, buildings over 1000 m² occupied by public authorities and visited by the public must display an energy certificate in a clearly visible location**.

4. **Boilers and air-conditioning systems shall be inspected at regular intervals** to assess their energy efficiency and CO_2 emissions.

5. Certification of buildings, drafting of energy efficiency improvement recommendations, and inspection of boilers and air-conditioning systems shall be carried out by **independent qualified and/or accredited experts.**

Figure 3 Energy Performance of Buildings Directive at a Glance

ENERGY LABELING IN THE U.K.

The U.K. has designed its energy labeling scheme for residential and non-residential buildings based on the framework established at the EU level by the Energy Performance of Buildings Directive (EPBD). The U.K. is particularly interesting in that it provides a concrete example of the road to implementation, as it has been travelled by one of the EU Member States. While still in its early days of implementation, a number of shortcomings and potential improvements have already been identified at the national and European levels.

The U.K. energy labeling scheme separates buildings into two distinct categories: residential and non-residential. Each one has a different set of rules and obligations.

RESIDENTIAL PROPERTIES

For residential properties, U.K. law requires the production of an **Energy Performance Certificate (EPC) at the time of sale or rental of a home.** The EPC is one of several elements contained in the Home Information Pack, a set of documents that provides the potential buyer with key information about the property. The provision of the Home Information Pack by the seller or the seller's agent at the time the property is put on the market is a legal requirement in the U.K.; sellers simply cannot market a property without one. Furthermore, the EPC rating of the home must be included on all printed or electronic marketing material about the property. The penalty for failure to produce a residential EPC is £200 (~US $325).

NON-RESIDENTIAL PROPERTIES

The U.K.'s commercial labeling scheme captures many different kinds of buildings and as such the terms "non-residential", "commercial", "non-domestic", and "non-dwelling" are all used interchangeably. Exempted buildings include industrial buildings, as well as places of worship, temporary buildings, small buildings and buildings with a very low energy demand.

Commercial EPCs are mandatory for all buildings covered by the scheme, and must be produced at the **time of construction, sale or lease of the whole building or of any part thereof**. For new construction, the party responsible for the construction of the building must obtain an EPC when the building has been completed. For existing buildings, it is the seller or lessor that must contract a consultant to carry out the work required to obtain an EPC. An EPC is also required upon completion of major renovations that affect the number of parts in the building and/or their HVAC requirements.

Furthermore, buildings with a useful floor area over 1000 m^2 (approx. 11,000 ft^2) occupied in whole or in part by a public authority and that provides services to the general public has an additional obligation: these buildings must obtain a **Display Energy Certificate** (DEC), an operational rating that is based on normalized annual energy consumption data. The DEC's must be renewed every 12 months and clearly displayed in public view inside the building.

ENERGY PERFORMANCE CERTIFICATES (EPC)

An Energy Performance Certificate provides potential buyers or tenants with an asset rating that evaluates a building's designed energy performance, including the building envelope and the HVAC and lighting systems, via energy modeling. EPC's are produced by independent, accredited energy assessors hired by the building owner. Assessors must belong to one of over a dozen accreditation schemes (independent organizations, such as private companies and professional associations, approved by the government to train and certify assessors). EPC's are generated by assessors using one of several government-approved software tools, using a government-maintained National Calculation Methodology.

RESIDENTIAL EPC

The residential EPC discloses an A-G rating for both the energy efficiency and the environmental impact of the building in its current condition as well as potential ratings if all recommended efficiency measures were implemented. The EPC also provides information about the building's current and potential absolute site energy consumption and carbon emissions, (expressed in kWh/m²/yr and kg CO_2/m²/yr respectively).

Each component of the home's envelope and systems is evaluated on a scale from Extremely Poor to Excellent based on the results of a home audit. This information is displayed on page 2 of the residential EPC, along with a series of energy improvement recommendations and estimated annual savings. Page 3 of the EPC (not displayed here) gives consumers detailed information on each recommended measure.

Residential EPC's are valid for 3 years in most cases, or for 10 years for years for a direct, non-advertised sale between 2 parties, or when superseded by a more recent EPC.

THIS IS AN EXAMPLE REPORT AND IS NOT BASED ON AN ACTUAL PROPERTY

Section H: Energy Performance Certificate

Save money, improve comfort and help the environment

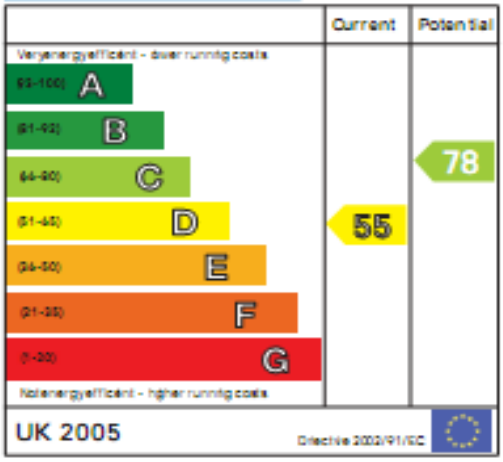
The following report is based on an inspection carried out for:

Address:		Building type:	Home	Certificate number:	XXXX
100 Any Street,		Whole or part of building:	Whole	Date issued:	XXXX
Any Town,		Assessment method:	SAP	Name of inspector:	XXXX
Anywhere, AB1 CD2		Date of inspection:	XXXX		

This home's performance ratings

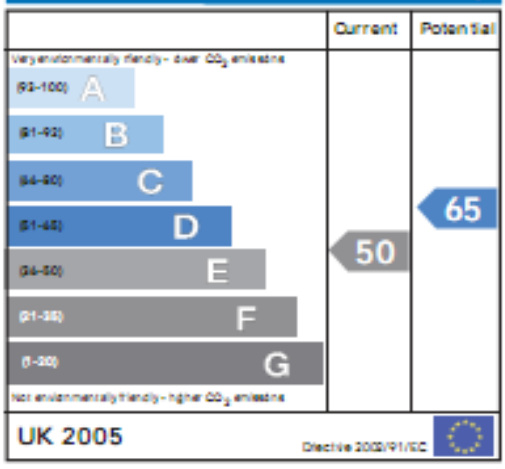
This home has been inspected and its performance rated in terms of its energy efficiency and environmental impact. This is calculated using the UK Standard Assessment Procedure (SAP) for dwellings which gives you an energy efficiency rating based on fuel cost and an environmental impact rating based on carbon dioxide (CO_2) emissions.

Energy Efficiency Rating



The energy efficiency rating is a measure of the overall efficiency of a home. The higher the rating the more energy efficient the home is and the lower the fuel bills will be.

Environmental Impact Rating



The environmental impact rating is a measure of this home's impact on the environment. The higher the rating the less impact it has on the environment.

Typical fuel costs and carbon dioxide (CO_2) emissions of this home

This table provides you with an indication of how much it will cost to provide lighting, heating and hot water to this home. The fuel costs and carbon dioxide emissions are calculated based on a SAP assessment of the actual energy use that would be needed to deliver the defined level of comfort in this home, using standard occupancy assumptions, which are described on page 4. The energy use includes the energy used in producing and delivering the fuels to this home. The fuel costs only take into account the cost of fuel and not any associated service, maintenance or safety inspection costs. The costs have been provided for guidance only as it is unlikely they will match actual costs for any particular household.

	Current	Potential
Energy use	xxx kWh/m^2 per year	xxx kWh/m^2 per year
Carbon dioxide emissions	xx tonnes per year	xx tonnes per year
Lighting	£xxx per year	£xxx per year
Heating	£xxx per year	£xxx per year
Hot water	£xxx per year	£xxx per year

To see how this home's performance ratings can be improved please go to page 2

THIS IS AN EXAMPLE REPORT AND IS NOT BASED ON AN ACTUAL PROPERTY

Certificate number: xxxx
Date issued: xxxx
Name of inspector: xxxx

Section H: Energy Performance Certificate

Summary of this home's energy performance related features

The table shows the current performance of each element of this home on the following scale:
Extremely poor/ Very poor/ Poor/ Average/ Good/ Very good/ Excellent

Element	Description	Current performance
Main walls	Uninsulated cavity wall	Poor
Main roof	Pitched, 100mm loft insulation	Average
Main floor	Uninsulated solid concrete (assumed)	Average
Windows	Single glazed throughout	Extremely poor
Main heating	Mains gas back boiler	Poor
Main heating controls	No controls	Extremely poor
Secondary heating	Flame effect fire	Extremely poor
Hot water	From main heating system; uninsulated cylinder	Extremely poor
Lighting	Low energy lighting throughout	Excellent
Current energy efficiency rating		D 55
Current environmental impact rating		E 50

Measures to improve this home's performance ratings

The improved performance ratings are cumulative, that is they assume the improvements have been installed in the order that they appear in the table.

Lower cost measures	Typical savings	Performance ratings after improvement	
		Energy efficiency	Environmental impact
Cavity wall insulation	£xx per year	D 65	D 56
Loft insulation top up to 250mm	£xx per year	C 68	D 57
Hot water tank and pipe work insulation	£xx per year	C 69	D 58
	Sub Total £xx per year		
Higher cost measures			
Condensing boiler	£xx per year	C 75	D 63
Installation of a full heating controls package	£xx per year	C 78	D 65
	Sub Total £xx per year		
Potential energy efficiency rating		C 78	
Potential environmental impact rating			D 65

Further measures to achieve even higher standards

Double glazing	£xx per year	C 80	C 67
Solar water heating	£xx per year	B 85	C 72
Enhanced energy efficiency rating		B 85	
Enhanced environmental impact rating			C 72

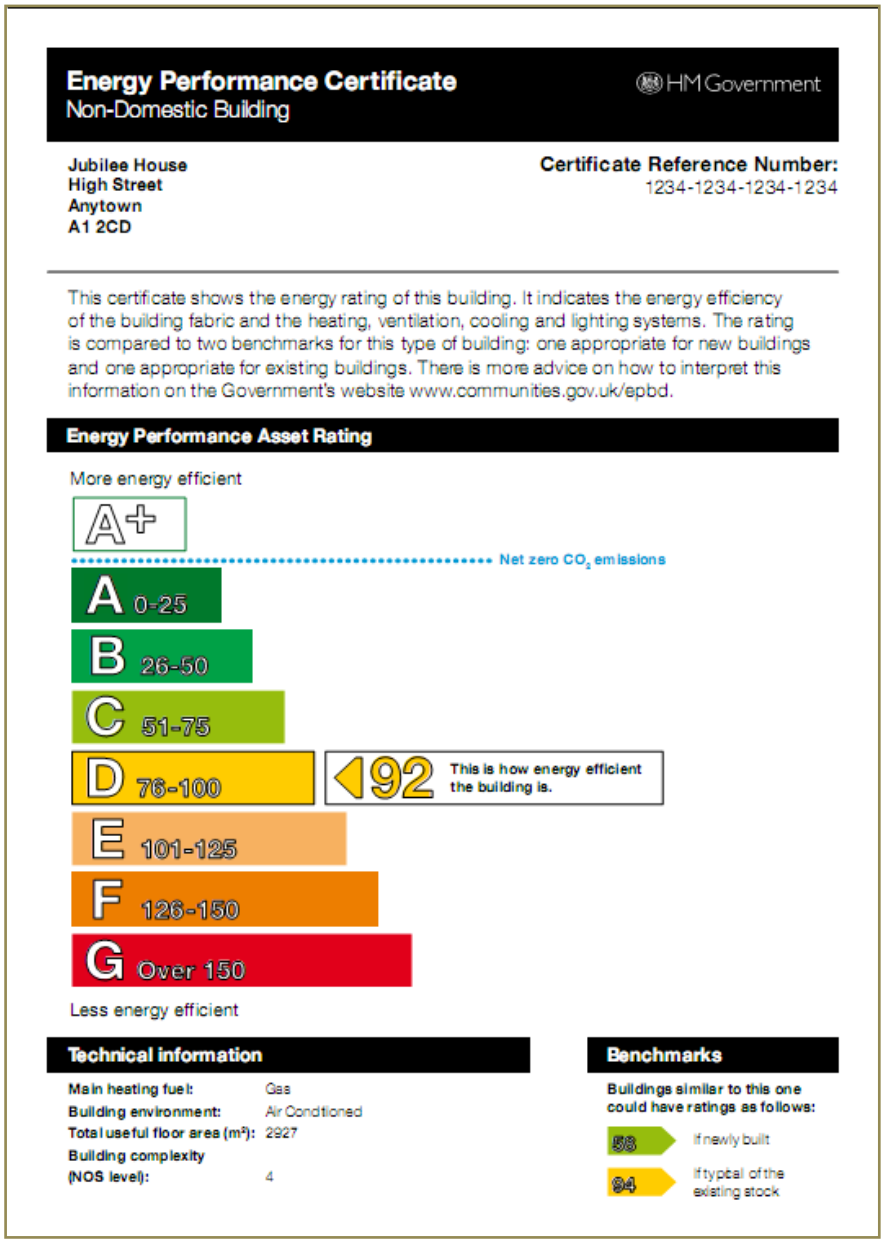
Improvements to the energy efficiency and environmental impact ratings will usually be in step with each other. However, they can sometimes diverge because reduced energy costs are very occasionally not accompanied by reduced carbon dioxide emissions.

For further information on how to take action and to find out about grants for making your home more energy efficient freephone 0800 512 012. Or alternatively visit www.est.org.uk/myhome

'NON-DOMESTIC' EPC

The EPC for commercial buildings discloses a rating based on a scale of 0 to infinity which is correlated to a linear A-G scale. Zero on the rating scale indicates a building with net-zero carbon emissions. The EPC also provides benchmarking information on the energy performance rating of comparable new or existing buildings. The **Advisory Report constitutes an integral part of a non-residential EPC** and provides a list of recommended, cost-effective investments and behavioral advice for low-cost/no-cost operational improvements.

A commercial EPC is valid for a period of 10 years, or until a more recent one is produced.



DISPLAY ENERGY CERTIFICATES (DEC)

In addition to residential and non-residential EPCs, certain public buildings must also obtain a **Display Energy Certificate (DEC).** A DEC is an **operational rating label** that must be issued annually for **all public buildings over 1000 m² that provide services to the general public.** The DEC must be displayed clearly in view inside the building.

A Display Energy Certificate provides an energy rating that takes into account the annual CO_2 emissions per m² of the building based on the actual amount of metered energy used over the course of a 12 month period. The rating number itself does not represent actual units of energy or CO_2 emissions but rather tells consumers how efficiently energy is being used in the building, when compared to a typical building (attributed a 100 on the scale) in the same category.

Energy consumption data is reviewed by an accredited assessor and adjusted for occupancy, intensity of use, special energy uses, weather and climate. The carbon dioxide emissions information displayed on the certificate (top right) covers 3 years of historical data and is based on the adjusted energy consumption, total useful floor area, and building type.

As described for EPC production, assessors are accredited by accreditation schemes, companies and non-governmental organizations approved by the government to train and certify assessors. DECs are generated using government-approved software and methodologies.

Display Energy Certificate

HM Government

How efficiently is this building being used?

A Government Dept
12th & 13th Floor
Jubilee House
High Street
Anytown
A1 2CD

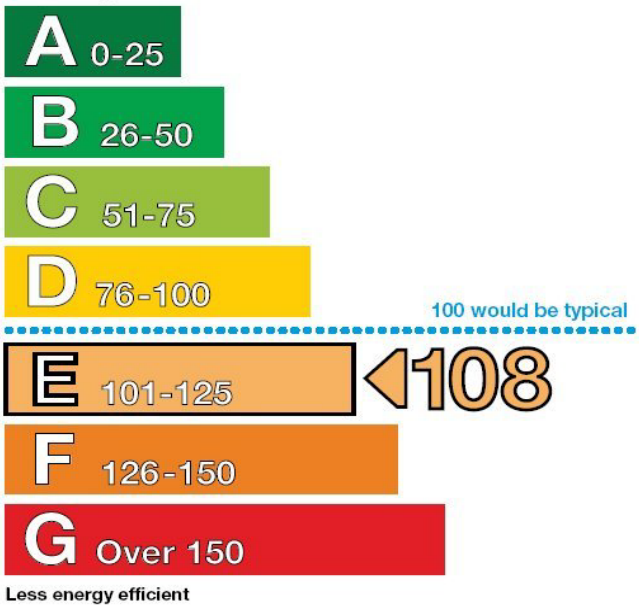
Certificate Reference Number:
1234-1234-1234-1234

This certificate indicates how much energy is being used to operate this building. The Operational Rating is based on meter readings of all the energy actually used in the building. It is compared to a benchmark that represents performance indicative of all buildings of this type. There is more advice on how to interpret this information on the Government's website www.communities.gov.uk/epbd.

Energy Performance Operational Rating

This tells you how efficiently energy has been used in the building. The numbers do not represent actual units of energy consumed; they represent comparative energy efficiency. 100 would be typical for this kind of building.

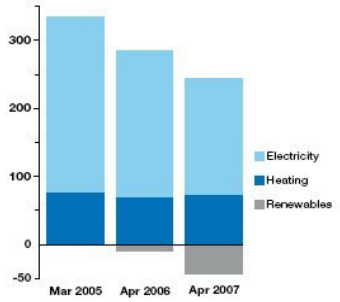
More energy efficient



Less energy efficient

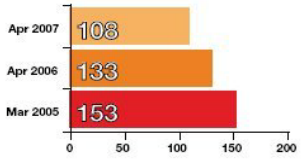
Total CO_2 Emissions

This tells you how much carbon dioxide the building emits. It shows tonnes per year of CO_2.



Previous Operational Ratings

This tells you how efficiently energy has been used in this building over the last three accounting periods



Technical information

This tells you technical information about how energy is used in this building. Consumption data based on actual readings.

Main heating fuel:	Gas
Building Environment:	Air Conditioned
Total useful floor area (m^2):	2927
Asset Rating:	92

	Heating	Electrical
Annual Energy Use (kWh/m^2/year)	126	129
Typical Energy Use (kWh/m^2/year)	120	95
Energy from renewables	0%	20%

Administrative information

This is a Display Energy Certificate as defined in SI2007:991 as amended.

Assessment Software:	OR v1
Property Reference:	891123776612
Assessor Name:	John Smith
Assessor Number:	ABC12345
Accreditation Scheme:	ABC Accreditation Ltd
Employer/Trading Name:	EnergyWatch Ltd
Employer/Trading Address:	Alpha House, New Way, Birmingham, B2 1AA
Issue Date:	12 May 2007
Nominated Date:	01 Apr 2007
Valid Until:	31 Mar 2008
Related Party Disclosure:	EnergyWatch are contracted as energy managers

Recommendations for improving the energy efficiency of the building are contained in Report Reference Number 1234-1234-1234-1234

ADMINISTRATION & INFRASTRUCTURE

As the U.K. is divided into three administrative regions, England & Wales, Scotland, and Northern Ireland each run separate bodies to carry out the day to day operations of the labeling scheme.

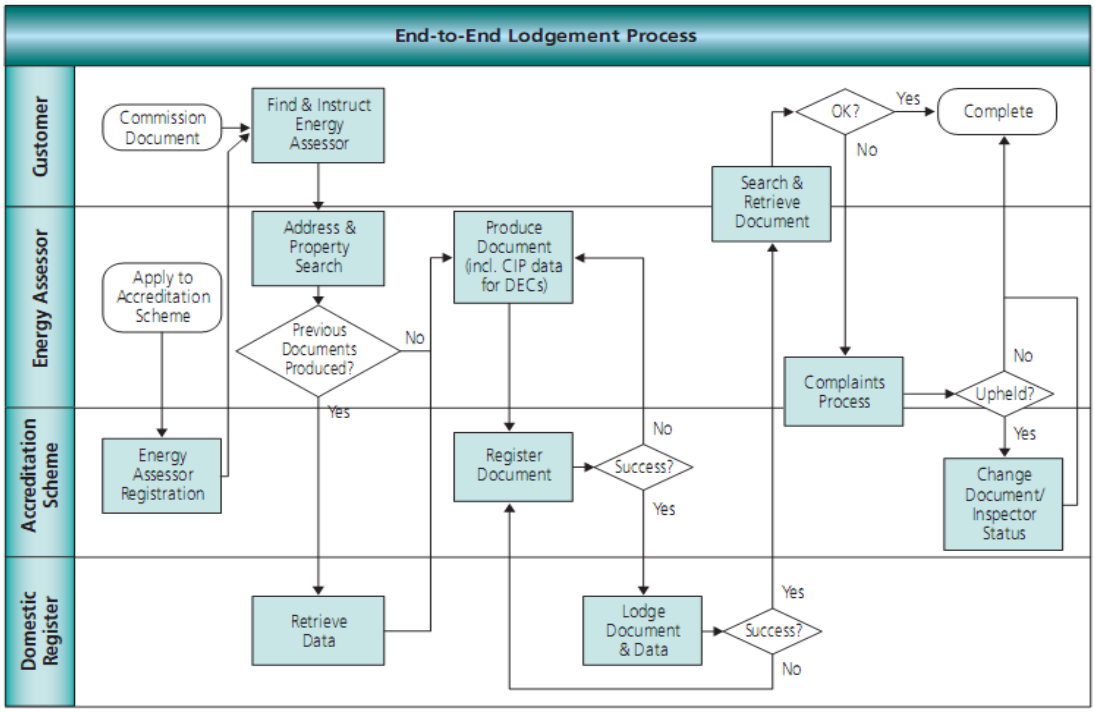
However, most other administrative functions of the labeling scheme are centralized at the national level. First and foremost, all building energy data that is captured by EPCs and DECs throughout the U.K. is entered into the **Domestic Register**, a centralized online database that provides a single point interface for all inquiries relating to the energy performance of buildings.

The **Accreditation Scheme** is an administrative body that manages energy assessor accreditations as well as the registration of EPCs and DECs. They are also responsible for tool development and approve third-party software for use in generating EPCs and DECs. All software must use officially-sanctioned algorithms.

Energy Assessors must go through formal training to become authorized to emit and register energy certificates. The cost to become an accredited energy assessor varies between £750 and £4,000 ($1,250 - $7,000) depending on prior experience and the type of accreditation being sought (costs vary for Display Energy Assessor, Residential Assessor and Commercial Assessor (Levels 3, 4, or 5) authorizations).

The following flow-chart depicts the administrative process relating to the issuance of energy rating certificates:

Figure 4 Administrative Process for Energy Labeling in the U.K.



EMERGING U.S. POLICIES

The United States has recently seen a flurry of activities around mandatory disclosure and upgrade policies. Below we profile several of the most interesting cases, including five local and three statewide initiatives.

AUSTIN, TX

The **Energy Conservation Audit and Disclosure (ECAD)** ordinance took effect in Austin, Texas on June 1st, 2009. The ordinance requires that all single-family, multi-family and commercial buildings that purchase electricity from Austin Energy obtain an energy audit at the time of sale. The ECAD is notable for being the first rating or audit-based disclosure policy launched in the US, covering both residential and commercial buildings. It also includes an interesting mandatory upgrade component for multi-unit residential buildings.

SINGLE FAMILY HOMES AND SMALL MULTI-TENANT BUILDINGS (<5 UNITS)

Residential building owners selling their home after June 1, 2009 must obtain or hold a valid energy audit report and provide prospective buyers with a copy of the audit report. The audit does not include a rating and is a combination of a walk-through audit and duct pressure testing. The report includes recommendations for retrofits and links to Austin Energy incentive programs, but no financial analysis. Austin Energy indicates that audits will take two to three hours and cost $200-$300. Audits must be conducted either by raters certified by the Home Energy Rating System (HERS), or by Building Analyst Professionals certified by the Building Performance Institute (BPI).

Compliance will be enforced via fines – non-compliance is classified as a misdemeanor (up to $500 fine for individuals, more for corporations). The ordinance defines several exceptions: condominiums, mobile homes, homes less than ten years old, homes that have implemented at least three efficiency measures or $500 in rebates or more from one of Austin Energy's voluntary retrofit program within the last ten years; and certain types of ownership transfer (such as foreclosure, gift to family member, legal dissolution of marriage). Exemptions can also be obtained if the home will be demolished, undergo substantial renovations, or participate in a specific weatherization program within six months of sale.

MULTI-FAMILY BUILDINGS (>5 UNITS)

Disclosure: Buildings with five or more residential units must be audited by June 1st, 2011, and owners will be required to clearly post the audit report in the building and provide a copy of the audit report to potential buyers or tenants. Auditor qualifications are identical to those for single family homes, and audit reports are similar in format to residential reports - including recommendations and links to incentive programs, though they will not provide financial analysis.

Upgrades: In parallel with the audit process, owners of "high energy-use" multi-family buildings will be required to conduct upgrades. High energy-use buildings are defined as using 150% of the average energy use per square foot of all multi-family buildings served by Austin Energy. Austin Energy will identify high energy-use buildings via billing analysis and notify owners of their status. Owners will then have 18 months to conduct upgrades; upgrades are required to reduce energy use to at most 110% of the average use in the Austin Energy service territory.

As with homes, compliance will be enforced via fines. Condominiums, buildings less than ten years old, or buildings having participated in certain voluntary retrofit programs will be exempted.

COMMERCIAL BUILDINGS

All non-residential buildings (aside from industrial buildings) will be required to obtain an operational energy rating by June 1st, 2011. Building owners must use Energy Star Portfolio Manager (E*PM), or, in the case of buildings under 5,000 square feet, a free online tool from Austin Energy. The operational rating must be disclosed to prospective purchasers before the sale of the building.

Commercial buildings over 5,000 ft^2 that are not covered by E*PM, buildings less than ten years old, or buildings classified as industrial can obtain an exemption.

NEW YORK CITY

According to a greenhouse gas inventory conducted in New York City in 2007, building energy use accounts for 80% of the city's carbon footprint. As part of the PlaNYC initiative for a more sustainable city, in April 2009, Mayor Michael Bloomberg introduced the Greater, Greener Buildings Plan, a comprehensive framework that aims to reduce greenhouse gas emissions from existing government, commercial, and residential buildings. The six-point plan, which will be financed thanks to the $16 million provided through the American Recovery and Reinvestment Act, is built in part around four pieces of proposed legislation, three of which are directly related to disclosure and upgrade policies. The fourth piece of legislation will modify the NYC Energy Code and will require that renovations to existing buildings meet current energy codes.

The three pieces of legislation address mandatory public disclosure (benchmarking), lighting upgrades and audits-driven upgrades. NYC forecasts the creation of 19,000 new jobs and a 5% reduction in city greenhouse gas emissions from the combination of the audit and lighting upgrade requirements by 2030.

BENCHMARKING LEGISLATION

Under proposed Benchmarking legislation, all buildings over 50,000 sq. ft. and all city-owned buildings over 10,000 sq. ft. will be required to annually benchmark energy and water usage based on actual consumption data of the previous 12 months. Commercial building owners will also be required to enter tenant consumption data (not required for multi-family residential buildings). Benchmarking data will be included on the city Assessment Roll and will be used in conjunction with other indicators to assess property values.

Benchmarking will be achieved using Energy Star Portfolio Manager, with possible customization for NYC. The City is working with utilities to facilitate data import into the rating tool.

Buildings must benchmark 2009 consumption by July 1st, 2010, and benchmarking data will be included on the Assessment Roll by:

- Sept. 1st, 2011 for city buildings
- Sept. 1st, 2012 for commercial buildings
- Sept. 1st, 2013 for multi-family residential buildings

MANDATORY LIGHTING UPGRADES LEGISLATION

Proposed legislation requires that all buildings over 50,000 sq. ft. bring lighting in commercial and retail spaces up to the current state energy code, either at the time of major renovations (over $50,000) or no later than December 31st, 2022 (for all buildings that have not otherwise been upgraded since July 1st, 2010). Requirements would not apply in the case of multi-family residential buildings.

MANDATORY AUDITS LEGISLATION

Under the proposed legislation, beginning in 2012, all buildings over 50,000 sq. ft. will be required to conduct an energy audit of the building's central systems and to implement, within three years of the audit, all measures with a simple payback under five years. Initially, the timing of building audits will be determined by the city, with 10% of affected buildings being selected annually, at random. Full details of auditor and audit requirements are not yet available but the legislation references ASHRAE's standard for commercial audits.

Of note, the New York Chapter of BOMA (the Building Owners and Managers Association) has released a formal letter addressed to Mayor Bloomberg indicating that they are strongly opposed to mandatory audit and upgrades legislation, but supportive of benchmarking and lighting requirements.

BERKELEY, CA

Berkeley, California has had a mandatory upgrade policy in place for residential properties since 1980. The Residential Energy Conservation Ordinance (RECO) requires home owners to install ten prescriptive measures at either the time of sale or major renovation (over $50,000). Most measures are relatively low-cost, with the exception of duct-work and ceiling insulation, and all are typically cost-effective.

The ordinance includes a spending cap of 0.75% of the sales price of the home. Homes are audited to ensure compliance.

Item	Requirement
Toilets	1.6 gal./flush toilet or flow reduction devices
Showerheads	3.0 gal./min flow rate
Faucets	275 gal./min flow rate for kitchen and bathrooms
Water Heaters	R-12 Insulation wrap
Water piping	R03 insulation wrap for first two feet from heater (all piping for pumped, recirculating systems)
Exterior Door Weather-Stripping	Permanently affixed, and door sweeps or shoes
Furnace Duct Work	Seal duct joints, R-3 insulation wrap
Fireplace Chimneys	R-30 insulation
Ceiling Insulation	R-30
Common Area Lighting (multi-unit bldgs)	Replace incandescent with CFLs

The city is currently considering an update of the RECO to move towards a performance-based requirement, which could potentially be stringent enough to incent major measures such as wall insulation, HVAC systems upgrades and comprehensive air sealing.

BURLINGTON, VT

Burlington, Vermont's Minimum Rental Housing Energy Efficiency Standards Ordinance has been in place since 1997. It requires a certificate of energy efficiency performance to be filed upon transfer of all residential rental properties where tenants are responsible for directly paying heating costs. It does not apply to owner-occupied portions of buildings, buildings not rented during winter months, hotels, motels and other institutional facilities, and new construction.

The ordinance stipulates minimum prescriptive standards for envelope insulation levels, water heater and pipe insulation, windows and doors, air leakage rates, and heating system combustion safety. It also contains a spending cap of 3% of the sale price or $1300 per rental unit (whichever is less). Significantly, however, this cap does not apply to measures with a simple payback of seven years or less.

WASHINGTON, DC

In 2006, Washington DC passed the Green Building Act, a piece of legislation that introduced minimum energy performance standards and benchmarking requirements for new government-funded buildings. The Act also announced the introduction of an updated 'greener' building code (which came into effect in December 2008) as well as a requirement that all commercial buildings over 50,000 sq.ft. built after 2011 be LEED certified.

The DC Energy Act of 2008 requires non-residential buildings to benchmark their energy performance annually using E*PM, and to disclose ratings to a public database. Implementation will be staggered, starting with government buildings in the fall of 2009 and privately owned buildings over 200 000 ft² in 2011, with size requirements falling annually to 50,000 ft² in 2013.

CALIFORNIA

In July 2004, the Governor of California signed Executive Order S-20-04, calling for a 20% reduction in energy use by state buildings by 2015 and formalizing the State's commitment to energy- and resource-efficient high performance buildings. The **Green Buildings Initiative** (GBI) required that the energy performance of state buildings be benchmarked and attributed an energy rating.

In October 2007, the Governor approved **Assembly Bill 1103**, requiring all non-residential buildings to be included in the mandatory benchmarking scheme. As of January 1, 2009, electric and gas utilities were required to provide consumption data to building owners in an electronic format that can easily be uploaded into EPA's Portfolio Manager tool.

As of January 1, 2010, building owners will be required to provide a certified Energy Star Portfolio Manager (E*PM) performance rating, *as well as a California-specific technical rating and report*, to any prospective buyer, lessee, or lender when the entire building is involved in the transaction. Ratings and reports will be provided along with sales contracts, leases or loan applications.

The California Energy Commission is currently (as of August 2009) developing implementation details with a stakeholder working group. Key elements still being finalized include: the creation of a California-specific label and rating scale and other possible enhancements to E*PM; a phased implementation plan based on building size; protocols for obtaining multi-tenant billing data; and data verification requirements.

Concept of net zero is reflected in the scale

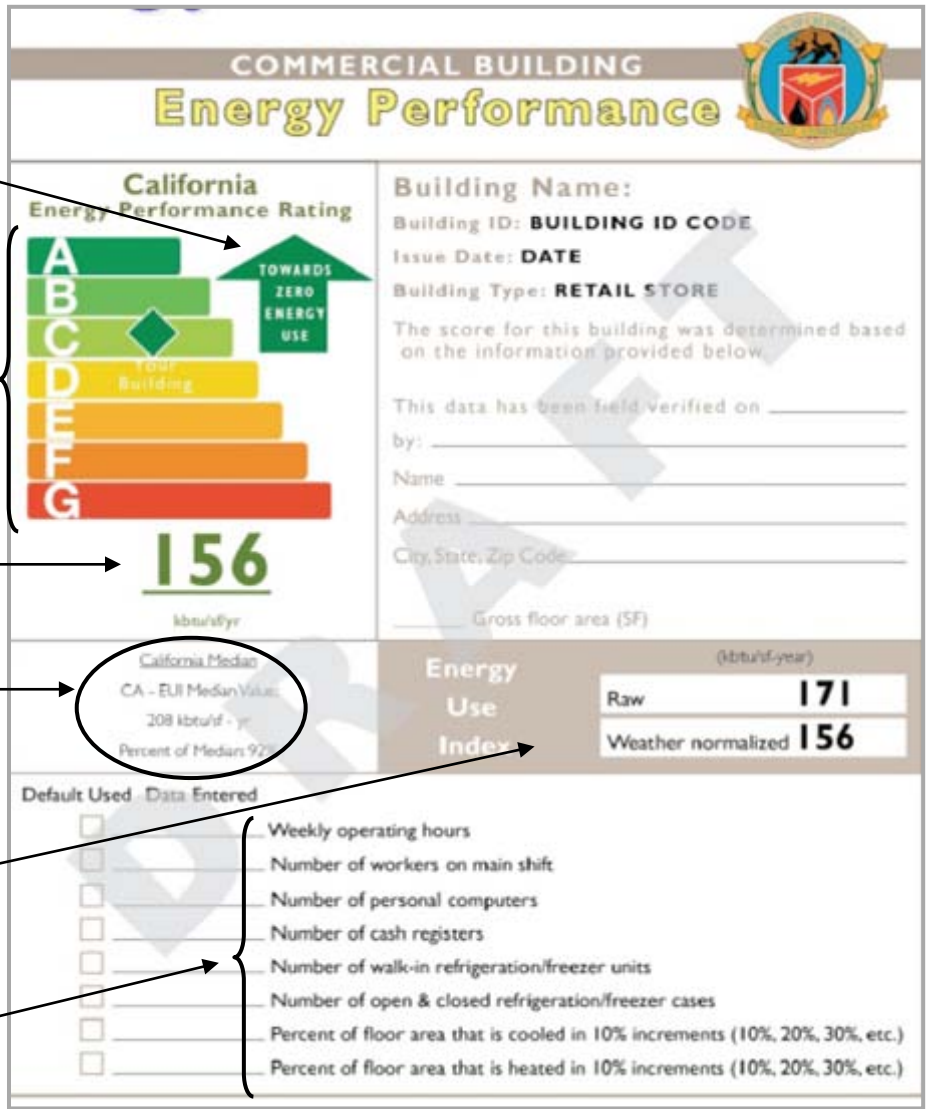
A-G color coded rating scale with position of evaluated building

Energy usage intensity (EUI) kBTU/sq.ft./year

Building benchmarked against CA median EUI

Raw and weather normalized EUI data

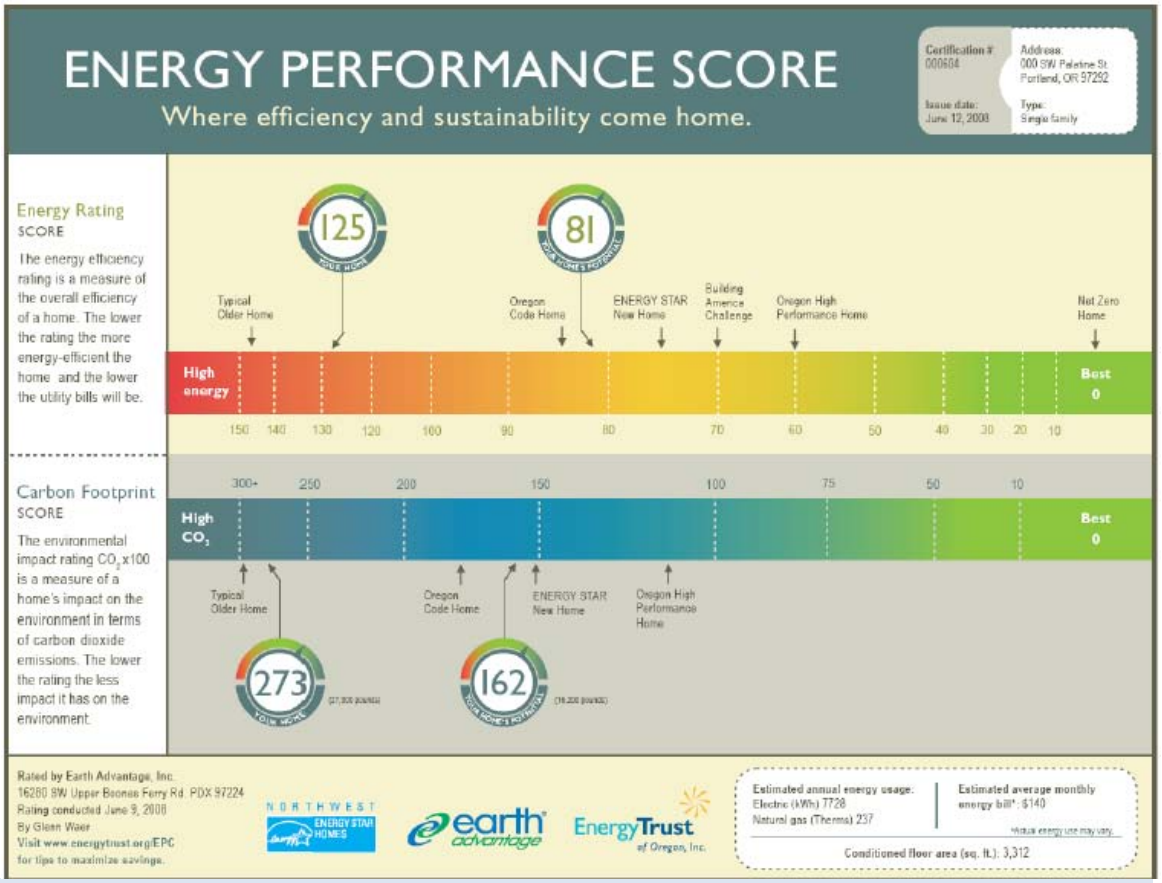
Other parameters considered in normalization



OREGON

The state of Oregon is also moving forward with plans to legislate the energy performance of buildings. The Oregon Energy Efficiency Work Group was convened in the spring of 2008 by the Governor's Sustainability Advisor with the goal of developing broad legislative concepts that will contribute to improving energy efficiency in the built environment and reducing overall carbon emissions. A House Bill (HB3061) which calls upon Oregon's Department of Energy to develop an energy rating system for both the residential and non-residential sectors was subsequently submitted to the legislature for a first reading in March 2009.

Of particular interest in Oregon is the pilot program that was created to test a new residential rating tool called the Energy Performance Score (EPS). Developed by the Energy Trust of Oregon, the new EPS discloses a home's energy performance and carbon emissions. The EPS is an asset rating and uses two rating scales, based on total site-level energy consumption and greenhouse gas emissions, respectively.



WASHINGTON STATE

In April 2009, the Washington State legislature passed House Bill 1747, which requires the benchmarking and disclosure of the energy performance of all commercial buildings using Energy Star Portfolio Manager (E*PM). It also requires utilities to provide owners with billing data in a format easily uploadable to E*PM as of January 1, 2010, and to upload it automatically upon authorization by the building owner.

Buildings will be required to disclose E*PM ratings at the time of sale, rental or financing according to the following schedule:

- Buildings >50 000 ft²: January 1, 2011
- Buildings >10 000 ft²: January 1, 2012.

All government owned or operated buildings must be benchmarked using E*PM no later than July 1st, 2010. The state government will develop a web interface allowing public disclosure of E*PM ratings and reporting on the results for all state facilities overall.

The legislation also stipulates an innovative, **rating-driven mandatory upgrade policy**. It indicates that the state may not renew leases with buildings after January 1, 2010, if they receive an E*PM score below 75, unless (a) a preliminary audit has been conducted within the last two years, (b) the building owner agrees to undergo an investment grade audit, and (c) the building owner commits to installing all cost-effective measures identified by the preliminary audit within two years.

Furthermore, public facilities receiving an E*PM rating below 50 must obtain a preliminary energy audit by July 1st, 2011. If cost-effective measures are identified in the preliminary audit, then the building must undergo an investment grade energy audit by July 1st, 2013. All cost-effective measures must be implemented no later than July 1st, 2016.

Buildings not covered by E*PM must also undertake a preliminary energy audit no later than July 1st, 2012. If cost-effective energy savings are identified, an investment grade energy audit must be completed by July 1st, 2013.

NATIONAL AND STATE ENERGY CODES

Most Northeastern states have energy codes for both residential and non-residential buildings. Although principally focused on new construction, energy codes generally contain provisions targeting significant renovations to existing buildings, which can be considered the most common form of mandatory upgrade policy currently in place in the U.S.

Most U.S. energy codes are based on the International Energy Conservation Code (IECC), and/or on ASHRAE's Standard 90.1.[21] Both the IECC and ASHRAE 90.1 contain clauses referring to significant renovations – we include specific language below.

There are two important limitations to energy code upgrade requirements. First, they are limited to the systems or building areas affected by the alteration or renovation. And second, they are poorly enforced in many states, with typical compliance rates much lower than those for new construction, which can vary from 40-60%.[22]

INTERNATIONAL ENERGY CONSERVATION CODE (IECC) 2009 UPGRADE PROVISIONS

Section 101.4.3: Additions, alterations, renovations or repairs. Additions, alterations, renovations or repairs to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portion(s) of the existing building or building system to comply with this code. Additions, alterations, renovations, or repairs shall not create an unsafe or hazardous condition or overload existing building systems.

Definition of alteration: Any construction or renovation to an existing structure other than repair or addition that requires a permit. Also, a change in a mechanical system that involves an extension, addition or change to the arrangement, type or purpose of the original installation that requires a permit.

ASHRAE 90.1 2007 UPGRADE PROVISIONS

Section 4.2.1.3 Alterations to Existing Buildings: Additions to existing buildings shall comply with [prescriptive requirements], provided, however that nothing in this standard shall require compliance with any provision of this standard if such compliance will result in the increase of energy consumption of the building.

Definition of alteration: A replacement or addition to a building or its systems and equipment; routine maintenance, repair, and service or a change in the building's use classification or category shall not constitute an alteration.

EARLY RESULTS

At least three statistical studies have assessed the effectiveness of building energy performance labeling. Although none of these studies by itself has tested all of the assumptions behind disclosure policies, they address at least two key questions:

- Two studies of the impact of building labeling on prospective buyers' decisions provide strong evidence that buyers will assign value to energy efficiency performance once building labels provide them the necessary information.
- A third study suggests that receiving energy audit information does not, by itself, cause new owners to install energy efficiency upgrades.

Two other essential questions are left unanswered:

- Whether or not building labeling causes owners to install upgrades prior to the sale, and
- Whether or not public disclosure of operational performance causes building owners to improve performance.

DOING WELL BY DOING GOOD? AN ANALYSIS OF THE FINANCIAL PERFORMANCE OF GREEN OFFICE BUILDINGS IN THE USA

Doing Well by Doing Good is a 2008 study that used CoStar data on commercial building rentals and sales to analyze whether or not voluntarily labeled 'green' buildings (Energy Star and LEED buildings) were preferred by buyers and leasers. It found a premium for Energy Star buildings but not for LEED buildings; the premium was on the order of 3% for rents and 16% at time of sale, and calculated that every 1$ invested in efficiency could bring a return of up to $18 in rental and sale price premiums when performance was disclosed to prospective buyers.[23]

This study strongly suggests that buyers and renters are willing to pay a substantial premium for labeled high performance buildings, which in turn suggests that time of sale mandatory disclosure policies should be effective in their primary goal of incenting pre-transaction improvements by owners hoping to improve their ratings. On the other hand, this study looks at voluntary labeling and does not break out the impact of rating improvements specifically.

ENERGY EFFICIENCY RATING AND HOUSE PRICE IN THE AUSTRALIAN CAPITAL TERRITORY (ACT)

As discussed on page 55, the Australian national government recently conducted a thorough analysis of the impact of rating disclosure at time of sale in the ACT. This study is particularly interesting because the ACT has one of the longest running disclosure policies, and requires disclosure early in the sale process (in all advertising), an essential design feature. The study is also interesting for the depth of its data sample and analysis– it analyzed all sales in 2005/2006 (roughly 5000 homes) and used regression analysis to assess the impact of the rating and 13 other independent variables more commonly associated with sales price. It found that the market in that region now attributes approximately $11,000 Australian dollars – roughly $9,000 USD – to every additional star (on a 6-star scale), equivalent to a price premium of roughly 3%.[24]

A very basic analysis using examples of typical retrofit costs and savings cited by ACT suggests that this premium makes it extremely cost-effective for home owners to invest in improvements pre-sale, with returns of 900%. This is the strongest evidence to date that disclosure policies can transform the market. The study does not, however, analyze to what extent the policy has successfully caused owners to install energy efficiency upgrades.

DOES ENERGY LABELING ON RESIDENTIAL HOUSING CAUSE ENERGY SAVINGS?

This 2009 study, also discussed on page 62, looks at the case of Denmark, which has had a time of sale labeling requirement in place since 1996, but low compliance and awareness rates (~50% in the period studied) because of limited enforcement. The study compares energy use in homes sold from 1999-2001 in two groups – homes that received a label (which includes retrofit recommendations) and homes that did not. It found no difference in post-sale consumption, and argues in the conclusion that this may suggest that labeling does not cause home buyers to make improvements (though the authors warn against concluding too hastily – see endnote 20.

However, it is noteworthy that the study *fails to test for energy consumption changes pre-sale*, i.e., improvements undertaken by owners in the hope of increasing value when they do decide to sell, much as homeowners often renovate kitchens or bathrooms with resale value in mind. Similarly, the study did not examine the impact of label results on housing prices.[25]

KEYS TO SUCCESS

Our review of existing and planned policies points to several keys to ensuring success.

"TOP 5" KEYS TO SUCCESS (DISCLOSURE)

Indeed, when considering either triggered disclosure (required at the time of sale or lease, for example, of homes or commercial buildings) or scheduled disclosure (required at regular intervals; applicable to commercial buildings only), an effective policy will require, above all else, five key ingredients:

1. **A Trusted Rating System:** Market actors must believe that ratings reflect the relative performance of homes or buildings, and trust that they have been produced honestly. This does not mean that energy audit models need be perfect, but that the rating is considered a reasonable indication of the relative performance of buildings.

2. **Clear Messaging:** The information disclosed, especially the overall building rating, must be meaningful to the average consumer. It must also allow prospective homes and buildings to be easily compared or, in the case of scheduled disclosure (commercial buildings), allow owners and operators to measure their performance over time.

3. **Strong Enforcement:** Mandatory disclosure policies are predicated on the ratings being ubiquitous; as such, high compliance rates are considered key to the policy's effectiveness. Both the Danish and Australian experiences strongly suggest that information campaigns and light penalties are insufficient. Instead, a combination of incentives, credible enforcement and dissuasive penalties is deemed essential.[26]

4. **Timely (Early) Disclosure:** For triggered disclosure policies, such as time of sale, ratings must be displayed early in the process, i.e., in all advertising. If buyers only receive the information toward the end of the process – after having made an offer, for example, or when notarizing a sale –, they will not be able to use that information effectively, and the policy will have forfeited its opportunity to influence the marketplace. Europe is in the process of correcting its initial error in this respect. Fortunately, MLS systems in the Northeast are already beginning to offer this option.

5. **Link to Action:** Mandatory disclosure policies are an important tool in the toolbox to incent cost-effective energy savings, but are only a means to an end. To lead to action, the rating or audit report should assist consumers by recommending appropriate energy efficiency improvements, providing financial analyses, referring to government or utility incentives, referencing financing opportunities and providing options for more detailed analysis, such as investment grade audits for commercial buildings.[27]

OTHER SUCCESS DRIVERS (DISCLOSURE)

In addition to the key success drivers listed previously, the following considerations will either improve the effectiveness of policies or make them easier to implement.

- *Public Availability:* For scheduled disclosure policies (commercial buildings only), we believe there is great value in ensuring, as some regions have begun to do, that ratings are made public (e.g., in an online registry, or in a visible area of the building). As discussed on page 11, this approach can leverage market forces and public sentiment to encourage building owners to continuously improve their performance, while simultaneously allowing utilities and ESCOs to market directly to high-use customers.

- *Eye on the Prize:* Disclosure policies are part of a long term strategy of moving the building stock as a whole toward high energy performance. Keeping our eye on this prize means ensuring that buildings can be benchmarked not only against their peers ("statistical" rating scales), but also against society's efficiency goals ("technical" scales). Metrics and ratings should also, to the extent possible, be consistent or compatible with existing and planned energy codes, which are increasingly looking towards achieving high performance and even zero-net-energy buildings.

- *Low Development Costs:* To ensure that development of disclosure policies is not prohibitive, policymakers need to give due consideration to using existing tools and support infrastructure (building evaluator training and certification, software certification, modeling protocols, etc.), and to adopting simple and complementary approaches wherever possible.

- *Low Consumer Costs:* While the benefits of a mandatory disclosure policy should far outweigh its costs, consumer acceptance will depend on keeping rating costs to a minimum. For both homes and businesses, an effective policy will strike an appropriate balance between requirements (e.g., level and frequency of audits), and associated costs.

- *Keep Transactions Fluid:* In addition to keeping consumer costs low, disclosure requirements linked to the time of sale need to minimize unnecessary delays or obstacles to the sale process. Doing so requires giving careful thought to issues such as the moment, during the sales process, at which disclosure is required, and to ensuring a sufficient volume of raters able to respond quickly to market demand.

Broad Coverage and Phased Implementation: An effective policy will eventually apply to a significant share of building types. To get there, however, requires phased implementation. Effective phasing of *triggered disclosure* can be done in a number of ways: by building type, as in Australia; by size, as in Washington and California; by age, as in Austin; and by ownership (public vs. private), as in Washington D.C. and California. The U.K.'s experience suggests that phased implementation and pre-implementation training of raters is essential to avoid bottlenecks during the initial demand pulse.

BACKGROUNDER: ISSUES AND OPTIONS FOR DISCLOSURE POLICIES

APPROACH

As we have seen in the review of international experience and of emerging U.S. policies, states interested in designing mandatory disclosure (and upgrade) policies must choose among a multitude of strategic and technical options, each with its inherent strengths, weaknesses and trade-offs. And while it may be possible to define a hypothetical "ideal" strategy, Northeast states do not operate in a vacuum; instead, they face – and in many ways benefit from – the existence of a variety of tools and systems, from rating systems to labels to modeling software, that have already been developed over the years.

We have grouped the design choices involved in creating a disclosure policy into nine basic elements:

1. Enabling Legislation
2. Rating System Design
3. Rating System Management
4. Trigger Point
5. Data Collection and Registry
6. Enforcement
7. Rater Infrastructure
8. Phase-In Strategy
9. Link to Incentive Programs

The table on the following pages summarizes these nine points. Subsequent sections discuss four areas in more depth: rating system design, trigger points, rater infrastructure and phase-in strategy. Wherever relevant, we have broken out our discussion to focus on two markets:

- **Residential Homes**: Largely the single-family home market, as well as small (less than four units) multi-unit buildings.
- **Commercial Buildings**: Non-residential buildings and multi-unit residential buildings over four units.

DISCLOSURE POLICIES: BASIC INGREDIENTS	
1. ENABLING LEGISLATION	Enabling legislation mandates the use of building labeling, specifies trigger points and reporting requirements, and establishes administrative authority for defining regulations. A vital companion piece of legislation (for commercial buildings) is the requirement for utilities to provide billing data to rating systems in a common format and on a regular and timely basis.
2. RATING SYSTEM	The rating system is the most complex ingredient – it comprises the choice of a metric for measuring performance, a methodology for calculating the metric, a rating scale that enables building comparisons, and a building label that clearly communicates performance. **See separate section below for more details.**
3. RATING SYSTEM MANAGEMENT	Developing and maintaining a rating system involves a substantial, long-term effort. It will ideally be the responsibility of a regional or national entity rather than that of an individual state or municipality. Elements to be created, regularly reviewed and improved are the rating scale, label, report format, rating calculation metric, and rating software or other tools. Software can be developed by the rating system or third party software can be approved.
4. TRIGGER POINT	The trigger point defines when and how a building owner must disclose his or her building's performance. Triggers can include putting a property up for sale, advertising spaces for rent, or even requests to obtain financing. In addition to triggered disclosure, effective policies can also require "scheduled" disclosure (disclosure at regular intervals). **See separate section below for more details.**
5. DATA COLLECTION AND REGISTRY	Data collection is essential both for ensuring compliance and for measuring policy effectiveness (and making dynamic adjustments if needed). A common approach (used, for example, in Australia's Capital Territory) is to require that all building ratings and audit reports are filed electronically with a central registry. This facilitates enforcement, allows easy analysis of the building stock, and also ensures that future building owners will have easy access to past audits and ratings (particularly relevant when a relatively long-lived asset rating is used). The cost of central registries can also be shared between jurisdictions and reduced by adopting existing models. However, states may also benefit from maintaining control/influence over the registry interface: most importantly, it is an essential enforcement tool. It also facilitates future changes to the rating scale; allows states to add additional data collection fields as needed (for example, taking

	advantage of energy disclosure to simultaneously obtain information on water usage), and allows states to understand their building stock. For operational ratings (commercial buildings), states should require utilities to make billing data readily transferable to central registries. Note that as the database is populated, it will offer an extraordinary source of information on the evolution of a state's building stock, enabling continuous improvements to rating system designs and a feedback mechanism on the effectiveness of the policy as a whole.
6. ENFORCEMENT	Enforcement is vital to the effectiveness of disclosure policies, as the Danish experience has shown. Policies can be enforced via incentives, fines, market mechanisms, or requiring proof of compliance at a given point within a related transaction, for example registration of a sale.
7. RATER INFRASTRUCTURE	Third-party raters need to be trained and certified, and must be subject to a quality-control process. Although all raters will need to understand basic building science and learn to use rating software, training needs will vary according to the type of rating used. "Asset" ratings require expertise with building energy modeling software, and may (if full-scale audits are called for) require raters to be able to identify and evaluate potential retrofits. "Operational" ratings require less expertise. **See separate section below for more details.**
8. PHASE-IN STRATEGY	Disclosure policies may need to be phased in over time. Indeed, in some cases, new rating systems and infrastructure must be tested and refined. Where that is not the case, phased implementation may be required to provide the time to train and certify sufficient number of raters, and thus avoid bottlenecks, especially where the rating system requires significant expertise and capabilities (e.g., asset ratings). Options included phasing in by geographic region, by building type, size or age, or by using a set schedule. 'Triggered' disclosure – e.g., time of sale – also provides a "natural" phase-in approach. **See separate section below for more details.**
9. LINK TO INCENTIVE PROGRAMS	Building ratings offer a valuable opportunity to inform owners about any incentives that may be available – through their utilities, government agencies or financial institutions – to encourage adoption of energy efficiency measures and otherwise help them to improve their building's performance. Similarly, states and/or utilities may wish to consider subsidizing the cost of the ratings in the early years, both to encourage initial compliance and increase public acceptance.

RATING SYSTEMS

A building energy performance rating system is the combination of a rating scale, the metric underlying that scale, the methodology for calculating the metric, and the format for presenting the rating results (typically a label highlighting the rating, and a more detailed report). In our definition, a rating system also includes associated elements such as software tools used for calculating metrics and ratings, and building audit methodologies.

The choice of rating system is at the heart of a disclosure policy. We divide our discussion of design choices into two sections:

- **In Principle – Issues and Options:** We determine the key issues involved in designing an "ideal" rating system from the bottom up, review and assess the options, and point to what should be considered, in principle, preferred solutions.
- **In Practice – Options for the Northeast:** We identify the existing systems and infrastructure that Northeast states could build upon, discuss their strengths and weaknesses in relation to the *ideal* solutions discussed previously, and map out the region's options given the dual objectives of effectiveness *and practicality*.

IN PRINCIPLE – ISSUES AND OPTIONS

Developing an effective rating system involves several issues and design choices. Below we discuss the key issues involved in designing an "ideal" disclosure strategy from the bottom up. We then review and assess the options, and point to what should be considered, in principle and in the absence of other considerations, preferred solutions (compromises accounting for existing systems and tools are addressed in the next section). We approach each of these issues distinctly for residential (single family homes) and for commercial buildings (including multifamily residential buildings). We should also note that, to the extent possible, residential and commercial buildings should use a similar rating system, to minimize confusion between the two systems.

MAJOR ISSUES

1. Choice of metric (site energy, source energy and/or emissions)
2. Type of rating (how the metric is calculated - asset or operational ratings)
3. Rating scale (statistical or technical rating scales)
4. Role of audits (required or not)

OTHER ISSUES

We also address, albeit very briefly, three other issues that are often the subject of debate when designing rating systems, namely: the choice of metric denominators, the degree of normalization when developing an operational rating, and the treatment of tenant spaces individually.

MAJOR ISSUES

ISSUE #1	**CHOICE OF METRIC** Disclosure schemes can rate buildings based on their energy use or their greenhouse gas emissions. With energy use, buildings can be rated on either their site energy use - units of energy actually consumed at the building site - or their source energy use, which includes the energy required to produce the energy consumed at the building site. The difference between the two metrics arises primarily with electricity production, which on average (nationally) requires roughly three units of source energy for each site-level unit consumed. Each of these three metrics has its advantages and disadvantages. Site energy is the most intuitive unit for consumers since it directly reflects their energy costs. From an environmental perspective, however, site energy fails to distinguish and therefore to discourage electricity use for heating, since electric heat is 100% efficient at the site level despite being roughly 33% efficient, on average, at the source level. The use of source energy as the prime metric solves this problem but can be confusing for consumers. Greenhouse gas emissions have the same environmental advantage as source energy in that they reflect the true impact of each energy source; they also allow schemes to focus consumer attention on their carbon footprint and harness public will to reduce emissions. On the other hand, they do not reflect consumer's energy costs, and furthermore confuse the existence of non-carbon power sources – including large hydropower and nuclear power – with actual energy savings.
Question	For both commercial and residential markets, what metric or metrics should ratings be based on?
OPTIONS	**A.** Site energy **B.** Source energy **C.** Greenhouse gas emissions.
PREFERRED OPTION	**A and C.** We recommend two ratings if possible – site energy and emissions. A dual rating allows the label to tap into consumers' interest both in reducing energy costs and reducing carbon footprints, and reduces the bias towards electric heating created by a site energy only rating. While a dual rating may be more confusing for some consumers, other jurisdictions, such as the United Kingdom, have used this approach successfully (see page 66 for an example of the U.K. label). If only one rating can be used, however, it should be either source energy or GHG emissions, to ensure accurate reflection of overall environmental impact. We should add that this is not a 'make-or-break' issue – all three metrics can form the basis of effective rating systems.

ISSUE #2 TYPE OF RATING (ASSET OR OPERATIONAL RATINGS)

Building energy use depends on both its physical infrastructure (building envelope and HVAC – heating, ventilation and air conditioning – equipment) and how it is operated (including use of HVAC controls as well as lighting and other "end-uses"). Disclosure policies can choose to focus on one or both of these aspects.

- Under an **asset rating**, the energy use of the building, *under standardized weather and occupancy conditions*, is predicted using modeling software. This allows the consumer (buyer, renter, other) to compare buildings' physical assets on an equal footing, independently of how the previous occupants may have operated it or consumed within it.
- An **operational rating** is based on actual energy consumption over a given period. Although it may be normalized to remove some occupancy and weather impacts, it reflects the combination of physical systems *and* how they are operated (as well as other consumption such as lighting and computers).

The value of the two approaches varies with the audience and trigger points. Potential buyers or renters will be most interested in an asset rating, especially where the building will have new occupants and, presumably, new needs and consumption patterns (more lighting, less computing, etc.). (Asset ratings are also de facto the only rating available for new buildings.) Since an asset rating is based on energy modeling and not actual consumption, it only needs to be re-calculated if changes have been made to the building envelope and major systems. Typical asset rating policies allow a rating to stand unless modifications have been made, for an extended period of time (e.g., five to ten years).

Operational ratings are most useful when occupancy does not change – i.e., for helping or encouraging building operators to monitor and improve performance. Operational ratings are also generally less expensive than asset ratings, because they can be completed with verified billing data and a brief initial site visit, whereas asset ratings require a thorough site visit and modeling. An operational rating is generally only valid for the period of consumption data it is based on, e.g., a single year.

ENERGY MODELING ACCURACY: A CHALLENGE TO BE RESOLVED

Accuracy issues are significant for both residential and commercial modeling software, with actual energy consumption typically 20-40% above (or less commonly, below) predicted consumption, and larger discrepancies between modeled and actual use common. Historically, there have not been significant drivers in place to reduce these inaccuracies, since the principal use of modeling software has been to assist in building design, a task it can perform well despite inaccuracies.

As modeling software results are increasingly used to demonstrate compliance with building codes, incentive program requirements and disclosure programs, accuracy issues are beginning to be addressed. This process is likely to accelerate as states adopt disclosure policies. Work has already begun to occur in the residential sector, with RESNET's review of the HERS rating and independent work such as Oregon's EPS Pilot Study.

There are two essential points to retain when planning a disclosure policy. Firstly, accuracy issues are not an absolute barrier to policy effectiveness, and will be drastically reduced once rating systems set software accuracy standards. Secondly, for this to occur, modeling accuracy standards must be considered a vital part of any state rating systems used for mandatory disclosure.

Question	For commercial *and* residential markets, which type of rating should be used?
OPTIONS	**A.** Asset **B.** Operational
PREFERRED OPTION	**Residential: A.** As discussed in Issue 1, residential disclosure policies should focus on time of sale and time of rental. This makes an asset rating preferable for the residential market, since occupancy factors such as the number of occupants, their age (adolescents consume more hot water than adults), their employment status (stay-at-home parents will consume more in the home than if both parents are at work), and their vacation patterns, can dramatically impact energy consumption. The rating should be valid for a set time period or until modifications are made to the home. In the U.S., the existing Home Energy Rating System (HERS) provides an asset-based rating. **Commercial: Both A and B**. An ideal commercial labeling policy would require both asset and operational ratings at time of sale/rental, and scheduled operational ratings for public disclosure. If only one approach is feasible, then a time of sale asset rating should be prioritized. On the other hand, although an operational rating is best suited to scheduled disclosure, it can also provide useful information to buyers at the time of sale, especially as many commercial building purchases do not involve a change in occupancy. In either case, an operational rating should be regularly recalculated at time of scheduled disclosure, whereas the asset rating should be valid for a set time period or until

	modifications are made.

ISSUE #3	**RATING SCALE (STATISTICAL OR TECHNICAL SCALE)** A rating scale is an index that translates the modeled or actual energy use of a building into a relative measure of performance. Common rating scales can use stars (such as Australia's six-star scale for homes), A+ to F- ratings (such as ASHRAE's proposed ABEL rating), or percentiles (such as E*PM). There are two principal approaches to designing how energy use in converted to a rating scale: • **A statistical rating scale** compares a building against its peers, reflecting a statistical distribution of the existing building stock. Energy Star Portfolio Manager is the most eminent example of this approach in the U.S. • **A technical rating scale** rates a building according to categories or benchmarks determined by the policy administrator, generally based on policy goals, modeling and the region's own building stock. There are two main differences between the approaches. Firstly, a technical rating scale can be designed to emphasize high performance more easily than a statistical rating scale, since the latter reflects the existing building stock, which performs poorly compared to best practices. Secondly, developing a statistical rating scale requires a large, statistically significant data set for each building category. This can potentially limit the coverage of a statistically-based rating scale because of limitations in available data. In the U.S., this is an issue for commercial buildings – available data limits coverage to roughly 60% of floor space nationally, a situation which will persist for the next four to eight years.
Question	For both commercial and residential markets, should rating scales compare homes and buildings to each other ("statistical") or to high-performance goals ("technical")?
OPTIONS	**A.** Statistical **B.** Technical
PREFERRED OPTION	**B**: If the goal of mandatory energy performance disclosure is to encourage building owners and operators to move the building stock toward high-performance levels, a technical scale can be used to provide a clearer benchmark. Indeed, the scale can be designed to emphasize policy goals and, just as importantly, other strategies – including government or utility incentives – can more easily leverage the value of ratings to meet their own objectives. Note that if a statistical scale is used for other reasons, this can also be accomplished by adding clear benchmarks or an additional level of (technical) rating.

ISSUE #4	**ROLE OF AUDITS**
	Mandatory disclosure will be more effective if building owners have access to recommendations, including financial analysis. An energy audit is required to provide this information. However, energy audits can be expensive, and owners will generally need audit results before obtaining their final building rating (to inform disclosure-driven upgrades). Audit results are also not the only or perhaps the most effective source of information for every owner. A building owner may have access to internal expertise, or may prefer to use a different audit tool than the one mandated by law. Finally, audits come in a variety of shapes and sizes – from simple walkthroughs to more technically-advanced, investment-grade options. Because of these factors, the main issue in deciding whether or not to require audits at the time of rating becomes the potential for cost savings. Combining energy audits with asset ratings makes sense because the two processes share many steps (detailed site inspection and energy modeling), and because asset ratings are typically infrequent (triggered by a sale, for example). On the other hand, there are fewer cost savings in combining operational ratings with an energy audit (operational ratings require only a short site visit, interviews and access to energy bills), and such ratings are typically more frequent (e.g., annually if required for public disclosure).
Question	Should audits be required along with ratings?
OPTIONS	**A.** Never **B.** With asset ratings (i.e., at time of transaction) **C.** With operational ratings (as part of scheduled public disclosure)
PREFERRED OPTION	**B** Audits should be required as part of asset ratings, unless incremental costs prove to be significant. Alternatively, they can be conditional on poor operational ratings.

THE MANY SHADES OF AUDITS

Energy audits complement energy ratings by focusing on the identification and evaluation of potential improvements. Energy audits can vary in depth, from a simple walk-through of a building, with no attempt to estimate the cost-effectiveness of improvements, to detailed energy modeling and cost-effectiveness testing of each proposed efficiency measure. Widely used standards for audit types exist for both residential and commercial buildings.

RESIDENTIAL: RESNET's
"National Home Energy Audit standard"

- on-line energy surveys
- in-home energy surveys
- diagnostic/field rating inspection
- comprehensive energy audit

COMMERCIAL: ASHRAE's
"Procedures for Commercial Building Audits"

- Level I - Walk-Through Analysis
- Level II - Energy Survey and Engineering Analysis
- Level III - Detailed analysis of capital-intensive modifications

All of these audit types can produce recommendations, but only the more complex audits (comprehensive residential audits and Level III commercial audits) can provide detailed financial analysis of each recommended measure.

OTHER ISSUES

There are many other design issues to consider in selecting or creating a rating system for mandatory disclosure. We briefly address three of these here: metric denominators, normalization and treatment of tenant spaces.

Issue #6 – Metric Denominators: Most rating systems are based on a metric of *relative* consumption (or carbon emissions), for example, energy use/square foot otherwise known as "intensity-based". Most intensity-based systems fail to value the benefits of higher density in residential markets, leading some specialists to suggest either adjusting the intensity system (e.g., basing it on the number of rooms in a home, as opposed to square footage), or eliminating it entirely (basing ratings on absolute consumption of the home). While conceptually important, we do not believe this is a critical issue, as home buyers will typically shop for similarly-sized homes. This issue does not apply to commercial buildings, where an area-based intensity factor is the only realistic option.

Issue #7 – Normalization for Occupancy and Equipment: In commercial building operational ratings, consumption should be normalized, to the extent possible, for a variety of factors, including occupancy (the more people, the higher the energy consumption *should* be), and equipment (similarly for numbers of computers and similar energy-consuming devices). Rating systems can stop short of both, can adjust for occupancy only, or can adjust for both. While adjusting for occupancy is both preferred and relatively simple, adjusting for equipment raises a more important trade-off between cost and accuracy. While conceptually important, this is not a critical issue either way. Nor does it apply to home ratings, where the recommended use of asset ratings implies complete normalization to begin with.

Issue #8 – Tenant Spaces: This refers to the treatment **of tenant spaces** in multi-tenant buildings, and specifically whether or not ratings should apply to buildings as a whole or (and) to tenant spaces individually. The issue is complex, since such buildings come in a large variety of tenant-related configurations, with tenant control (of their heating, cooling and lighting needs), payment (of related utility bills) and metering (sub- or master-metering) varying between buildings and energy sources. While not insignificant, as a practical matter, policymakers should begin by focusing on designing policies to address buildings as a whole, leaving the complex and difficult issue of tenant spaces to a later phase.

SUMMARY OF PREFERRED OPTIONS

Taken together, our analysis of preferred design options constitutes the basis for a preferred, even "ideal" rating system.

	RESIDENTIAL	---------- COMMERCIAL ----------	
	@ transaction (e.g., sale)	@ transaction (e.g., sale)	@ scheduled intervals (e.g., annual)
CHOICE OF METRIC	✓ **Site energy** *and* ✓ **Carbon emissions**	✓ **Site energy** *and* ✓ **Carbon emissions**	✓ **Site energy** *and* ✓ **Carbon emissions**
RATING TYPE	✓**Asset rating**	✓ **Asset** *and* ✓ **Operational**	✓ **Operational**
RATING SCALE	✓ **Technical scale**	✓ **Technical scale**	✓ **Technical scale**
AUDITS	✓**Mandatory** (unless costs prohibit)	✓ **Mandatory** (unless costs prohibit)	✓ **Not mandatory**

In the following section, we examine how existing systems match up to these "ideals", and begin to map out the options and tradeoffs between our dual objectives of effectiveness *and* practicality.

IN PRACTICE – OPTIONS FOR THE NORTHEAST U.S.

Despite not having significant experience with *mandatory* energy performance labeling, a number of voluntary systems are currently operating or being developed for application in the U.S. Similarly, audit and rating tools also exist, some having been in use for decades.

Most significantly, there are several parallel efforts currently underway to create "complete" national-level rating systems suitable for mandatory disclosure policies. [28] We profile the five most relevant systems here:

- The Department of Energy (DOE)'s recently announced National Building Rating Program (NBRP) (residential and commercial)
- The Residential Energy Services Network (RESNET)'s Home Energy Rating System (HERS) (residential)
- The Environmental Protection Agency (EPA)'s Energy Star Portfolio Manager (E*PM) system (commercial)
- The American Society of Heating, Refrigerating and Air Conditioning (ASHRAE)'s planned Advanced Building Energy Label (ABEL)

To the extent possible, we identify the strengths and weaknesses of each system, and briefly describe other significant initiatives that will contribute to mandatory disclosure policies. This analysis forms the underpinning of the recommendations made in the Policies and Roadmap section of this report.

Note that one option not discussed is the development of new, standalone rating systems by states. Developing a complete rating system is a resource-intensive and long-term engagement, and states can substantially reduce the cost of disclosure policies by using existing national or regional-level rating systems. We therefore recommend that states focus their efforts on engaging with the organizations currently developing or refining wider rating systems to ensure that these rating systems meet state needs.

MAINTAINING STATE CONTROL OVER THE DISCLOSURE PROCESS

Although we recommend that states should use a national-level rating system, building labels themselves should ideally be emitted and tracked by the state. Providing a state-specific label, even if it largely repackages data from another rating system, offers the flexibility to add additional information and change formats as state policies and needs evolve. Having customers upload data to a state-operated portal further enables gathering additional data on state building stock, customizing the user experience, and even changing rating systems at a later date with minimal disruption.

If possible, states would ideally work with a national-level rating system that gives states the option to customize its label, web interface and database.

DOE'S NATIONAL BUILDING RATING PROGRAM (NBRP)

On September 30th, 2009, the EPA and DOE announced details of a new energy efficiency partnership, including the development of an enhanced National Building Rating Program (NBRP) by the DOE. [29] Under the NBRP, DOE will essentially take ownership of several of the nine basic ingredients of a disclosure policy. NBRP functions directly relevant to state disclosure policies include:

- **RATING SYSTEM:** A comprehensive, whole-building "asset" rating system and software tool, for both residential and commercial buildings, which will also include some form of operational rating. The rating tool will also provide some degree of energy audit, by offering retrofit recommendations based on energy modeling. DOE will also develop a label for presenting rating results to consumers. The MOU specifies that the rating system will "build upon existing systems".

- **TRAINING AND CERTIFICATION:** Certification standards and training programs for the *residential sector* (home contractors and other home improvement professionals), including an audit program for quality control of building ratings. Although the memorandum does not mention commercial rater certification, it is likely to be included.

- **UTILITY DATA STANDARDS:** Work with utilities to develop a common format for automatically uploading utility bills into the rating tool.

- **DATABASE:** A new database on energy usage and building characteristics from all buildings receiving federal efficiency funding (e.g., Weatherization Assistance Program funds, Energy Efficiency Block Grants, others).

The NBRP will also put into place additional elements that will be useful to voluntary retrofit programs complementing state disclosure policies, notably the ability for the rating system and database to track costs and energy savings from retrofits; a DOE/EPA directory of funding sources; and free online software tools for analyzing energy bills by end-use.

Status: At the time of writing, most details about the NBRP design were still unknown. DOE has committed to announcing a timeline in January 2010, and has informally indicated that it hopes to make rating systems within one to two years. However, proposed federal climate change and energy legislation could potentially cause delays or changes in the administration and scope of the NBRP initiative (see text box).

Basis for Residential Rating System: DOE has begun testing a preliminary, "strawman" residential energy rating system in pilots with federal weatherization participants, based on its Home Energy Saver (HES) self-audit tool. It is simultaneously beginning discussions with RESNET, with which it has a long-standing relationship, on how to incorporate RESNET efforts into a national rating system.

Basis for Commercial Rating System: The eventual basis of a commercial rating system is still unknown; our understanding is that work on a commercial system will begin in 2010. Although not inevitable, it seems highly likely that the Energy Star Portfolio Manager system will strongly inform an eventual operational rating.

Strengths: Regardless of uncertainty about final design and timelines, the advantages of a freely-available, federally-maintained rating system make the NBRP the most likely foundation for state disclosure policies. Most significantly, a national rating system reduces state costs, and avoids redundancy and market confusion that can arise from multiple, state or regional rating systems. A federal label would likely become widely adopted and would thus eventually have the advantage of broad public recognition and an established infrastructure, especially if it built on existing resources. It would also (under proposed federal legislation) be eligible for implementation funding. A federal label would also presumably address accuracy and cost per use issues, although this is not guaranteed. Furthermore, the label, its methodology, and many other resources would be available at no cost to states, as would a new low cost (conceivably free to users) operational rating.

Challenges: There are three challenges inherent in relying on the federal label. The first is political uncertainty: the NBRP may face delays or a change in scope or administration if climate change legislation is passed. Secondly, nothing guarantees that the label and associated metrics would be optimized for state-level mandatory disclosure policies. If the NBRP focuses on supporting federally funded retrofit programs, its final design may not be ideal for broad disclosure and market transformation. Lastly, a federal label is potentially less adaptable by states – obtaining changes or permission to customize labels could be time consuming.

IMPACTS OF PROPOSED FEDERAL CLIMATE CHANGE LEGISLATION ON THE NBRP

The U.S. senate is currently (November 2009) considering several pieces of historic climate change and energy legislation, notably:

- HR 2454, the American Clean Energy and Security Act (ACES) (aka "Waxman-Markey"), passed by the House of Representatives June 26th 2009;
- S.1733, the Clean Energy Jobs and American Power Act (CEJAPA) (aka "Kerry-Boxer")
- S.1462 the American Clean Energy and Leadership Act of 2009 (ACELA)

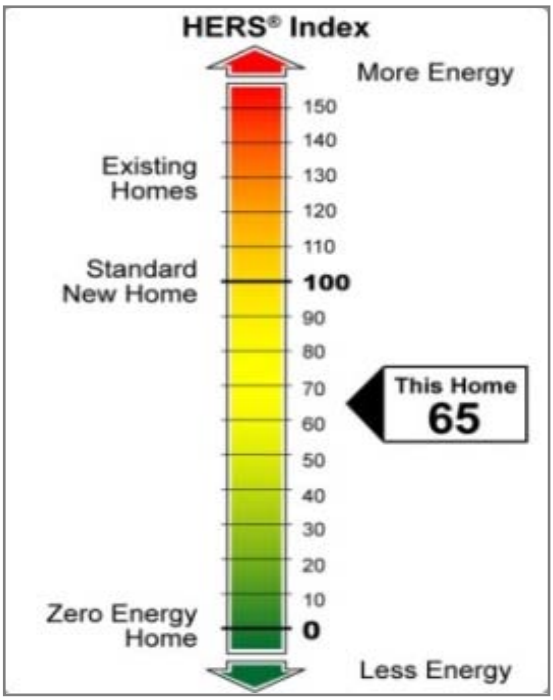
All three bills mention building energy performance labeling. HR2454 as passed includes a building energy performance labeling provision (Title II, Section 204). The provision requires the EPA to develop a model label for both residential and commercial buildings, including both an achieved (operational) and designed (asset) rating. It also requires the EPA to ensure that sufficient data is available on existing building stock to develop rating systems applicable to 90% of major building types. States can obtain funding for implementation. A last-minute amendment limited all requirements to new construction. Once the legislation becomes law, the EPA would be required to propose the model label within 12 months of enactment.

S.1462 uses similar language to mandate the development of a model building rating system (not limited to new construction), while S.1733 allocates emissions trading revenues to state energy efficiency programs including building labeling.

As of this writing, it is uncertain if any of the bills will become law and how energy labeling provisions will pass through the legislative process. The final outcome may support the DOE and EPA's new National Building Rating Program effort, supplant it with new requirements (for example, by returning responsibility to the EPA), or cause delays.

SINGLE FAMILY HOMES: THE HOME ENERGY RATING SYSTEM (HERS)

HERS is the only existing widespread, nationally recognized asset rating system for single family homes.[30] It is used in most of the U.S., primarily to demonstrate compliance for energy efficiency incentive programs aimed at new construction. Key organizations with programs that recognize the HERS rating include the IRS, the Environmental Protection Agency (EPA) and the Department of Energy (DOE). HERS is maintained by the Residential Energy Services Network (RESNET), a national, consensus-based standards body, with a transparent, well developed process for improving the rating system. RESNET also maintains and/or oversees much of the support infrastructure required for a rating system, including: a detailed methodology that minimizes gaming, an approval process for energy modeling software, training and certification for auditors, and quality control processes for auditors. Currently, two energy modeling programs are eligible for calculating a HERS rating – REM/Rate and EnergyGauge.



The HERS rating scale scores a house from 0 to infinity (though in practice, the upper limit is generally 200-300). The score reflects the building's modeled site-level energy consumption divided by the modeled consumption of the same building if built to the 2003 IECC energy code (with 2004 amendments).[31] A score of 100 reflects this reference code; a score of 0 denotes a net-zero-energy home. Homes can also be rated on a scale of 0 to 5 stars, as determined by the initial HERS scale.

HERS ratings are accompanied by a comprehensive energy audit, which includes recommendations for upgrades, and financial analysis of potential savings and costs.

Note that the system as described above is the current HERS approach for existing homes. RESNET has, however, begun multiple review efforts (see below) which may result in substantial changes.

Strengths: HERS has the significant advantage of being an established, recognized rating system with a well-developed infrastructure. In 2008 nearly 17%[32] of new homes constructed in the U.S. participated in the Energy Star homes program, and the vast majority of these used a HERS rating to show compliance. There are over 3,000 raters nationwide, 88 accredited rating providers, and 29 rater training providers. A second advantage is RESNET's role as a consensus-driven standards body, providing a credible, independent avenue for improving the rating system. A third advantage is HERS' long history – the rating has already been well tested (albeit mainly for new construction) and has been refined by experience. Finally, HERS is relatively close to our preferred design as summarized on page 100 – it is an asset rating based on site energy and using a technical rating scale, and provides a comprehensive audit with actionable recommendations.

Challenges: The two major issues with the current HERS system are modeling accuracy and cost. More minor issues include the rating denominator and the use of energy codes as a reference point.

- **Accuracy**: As discussed previously, residential energy modeling software frequently under or over predicts energy usage, particularly for older existing homes. RESNET software approval criteria currently do not test for accuracy in predicting actual consumption – using this type of testing would likely drive significant improvements in software accuracy.
- **Cost per rating**: Nationally, HERS rating costs range from $300-$700, while costs for the Northeast are in the $600-$1 000 range. A recent survey in Oregon found a strong consensus among homeowners that $200 was the upper limit for acceptable rating costs. RESNET and participating states will want to investigate the appropriateness of the SIMPLE tool tested in Oregon's EPS pilot (see sidebar). The tool, still in its early stages of development, may allow raters to accurately model a home with substantially less time and effort, and without using diagnostic equipment.
- **Denominator**: HERS compares a building to itself as built to code – i.e., it measures energy use intensity rather than absolute or functional energy use. This gives larger homes an undue advantage. The HERS rating basis also makes it difficult to compare homes on typical operating costs and greenhouse gas emissions, although this information is generally included in a full HERS report.
- **Energy Code as Basis**: A lesser issue is that the HERS rating is periodically updated to reflect changes in energy codes, which change over time. This means that ratings will need to be recalculated and reissued each time RESNET updates the HERS rating scale.

OREGON'S ENERGY PERFORMANCE SCORE (EPS) PILOT

The Energy Trust of Oregon ran a pilot project in 2008 aimed at developing a residential rating system. This pilot is principally interesting as an example of a new U.S. approach that reflects recent labeling efforts in Europe and the U.K. The label was designed for the Oregon market, but some aspects of its design could be applied to a standalone Northeast approach.

The pilot also tested energy modeling tools for accuracy and cost per use, including an innovative new tool, "SIMPLE". According to the study authors, raters required 1.5 hours per home to complete a rating with SIMPLE, versus 2.5 hours for REM/Rate and other tools, and achieved similar levels of accuracy. The SIMPLE tool (an Excel worksheet developed by residential retrofit program expert Michael Blasnik) accomplishes this by reducing the number of inputs required and using auditor judgment to estimate building air tightness rather than a blower-door test.

These results have generated high levels of interest in the home rating and auditing field, and are being taken seriously by RESNET and other organizations. See http://www.energytrust.org/eps/eps_ex.html for the full report and supporting documents.

Plans to address building labeling: RESNET has recently established an Existing Homes Task Force aimed at improving the HERS rating's applicability to the existing homes market. It has also launched a Building Labeling committee aimed at ensuring HERS or other possible RESNET rating systems are well adapted to mandatory disclosure policy needs, and is working with DOE and others to improve energy modeling accuracy.

COMMERCIAL BUILDING RATING SYSTEMS

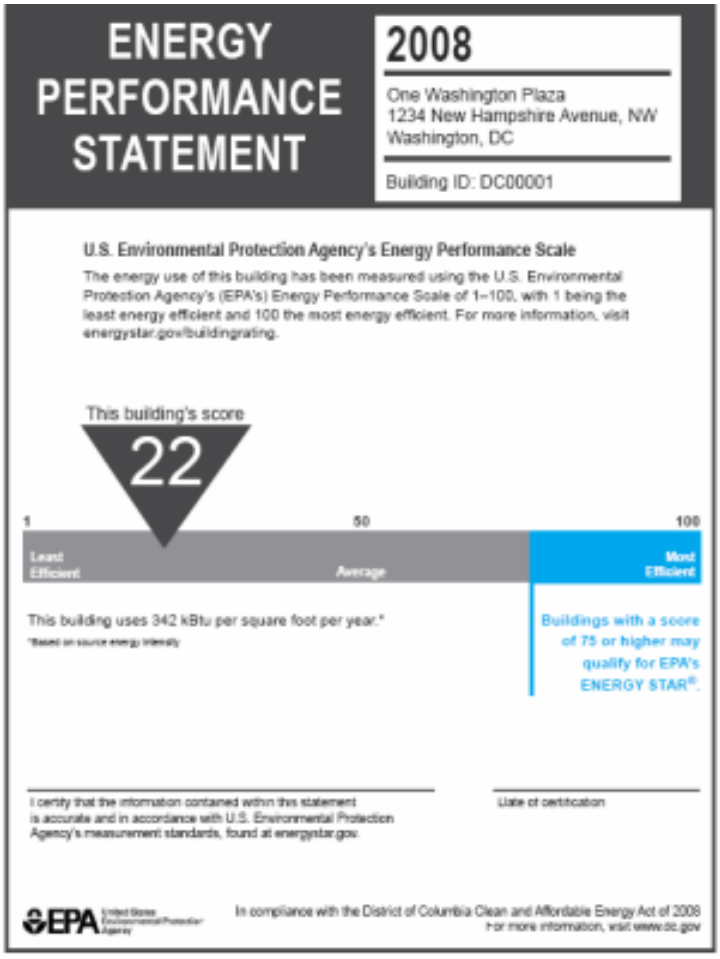
As discussed previously, a commercial building disclosure policy should require disclosure at two points:

- **Scheduled intervals (public disclosure):** an operational rating should be regularly disclosed to a public database, both to provide continuous feedback to the operator and to ensure transparency in the marketplace.
- **At time of transaction (private disclosure, e.g., to buyer, lessee)**: an asset rating and (optionally) an operational rating should be disclosed in all advertising about building sale or rental.

Currently, there is only one available, well-developed rating system for commercial buildings - Energy Star Portfolio Manager (E*PM), an operational rating managed by the EPA. A rating system is also under development by ASHRAE.

E*PM – EPA'S ENERGY STAR PORTFOLIO MANAGER

The EPA's Energy Star Portfolio Manager (E*PM) is a free, voluntary operational rating system for whole buildings, managed principally by the EPA. Buildings over 5 000 square feet that fall into one of 12 categories can be rated under the system, by inputting energy use, building area and few other inputs. The rating is based on normalized source energy use per square foot of building area, with source energy calculated using national average multipliers for each energy source.



E*PM is a statistical rating - buildings receive a score of 1-100, reflecting how their energy use/ft 2 compares to the existing national building stock in their building category. For example, a score of 75 indicates that the building is in the 75th percentile for energy consumption. Scores are

determined using algorithms based on analysis of the Commercial Building Energy Consumption Survey (CBECS) and several smaller, industry-specific databases. The rating is normalized for climate, occupancy, and some equipment variables (for example, number of computers for office buildings). Because of limitations in the CBECS data, EPA is unlikely to be able to expand building categories unless an expanded building survey is conducted. E*PM currently covers roughly 60% of building area nationally (though a smaller percentage of buildings per se).

Currently, building owners receive a rating using the E*PM website. Energy Star has a voluntary, third-party verification process in place for building owners wishing to receive the Energy Star label, which requires a score of 75 or above. The certification process requires that a professional engineer conduct a brief site visit and verify all data. States requiring mandatory disclosure will need to review this process.

Energy Star also offers the Energy Star Target Finder service, which allows building designers to receive a rating on the E*PM scale for a building design's modeled energy consumption. This approach could easily be used for producing a mandatory asset rating, if the EPA or states develop such a rating. It would require a certification/enforcement process to be developed for all buildings, and would require a modeling protocol along the lines of those currently proposed by COMNET (see sidebar).

E*PM is not capable of rating tenant spaces, and the EPA has no plans to develop tenant space ratings.

COMMERCIAL ASSET RATING: THE MISSING PIECES

Two new initiatives were recently launched, aimed at addressing key missing elements for commercial asset rating.

The Commercial Energy Services Network (COMNET): COMNET is an on-going initiative aimed at ensuring consistent asset modeling of commercial buildings at a relatively low cost. A key deliverable is a technical standard for modeling commercial buildings, aimed at allowing faster modeling and reducing gaming. A second deliverable will be a standard for energy modeling software. COMNET appears likely to become the default methodology for asset modeling in the commercial market. Notably, ASHRAE's proposed building label will rely on the COMNET standard. COMNET is also working on a building rater certificate for commercial buildings. It appears that RESNET may take on responsibility for the initiative in the near future.

ASHRAE's Commercial Modeller Certificate: As part of the development of its ABEL rating system, ASHRAE has announced it will create and manage the first U.S. certification process for energy modellers. Administrators of any asset rating scheme could use this certification to screen modellers and auditors.

Strengths: E*PM is widely used, with almost 17% of U.S. commercial floor space benchmarked in 2008. The Energy Star brand is also well recognized, and its methodology is robust and well tested. It also has very low administrator and user costs – it is currently free to use, and third party verification of ratings should be inexpensive, especially as sales volumes increase for auditors. Finally, E*PM appears to be the most likely candidate for an operational label for DOE's National Building Rating Program.

Challenges: The most significant issue with the E*PM rating scale is that it reflects the existing building stock rather than best performance, making it easy – many would say far too easy – for buildings that perform poorly relative to achievable best practices to obtain a high score. A second challenge is coverage, with 40% of the building stock unable to receive a rating. This will not change in the near term, but will hopefully be resolved within 4 to 8 years, particularly if proposed improvements to the CBECS survey take place.[33] It is also not likely to be

resolved by other rating systems in the short to medium term – see discussion below. Finally, a third issue is the current lack of an asset rating, although it should be relatively straightforward to develop using the E*PM scale and COMNET protocols.

ABEL – ASHRAE'S ADVANCED BUILDING ENERGY LABEL

ASHRAE recently proposed a rating system combining an asset and operational rating. The ratings would be based on source energy use per square foot, as with E*PM. ABEL uses a technical rating scale, from A+ to F-, calibrated so that higher ratings are equivalent to best practices in building design, including net-zero energy. The ratings would be determined by dividing actual or modeled energy use/sq.ft. by the median energy use/sq.ft. of existing buildings for the building type. The median energy use would be determined using CBECS data.

Operational energy use would be normalized for weather, occupancy and some plug loads. The rating would be obtained by a certified third-party rater. It appears that at least initially, ABEL would rely on E*PM algorithms to normalize energy use, which would limit ABEL to covering 60% of building area until E*PM coverage is expanded or ASHRAE is able to develop a broader database.

The ABEL rating would not include a full energy audit or recommended upgrades. It would include a feature checklist and possibly an optional audit for interested building owners. ASHRAE also plans to eventually rate individual building end-uses, such as lighting, HVAC, and envelope.

ABEL is not yet fully developed. ASHRAE currently plans to test the operational rating with a pilot project in 2009-2010, while simultaneously developing a certification program for energy modelers. In 2010-2011, the operational rating would be refined and the asset rating further developed, with a full implementation of the rating system at some point in 2011-2012.

Strengths: ABEL's biggest advantage is that it follows solid design principles and is specifically designed for disclosure policies. It combines both an operational and an asset rating and would include optional audits and eventually optional end-use ratings. It would also use a technical scale that requires best practices to receive higher ratings – this last point being its biggest distinction from E*PM. ASHREA's profile and resources as a premier organization in the building performance community also constitute a valuable asset.

Challenges: The major issue for ABEL is its timeline and apparent lack of resources. The June 2009 report detailing the label underscores limitations in funding, which could arguably delay the full launch beyond 2011. On the other hand, the funding issue could be resolved if the DOE, a state or a group of states contributed financing as part of their adoption of the rating system. A second issue is the lack of coverage for 40% of building area, which, as with E*PM, is likely to remain an issue until the CBECS database is expanded or a similar effort is undertaken. A third issue may be cost. ASHRAE has not determined its fee structure for the label, but it would presumably need to be higher than E*PM to cover ASHRAE's administrative and development costs. Lastly, ABEL is a new label, which would need to compete for market share with the already-successful E*PM.

REQUIRING UTILITIES TO PROVIDE BILLING DATA

Regardless of the final approach – Portfolio Manager, ABEL or a new NBRP system –, states will want to pass legislation requiring utilities to make billing data available in an easy-to-upload format for operational ratings.

This requirement has begun in several jurisdictions, notably California and New York. It can represent a substantial effort for utilities, which need to address issues such as tenant privacy and technical limitations of their current data systems.

For these reasons, policymakers should consider moving the requisite legislation forward without waiting for the entire disclosure and/or upgrade legislative package to be ready.

TRIGGER POINTS

There are two key options for triggering mandatory performance disclosure, each of which aims to affect the market in a different way:

Trigger Point	Market Impacts
"Time of transaction" (sale or rental)[34]	• **Major Opportunity**: Enabling market actors to value energy efficiency when purchasing or renting buildings • **Secondary Opportunity**: Providing purchasers with information on potential energy efficiency upgrades
Scheduled Intervals (typically publicly disclosed)	• **Where Public**: Creating mechanism for public recognition and pressure on building operators • **In all cases**: Provides operators with regular feedback on their performance.

Time of transaction policies are focused on enabling the market to value energy efficiency, and can also provide information on retrofit options and subsidies. Time of transaction disclosure will principally encourage physical retrofits to buildings, rather than behavioral and operational changes. This is because, in order to allow buildings to be compared meaningfully by purchasers or renters, the rating system used will need to rate only the building's physical assets. Scheduled disclosure policies, on the other hand, are focused on providing feedback to building owners/operators on their own performance, via regular disclosure and (when disclosure is public) creating an opportunity for public leverage. Scheduled disclosure can incent both physical retrofits and changes to behavior and building operations.

The preferred choice of trigger point(s) for a disclosure policy varies by the type of building.

Residential Homes: We suggest that time of transaction, particularly time of sale, is the most appropriate trigger point for residential markets. Policies in other jurisdictions have been shown to be effective in convincing the homebuyer market to value energy efficiency (see page 84). As buyers value energy performance, sellers will pay more attention to cost-effective savings opportunities, much as they already consider the intrinsic resale value of kitchen and bathroom renovations. A scheduled disclosure policy is less relevant for the residential sector because the potential for savings from operational changes is relatively small, and if made public, it is unlikely that public scrutiny will have a strong impact on private homeowners.

Commercial Buildings: We suggest that both trigger points are relevant to commercial markets. There is strong, recent evidence that both buyers and renters in the U.S. will pay a premium for buildings with high-efficiency performance labels or ratings, i.e., will internalize efficiency into investment considerations (see page 84). Regarding scheduled disclosure, potential savings from operational improvements are significant. We recommend that

scheduled energy performance disclosure be made public, because commercial building owners, particularly high-profile owners, are likely to be influenced by public scrutiny.

Given that either approach can be effective for commercial buildings, states need to decide if it is worthwhile adopting both trigger points. We recommend that both approaches be adopted, since each transforms the market in different ways. Time of transaction disclosure primarily affects the behavior of potential buyers, while scheduled disclosure works on building operators, ESCOs, utility incentive programs and stakeholder organizations.

SPECIFIC TRIGGERS – WITHIN "TIME OF TRANSACTION"

An essential design question for time of transaction policies is *when* in the process disclosure should occur. There are three broad options, all of which have been adopted by different jurisdictions:

- At the earliest possible stage, e.g., in all advertising.
- During the process, e.g., upon receipt of an offer.
- At the end, e.g., at signing before the notary.

Time of transaction disclosure affects the market by allowing potential buyers or renters to compare the efficiency of buildings. For the policy to effectively impact purchase or rental decisions, **it is critically important that energy performance be disclosed in all advertising**, for example in MLS sheets or other descriptive documentation provided to potential buyers or renters. This is notably the case in the Australian Capital Territory. Exceptions should be made where impractical (for example, if the advertising is in print form and below a size threshold, as in many newspaper listings). While administratively simpler, limiting the requirement to the final stages of the process fundamentally annuls the value of the disclosure in the first place.

SPECIFIC TRIGGERS – WITHIN SCHEDULED PUBLIC DISCLOSURE

Under a **scheduled public disclosure** policy, the exact period or timing of disclosure becomes less important. Because scheduled disclosure focuses on providing feedback to current operators and owners, disclosure should be frequent enough to show progress without becoming prohibitively expensive. Typically (e.g., in Denmark and in Washington, D.C.), existing scheduled policies require annual disclosure, but are limited to less-costly operational ratings that do not include audits.

RATER INFRASTRUCTURE

Raters and/or auditors will need to be trained and certified. Several programs already exist in the U.S. – two essential residential options are RESNET's Accredited Rater certification, and the Building Performance Institute's Building Analyst certification.[35] The NBRP will also provide certification for residential building raters, presumably based on RESNET and BPI certification, although this is not confirmed.

The current E*PM approach for buildings seeking (voluntary) Energy Star status is to have results verified by a professional engineer. This approach could be used in the short term by states for commercial operational ratings, but should ideally be replaced with a short training and certification process that could be open to a broader range of professionals (architects, building managers, etc.). Because operational ratings such as E*PM are relatively straightforward to produce, training and certification should be simple and low-cost.

For commercial asset ratings, however, raters need to have expertise in building energy modeling. There is currently no broadly-accepted certification for this task; however, ASHRAE and COMNET are both currently developing a certification to address this gap, and the NBRP is likely to address it as well.

In all cases, rater certification should include some form of quality control by the policy administrator or by third-party certification bodies, using a combination of paper audits (reviewing modeling and rating reports) and on-site verification of rating quality.

Experience in other jurisdictions has shown that a lack of sufficient raters can cause bottlenecks at the beginning of policy implementation. States should avoid this by developing a rater training and certification program before implementation, combined with efforts to gradually increase market demand for rating services during the ramp-up to mandatory disclosure implementation.

PHASE-IN STRATEGY

NEED FOR PHASED IMPLEMENTATION

Most existing disclosure policies have been phased in gradually, for three reasons. Firstly, gradual implementation allows rating systems and administrative structures to be tested and fine tuned before full implementation. Secondly, gradual implementation avoids bottlenecks by limiting growth in demand for rating, audits and administration. Lastly, and less crucially, gradual implementation can, if well designed, allow administrators to measure policy effectiveness, for example by comparing retrofit rates in markets with and without disclosure requirements. These three drivers for phased implementation favor slightly different options.

OPTIONS

There are several methods of gradually phasing in disclosure or upgrade requirements:

1. **Voluntary to Mandatory Phase-In**: An initial voluntary phase, where compliance is optional, is effective for testing and fine tuning systems. Voluntary energy efficiency retrofit programs are an excellent potential vehicle for this type of testing, since they are already conducting building audits. A voluntary phase does not, however, allow administrators to test the effectiveness of policies in transforming the market. In existing voluntary programs, participating building owners are disproportionately well-performing buildings, who participate out of an interest in obtaining recognition for already obtained performance.

2. **Regional Phase-In**: Policies can be phased in by county or municipality. This can be effective for testing and fine tuning systems, and also for testing effectiveness, particularly for time of sale-triggered disclosure policies, since real estate markets are often local. Regional phase-in is less effective for reducing bottlenecks to the extent that auditors and code enforcement staff are based locally.

3. **Public Buildings**: Many jurisdictions choose to fine tune their rating systems and administrative structures by initially requiring disclosure or upgrades from publicly owned or operated buildings only. This approach proved useful in California, and has also been adopted by Washington State for its upgrade policy.

4. **Building type/size /age**: Policies can be designed to apply initially to a single building type, as with Australia's proposed commercial disclosure program, which will apply at first to office buildings only. They can also be phased in by size, as in D.C. and California's commercial requirements. Age can also be used to stagger implementation, as in Austin, TX, where audit requirements apply to buildings 10 years or older. These approaches are

all aimed principally at reducing bottlenecks, although limiting building types also allows software capabilities to be gradually expanded. Phasing-in by building type or size could also lend itself to testing effectiveness.

5. **Schedule**: Disclosure or upgrade requirements can be applied by schedule, as in New York City's proposed audit requirement, which will apply to 10% of affected buildings, selected randomly each year. This approach would be difficult to implement with a time of sale/rental triggered policy, and would not allow administrators to evaluate the effectiveness of this type of policy (although it could allow for testing the effect of annual public disclosure).

6. **Trigger Design**: The choice of trigger point for a disclosure or upgrade policy creates a natural opportunity for staggering implementation. A time of sale/rental disclosure policy does this effectively, as does a time of renovation upgrade policy. A common, additional implementation choice is to initially require disclosure only at time of sale, leaving time of rental for a second phase. Scheduled public disclosure, as recommended for commercial buildings, does not naturally create a phased implementation.

One useful approach for phasing in scheduled public disclosure, used in the District of Columbia, is to avoid publishing performance for the initial year of disclosure. This reduces pressure on participants and allows infrastructure to be fine-tuned.

	Fine-Tuning Systems	Avoiding Bottlenecks	Testing Effectiveness (comparing markets)
1. Voluntary to Mandatory	✓	~	X
2. Regional	✓	~	✓
3. Public Buildings	✓	✓	~
3a. Building type	✓	✓	✓
3b. Building size	~	✓	~
3c. Building age	~	✓	X
4. Schedule	~	✓	✓
5. Trigger Design	~	✓	~

A state's choice of implementation strategies will depend on which rating systems are being used. If a new, untested rating system is being adopted, then a voluntary or regional pilot project can be used for testing. If an existing, already field-tested rating system is being adopted, then phase-in should focus on avoiding bottlenecks via use of building type/size/age, a schedule, or trigger design.

BACKGROUNDER: ISSUES AND OPTIONS FOR UPGRADE POLICIES

Note to the reader: *Our review of mandatory energy efficiency upgrade policies is less comprehensive than our previous review of mandatory energy performance disclosure policies, given the emphasis our clients placed on the latter as an initial step forward.*

KEYS TO SUCCESS (UPGRADES)

While the focus of our international and U.S. policy review was squarely on mandatory *disclosure* policies, it is worth noting here several keys to successful mandatory *upgrade* policies. Specifically:

- *Enforcement cannot be an afterthought:* Trigger points should be designed to make enforcement and tracking as simple and, as a result, as realistic as possible.

- *Minimize gaming opportunities*: Upgrades tied to cost estimates are open to manipulation. Policies should use straightforward prescriptive lists (or possibly building rating thresholds).

- *Ensure consumer acceptance* that required upgrades are worthwhile, via a focus on cost-effective measures.

- *Timely triggers:* the earlier policies can induce upgrades (for example, by setting an upgrade schedule rather than a long-term deadline), the better in terms of achieving related energy, economic and environmental savings targets**.**

- *Keep transactions fluid*: This can be done by carefully considering trigger points and other key issues, with a view to ensuring that upgrade requirements do not inadvertently block fluid rental and sales transactions.

IN PRINCIPLE – ISSUES AND OPTIONS

Developing an effective mandatory energy efficiency upgrade policy requires choosing among a variety of key design options. Below we discuss these issues broadly, review and assess the options, and point to what should be considered, in principle and in the absence of other considerations, preferred solutions (compromises accounting for existing codes and systems are addressed in the next chapter). As previously, we approach each of these issues distinctly for single family homes and for commercial buildings (including multifamily residential buildings).

MAJOR ISSUES

1. Basis for upgrade decisions
2. Trigger points (when is disclosure required)

OTHER ISSUES

We also address, albeit very briefly, four other issues that are often the subject of debate when designing mandatory disclosure policies, namely: type of measures included, the range of buildings (or owners) to whom the policy should apply, and spending caps and exceptions.

MAJOR ISSUES

ISSUE #1	BASIS FOR UPGRADE DECISIONS Upgrade policies must include a method for identifying which measures must be implemented in a given building. There are three key options for doing so, presented below.
Question	How should required upgrades be determined?
OPTIONS	**A. Cost-effectiveness**: requiring owners to install all upgrades that have a simple payback period below a given threshold, based on energy modeling results. Examples of this approach include Washington State's requirements for publicly owned or leased buildings, and New York City's proposed Audits and Retrofits legislation. **B. Performance-based requirements**: Setting requirements in terms of energy modeling results. Typical approaches include: improving energy performance ratings or energy consumption, or meeting minimum thresholds set by the program. For example, public and/or privately-owned buildings can be required to achieve a rating of at least 75 on the E*PM, or at least a B (or other benchmark) on a technical scale (see Disclosure Policy). **C. Prescriptive lists**: requiring owners to install a series of pre-defined measures. The list can be program defined or draw on existing energy codes. Berkeley, California uses a program-defined list, with all homes required to have installed ten prescriptive measures when they are sold. The most common code-based requirement is the International Energy Conservation Code (IECC) requirement – officially in force throughout much of the Northeast – that, in the case of additions, alterations, renovations or repairs, owners must upgrade any portion of the building (including major systems) touched by the renovation.[36] New York City has also proposed a code-based requirement that goes beyond the IECC by requiring all lighting systems to be brought up to code at the time of major renovation (including those not touched by the renovation itself).
PREFERRED OPTION	**B or C**: Choosing among these issues involves trade-offs between cost-effectiveness, reliability and the potential for gaming. Options A and B are the least reliable because of inaccuracies in energy modeling, but conversely maximize cost-effectiveness – Option A uses cost-effectiveness as a criterion, and B gives consumers some flexibility, allowing them to maximize cost-effectiveness. Option C is prescriptive and therefore avoids modeling issues, but imposes specific measures regardless of cost-effectiveness. Both B and C are effective options, for different reasons. Option B has the advantage of providing owners greater flexibility, which allows them to focus on

both cost-effective measures and measures that provide other significant non-energy benefits to fit particular circumstances.

Option C is simpler to enforce and less open to charges of unreliability, and can also target cost-effectiveness if well-designed. Lists could either focus on measures likely to be cost-effective in most circumstances, or could incorporate conditional rules reflecting individual circumstances. For example, requiring insulation upgrades only in homes with low existing levels would ensure that upgrades are relatively cost-effective. This approach has been well-developed in many voluntary residential retrofit programs faced with the same tradeoffs. This is also the approach used by Burlington VT's upgrade policy for rental properties.

We do not recommend Option A because of the potential for gaming and inaccuracy around estimates of measure costs. That being said, New York City is currently discussing an upgrade policy with this approach, which will provide valuable practical insights if implemented.

ISSUE #2 TRIGGER POINTS

Like disclosure policies, upgrade policies require a trigger point.

Question When should upgrades be required?

OPTIONS

A. At time of transaction (pre-sale): Prior to selling a property, the building owner would be required – as is the case in Berkeley– to upgrade their homes or buildings. This approach could leverage results from a time of transaction *disclosure* policy that produces a rating and/or recommended upgrades prior to sale.

B. At time of transaction (post-sale): An alternative to the Berkeley approach would require that upgrades occur within a given time (e.g., one year) *after* a property is bought. This leverages rating and audit results from any time of sale disclosure policy and simultaneously reinforces the value given to energy efficiency by buyers.

C. During major renovations: This is the approach used by many state energy codes in effect in the Northeast U.S. (though not always enforced), as well as in some regions of Europe.[37] This approach has the advantage of leveraging investments already underway, and minimizing disruptions, management time and other costs.

D. At scheduled intervals/deadlines: With this approach, buildings must be upgraded either by a fixed deadline, or according to a random schedule. New York City's Lighting Upgrades legislation is a good example of the former, while its Audits and Retrofits legislation is a good example of the latter.

PREFERRED OPTION	**B, C and/or D**: Option A, requiring major upgrades *at* the time of transaction could create an expensive, complicated new obligation that could slow real estate transactions substantially by creating long delays. This could impact many stakeholders negatively and create perverse incentives (for example, to undertake pre-sale improvements quickly without regard for quality). That being said, several jurisdictions have successfully required upgrades at time of sale for residential properties. Option B, however, has the same advantages as Option A but avoids creating delays or additional burdens in the sale process. At the same time, it has the additional advantages of reinforcing the value of disclosure policies and leveraging the tendency for new owners to implement substantial renovations in the first years after a purchase. Time of renovation also has several advantages: it is more likely to lead to more cost-effective savings, due to cost savings from combining energy upgrades with other renovations. It also removes the major barrier of hassle/transaction costs related to renovations, since renovations are happening regardless. It does not risk creating delays in real estate transactions, an important concern. Both B and C face the issue of timeliness –no upgrades will occur in buildings that are not renovated or sold, which could leave a large portion of the building stock unaddressed for decades. This could be reduced by the use of a complementary deadline. An example is New York City's Lighting Upgrade proposal, where upgrades are tied to time of renovation, but an ultimate deadline is used to ensure relatively timely improvements. Care should be given in the design of deadlines to avoid creating a bottleneck if most owners choose to wait until the deadline arrives to implement upgrades. Scheduled upgrades have the advantage of addressing significant portions of the building stock, and limit effects on stakeholders beyond building owners. However, on their own they have no advantages in terms of depth or cost-effectiveness of savings, or costs for users.

OTHER ISSUES

There are many other design issues to consider in selecting or creating a rating system for mandatory disclosure. We briefly address four of these here: type of measures included, the range of buildings (or owners) to whom the policy should apply, spending caps and exceptions.

Issue #3 – Scope of Measures: Upgrade policies can focus on operational measures, for example retro commissioning, on physical upgrades such as increasing building envelope insulation levels and upgrading mechanical systems, or on both. A key difference is that many operational changes will be difficult to enforce, since they cannot be verified by an inspection,

and may be short-lived (whereas physical changes are "hardwired" into the system). We suggest that states should focus on physical upgrades, because they are verifiable, and leave operational changes to voluntary programs (on the residential side) or public disclosure policies (on the commercial side).

Issue #4 – Coverage: Upgrade policies must define which building types and sizes are required to undertake upgrades. This is less a technical consideration than a practical one. On the commercial side, for example, limiting upgrade requirements to large buildings reduces the administrative burden and targets those most likely to be able to afford, plan, finance and implement large upgrade projects. This is the approach used in New York City. Another approach to gradual implementation is to initially require audits only for publicly owned or operated buildings, as in Washington State. On the residential side, this is less of an issue – any upgrade policy should be applied uniformly.

Issue #5 – Spending Caps: Policy-makers may need to include a spending cap to reassure building owners that costs will be contained, unless upgrade requirements are limited to low cost measures. Ideally, access to low-interest financing programs can reduce the need for a spending cap, particularly if loans are tied to the property and not the owner. This approach has limitations in the commercial sector, however, where factors such as the ability to take on debt and accounting practices come into play.

If substantial expenditures are expected of building owners, then a spending cap is likely necessary, but it would need to be well-designed to avoid gaming, which could be a significant concern. For example, if caps are linked to renovation spending, owners could break large renovations into several smaller projects to keep spending caps low enough to exclude major measures.

Issue #6 – Exceptions: Policies should ensure that high-performing buildings are exempt, particularly if compliance is via a costly audit process. This avoids wasting resources on audits unlikely to identify major savings, and provides an incentive for achieving high performance. High performance can be identified either by building rating or third-party certification processes such as LEED. Policy-makers may also want to limit the number of times a building is required to go through the upgrade process. This would reduce the burden on building owners, but could also have negative effects. If it is combined with a spending cap, it could allow owners to game the system by going through a few smaller renovations before moving on to a larger renovation after exceptions apply.

SUMMARY

The table below summarizes our recommended design for key elements.

BASIS	✓	Conditional prescriptive lists or performance-based improvements(modeling)
TRIGGER POINTS	✓	Time of renovation or post-transaction deadline, possibly additional, complementary deadlines.
SPENDING CAPS	✓	Only if upgrades are expensive, and designed to avoid gaming.
MEASURE SCOPE	✓	Physical Assets - As broadly defined as is feasible
APPLICABILITY	✓	No preferred option
EXCEPTIONS	✓	High performance buildings, past participants (barring spending cap)

IN PRACTICE – OPTIONS FOR THE N.E.

Contrary to mandatory disclosure policies, the design of mandatory *upgrade* policies need not take into account a flurry of legislative activity, nor a plethora of pre-established tools or systems.

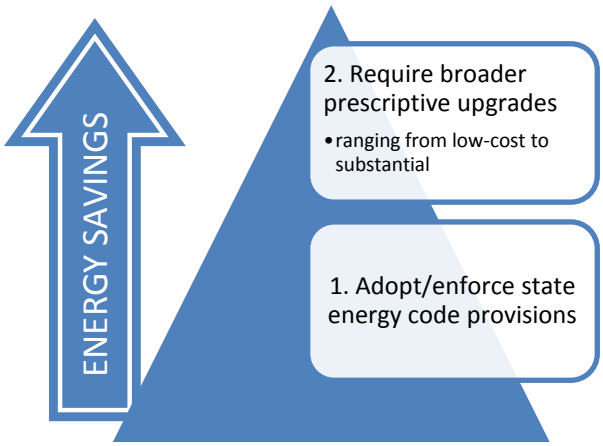
In fact, the only significant external factor policymakers should consider is the existence and enforcement – or lack thereof – of energy codes.

Indeed, the most common form of existing upgrade policy in the northeast are energy code provisions requiring building owners to upgrade all affected systems and building areas to meet the energy code in the event of major renovations. Both the International Energy Conservation Code (IECC) and ASHRAE 90.1 (the de *facto* model energy codes for residential and commercial buildings) contain similar clauses. According to the Building Codes Assistance Project, virtually all states in the Northeast have energy codes equivalent to at least the 2006 IECC and ASHRAE 90.1 1999/2001, both of which contain this provision.[38]

A larger issue with current IECC upgrade requirements is a current lack of enforcement in many states. As discussed in NEEP's recent white paper on progressive building energy codes, enforcement of codes is relatively lax even for new construction, with compliance typically ranging from 40% to 60%.[39] Energy code experts indicate that time of renovation compliance rates are even lower. **Improving enforcement levels should be the first step in any upgrade policy initiative.**

PROPOSED APPROACHES

As discussed, the minimal approach recommended to states is to increase enforcement of existing energy code requirements. Beyond this, we recommend creating a complementary upgrade policy following the design recommendations summarized on page 123. The key design choice for states then becomes how aggressively to pursue upgrades. A less aggressive approach will focus on low-cost/no-cost upgrades that are cost effective in most or all buildings. A more aggressive policy will target potentially expensive upgrades.



These choices can be summarized as two policy tiers:

1. **Adopt/enforce state energy code provisions**: Most states in the Northeast have already adopted the IECC and ASHRAE 90.1 or have equivalent energy codes. Those that do not should prioritize adoption; those with codes in place should increase enforcement of time of renovation provisions.[40]
2. **Require broader prescriptive upgrades**: We suggest that a broader upgrade requirement should be based on a simple prescriptive list of generally cost-effective measures, and be required at both time of renovation and post-sale to ensure timeliness. The costs of the required upgrades will determine exactly how aggressive the policy would be. An upgrade policy limited to relatively low-cost upgrades would keep building owner costs down while ensuring at least some energy performance improvements. States with the resources and momentum to put substantial upgrade policies in place should target deep improvements and as many cost-effective major measures as possible.

IMPLICATIONS FOR DISCLOSURE POLICIES

Although mandatory upgrade policies remove some of the impetus for mandatory disclosure, we argue that disclosure policies should be implemented even in states with well enforced upgrade policies.

Time of transaction disclosure can reinforce upgrade policies by creating additional value for investments in upgrades. This is particularly important because it is unlikely that an upgrade policy will cover all potential measures. By allowing users to integrate the value of energy efficiency into their decisions, a complementary disclosure policy creates value for measures outside of the scope of an upgrade policy. Additionally, the value created by disclosure policies reduces incentives for owners to avoid compliance with upgrade policies. Finally, disclosure policies create further benefits, such as increased consumer protection and additional feedback on performance to the building industry, that are not addressed by upgrade policies.

If an upgrade policy is based on energy audit results, one potentially negative impact of combining the two policies is that it could create the need for multiple audits, which could be both inefficient and create frustration. This is an argument for avoiding an audit-based upgrade approach. If audits are used for both policies, they should be interchangeable and as low-cost as possible.

Scheduled public disclosure policies can reinforce upgrade policies in two ways. Firstly, they create additional value for physical upgrades, since upgrades will improve operational performance and therefore the owner's public profile. Secondly, public disclosure policies are able to incent operational improvements. Upgrade policies can't do this as effectively, because enforcement would require long-term tracking and an effective enforcement mechanism.

Because scheduled public disclosure is likely to be based on a low-cost, annual operational rating, combining the two policies does not create significant additional cost or redundancy for users.

ADMINISTRATIVE NEEDS

Upgrade policies require both an administrative framework and many support structures. We discuss key elements and considerations below. Note that in many cases, administrative needs are better filled by national or regional bodies, rather than states. Equally, elements from existing initiatives can fill these functions. The table below summarizes how national and regional bodies, as well as foundations and utilities, can contribute to a state upgrade policy.

Element	State Gvt	Municipalities	Other*
Enabling Legislation	Preferred	*partner/ alternative*	
Central Registry Development/ Maintenance	*partner/ alternative*		Preferred
Enforcement	Preferred	*partner/ alternative*	
Contractor Training/ Certification	*partner/ alternative*		Preferred
Funding	Preferred		Preferred

**regional or national organizations; federal government; foundations; utilities.*

Enabling Legislation: Mandatory upgrade policies must be created by enabling legislation at either the state or the municipal level. A separate paper currently being prepared for NEEP by the Vermont Law School will address legislative specifics.

Central Data Registry: Data collection needs vary depending on the upgrade policy used. If states simply improve enforcement of existing energy code provisions, then existing tracking mechanisms used by code enforcement bodies (at the municipal level) will be sufficient. If states adopt a broader upgrade requirement triggered by time of sale and time of renovation, then a new compliance tracking system would be required. Time of sale triggered upgrades could be tracked using the same database developed for time of sale disclosure policies, while time of renovation upgrades could be tracked via building permit offices.

Recommendations: Data Registry

Residential / Commercial	**Improved Code Enforcement**: no action needed. **Broader Upgrade Policy**: States should ensure that databases developed for disclosure policies can also be used to track compliance with upgrade policies.

Enforcement: Enforcement is essential for mandatory upgrade policies, and consequences for non-compliance should be set at two to three times the average upgrades. Improved enforcement of existing building codes will require increased resources for municipal code offices. Broader upgrades at the time of renovation can also be built into existing municipal code enforcement mechanisms. Broader upgrades triggered by time of sale would require a new enforcement mechanism, possibly enforced by municipal codes offices but with state-level tracking. One approach would be to have building owners demonstrate compliance via a post-upgrade audit, which could also serve as an updated asset rating within the disclosure policy.

Recommendations: Enforcement

Residential/ Commercial	**Improved Code Enforcement**: Provide additional resources to municipalities. **Broader Upgrade Policy**: Provide additional resources to municipal code offices and develop links with state level disclosure policy for tracking time of sale triggers and demonstrating compliance. Set fines at two to three times the cost of compliance.

Contractor Training infrastructure: Contractors working within the renovation industry will need to be trained on building owner obligations under any new upgrade policy, and would also benefit from training on key energy efficiency retrofits in some regions. The latter training is often already available from utility efficiency programs and other sources, but may need to be scaled up. To the extent that post-upgrade audits will be used to demonstrate compliance, this will reinforce the need for rater/auditor training already identified for disclosure policies.

1 Recommendations: Contractor Training

Residential/ Commercial	Provide brief, low-cost training to contractors on new building owner obligations under upgrade policies. Liaise with existing contractor training efforts to ensure that a sufficient supply of well-trained contractors exists to install upgrades.

Funding Sources: The administrative tasks described above will require significant funding, in particular to municipal codes offices. A detailed analysis of funding sources is beyond the scope of this paper, but multiple initiatives aimed at improving building energy codes are potential funding sources, and energy utilities may also be potential funders. Most interestingly, utilities may be interested in subsidizing upgrade costs to owners.

Recommendations: Funding Sources

Residential / Commercial	Engage potential funders in early stages of policy development.

IMPLEMENTATION OPTIONS

As with disclosure policies, upgrade policies can benefit from phased implementation, principally to avoid bottlenecks caused by a lack of contractors and/or enforcement staff. The options for phased implementation are largely similar to those described for disclosure policies.

2 Recommendations : Implementation

Residential/ Commercial	**Improved Code Enforcement**: No phase-in necessary beyond the time needed to ramp-up municipal enforcement staffing levels. **Broader Upgrade Policy**: A broader upgrade policy should be brought in several years after a disclosure policy is fully in place, to ensure that auditor infrastructure is fully developed and to take advantage of increased incentives for upgrades created by disclosure policies. Commercial buildings should also be phased in by size to further reduce bottlenecks in enforcement or auditing.

Acronyms and Endnotes

ACRONYMS

ABEL	Advanced Building Energy Label
ACT	Australian Capital Territory
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineer
COMNET	Commercial Energy Services Network
DOE	U.S. Department of Energy
E*	Energy Star
E*PM	Energy Star Portfolio Manager
ECCP	European Climate Change Program
EPA	U.S. Environmental Protection Agency
EPBD	Energy Performance of Buildings Directive
EPS	Energy Performance Score (Oregon)
ESCO	Energy Services Company
EU	European Union
EUI	Energy Usage Intensity
GHG	Greenhouse gas
HERS	Home Energy Rating System
IECC	International Energy Conservation Code
MEPS	Minimum energy performance standards
NBRP	National Building Rating Program
RESNET	Residential Energy Services Network

ENDNOTES

[1] Our discussion of mandatory disclosure policies is focused on disclosure of energy ratings (and associated information). By normalizing for factors (like weather or occupancy) that could significantly impact actual consumption, standardized rating systems allow consumers to compare homes and buildings on an appropriate, "*all else being equal"* level playing field. We do not consider policies that require disclosure of energy bills, nor of simple metrics. Indeed, by failing to normalize for even the most basic of factors that can affect consumption, these approaches can mislead consumers. Nor do they allow policymakers to provide clear direction re. building performance goals.

[2] E.P.A., 2009. U.S. Greenhouse Gas Inventory Report, http://epa.gov/climatechange/emissions/usinventoryreport.html

[3] NEEP 2005. Economically Achievable Energy Efficiency Potential in New England, http://www.neep.org/files/Updated_Achievable_Potential_2005.pdf.

[4] For example, National Grid's generous MassSAVE residential retrofit program offers free home audits, turnkey installation of recommended measures, incentives covering 75% of envelope and air sealing work, and 0% financing – and still has post-audit uptake rates of only 40% (2008 data).

[5] More information presented on page 43.

[6] See the recent, landmark New Buildings Institute study of actual performance in LEED buildings - http://www.newbuildings.org/downloads/Energy_Performance_of_LEED-NC_Buildings-Final_3-4-08b.pdf. See also "Documenting Performance: Does It Have to Be So Hard?" in the Winter 2009 issue of High Performance Buildings - http://www.hpbmagazine.org/images/stories/articles/Hinge.pdf.

[7] See http://www.nathers.gov.au/about/publications/pubs/eer-house-price-act.pdf for the full report.

[8] To view the full report – *Doing Well by Doing Good* – see http://www.rics.org/NR/rdonlyres/44F67595-7989-45C7-B489-7E2B84F9DA76/0/DoingWellbyDoingGood.pdf.

[9] See the full report at http://www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf.

[10] In Australia, despite information campaigns and moderate penalties, initially high non-compliance rates were only turned around following implementation of effective enforcement and a substantial increase in penalties. In Denmark, a lack of enforcement and low penalties have kept compliance rates low. Two related issues, identified in the ACT's initial program evaluation, are homeowners falsifying data to improve ratings, and high levels of auditors failing to conduct site visits (necessary for accurate modeling) prior to issuing ratings.

[11] For example, Lawrence Berkeley National Laboratory's EnergyIQ tool allows users to rate individual systems in commercial buildings. See http://energyiq.lbl.gov/ .

[12] "Memorandum of Understanding on Improving the Energy Efficiency of Products and Buildings Between The U.S. Environmental Protection Agency and The U.S. Department of Energy", Sept 30th, 2009. Distributed publicly.

[13] One of the most interesting tools under development is Michael Blasnik's SIMPLE tool, which has undergone testing as part of a residential rating system pilot in Oregon. The Oregon pilot indicated that raters required 1.5 hours per home to complete a rating with SIMPLE, versus 2.5 hours for REM/Rate and other tools, and achieved similar levels of accuracy. The SIMPLE tool accomplishes this by reducing the

number of inputs required and using auditor judgment to estimate building air tightness rather than a blower-door test. These results have generated high levels of interest in the home rating and auditing field, and are being taken seriously by RESNET and other organizations. See http://www.energytrust.org/eps/eps_ex.html for the full report and supporting documents.

[14] See http://www.neep.org/energycodes/index.html and http://bcap-energy.org/ for more resources.

[15] For example, on the residential side, Massachusetts currently has 33 certified HERS raters and 94 BPI raters. Assuming that the number of asset ratings required in the state per year will be similar to single family house sales, new demand from mandatory disclosure policies will create the need for roughly 150 to 250 new full time raters working in the state. HERS and BPI certification generally requires a background in building sciences plus one week of training, with raters ideally being mentored for their first five to twenty ratings post-certification.

[16] A split incentive typically occurs with rental units, where the responsibility or costs of energy efficiency may accrue to the owner (or renter), while the benefits accrue to the renter (or owner), such that neither party has *both* the interest *and* the ability to act on energy savings opportunities.

[17] Laustsen, J. (DEA), *Danish Experience in Energy Labeling of Buildings,* September 2003.

[18] Hansen Kjaerbye, Vibeke, 2009. Does Energy Labelling on Residential Homes Cause Energy Savings?, http://www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf.

[19] Compliance levels are low because of a lack of significant consequences for non-compliance.

[20] According to the authors, "When comparing the results of this paper with other studies of the Danish Energy Labelling Scheme the conclusion is not clear-cut. We find no effect of the labelling scheme in terms of differences in the natural gas consumption between labelled and non labelled houses. But whether or not this means that no energy renovations are carried out is not possible to conclude. A complementary study would be needed to confirm the results from this statistical approach by verifying whether energy improvements were made or not."

[21] The "Energy Standard for Buildings Except Low-Rise Residential Buildings".

[22] Personal communication, Michael Dewein, Technical Director, Building Codes Assistance Project.

[23] See http://www.rics.org/NR/rdonlyres/44F67595-7989-45C7-B489-7E2B84F9DA76/0/DoingWellbyDoingGood.pdf.

[24] The statistical relationship found was strong, with the report citing an $R2 > 0.82$, $p < 0.0001$, and t-stat > 4. See http://www.nathers.gov.au/about/publications/pubs/eer-house-price-act.pdf for the full report.

[25] See the full report at http://www.akf.dk/udgivelser/2008/pdf/energy_labelling.pdf.

[26] In Australia, despite information campaigns and moderate penalties, initial high rates of non-compliance were only turned around following implementation of effective enforcement and a substantial increase in penalties. In Denmark, a lack of enforcement and low penalties have kept compliance rates low. Two related issues, identified in the ACT's initial program evaluation, are homeowners falsifying data to improve ratings, and high levels of auditors failing to conduct site visits (necessary for accurate modeling).

[27] For example, Lawrence Berkeley National Laboratory's EnergyIQ tool allows users to rate individual systems in commercial buildings. See http://energyiq.lbl.gov/ .

[28] A 'complete' rating system is defined as having an established rating scale and methodology, a software approval process, and links to supporting structures such as rater training/certification and a rating improvement process. Ideally, a rating system is already widely used and has a developed pool of raters.

[29] Sept 30th, 2009, Memorandum of Understanding on Improving the Energy Efficiency of Products and Buildings Between The U.S. Environmental Protection Agency and The U.S. Department of Energy", distributed publicly.

[30] Other options include the EPA's Home Energy Yardstick and DOE's E-Scale. The former is an operational rating (less suited to time of transaction) and the latter is based on the HERS rating.

[31] RESNET periodically updates the choice of energy code for the HERS reference building. However it does not automatically change with each IECC code update.

[32] http://www.energystar.gov/index.cfm?fuseaction=qhmi.showHomesMarketIndex

[33] Such as those proposed in federal climate change legislation.

[34] California and Washington have also required disclosure at time of financing. We don't discuss this option in this roadmap because it has less compelling value than disclosure at time of sale or rental, but suggest that states monitor the experience of these jurisdictions.

[35] Note that RESNET and BPI are in the process of merging these certifications.

[36] The IECC has been adopted by many states, and this requirement is the most common existing form of upgrade policy.

[37] Note that energy codes only require that altered systems and additions be brought up to current code at the time of renovation. Some upgrade policies, such as Berkeley's, can go beyond this by requiring upgrades to non-affected portions of a building at the time of renovation.

[38] See http://bcap-energy.org/node/21.

[39] NEEP 2009, Model Progressive Building Energy Codes Policy for Northeast States, http://www.neep.org/energycodes/NEEP_Building%20Energy%20Codes%20Policy_March%202009.pdf

[40] See http://www.neep.org/energycodes/index.html and http://bcap-energy.org/ for more resources.