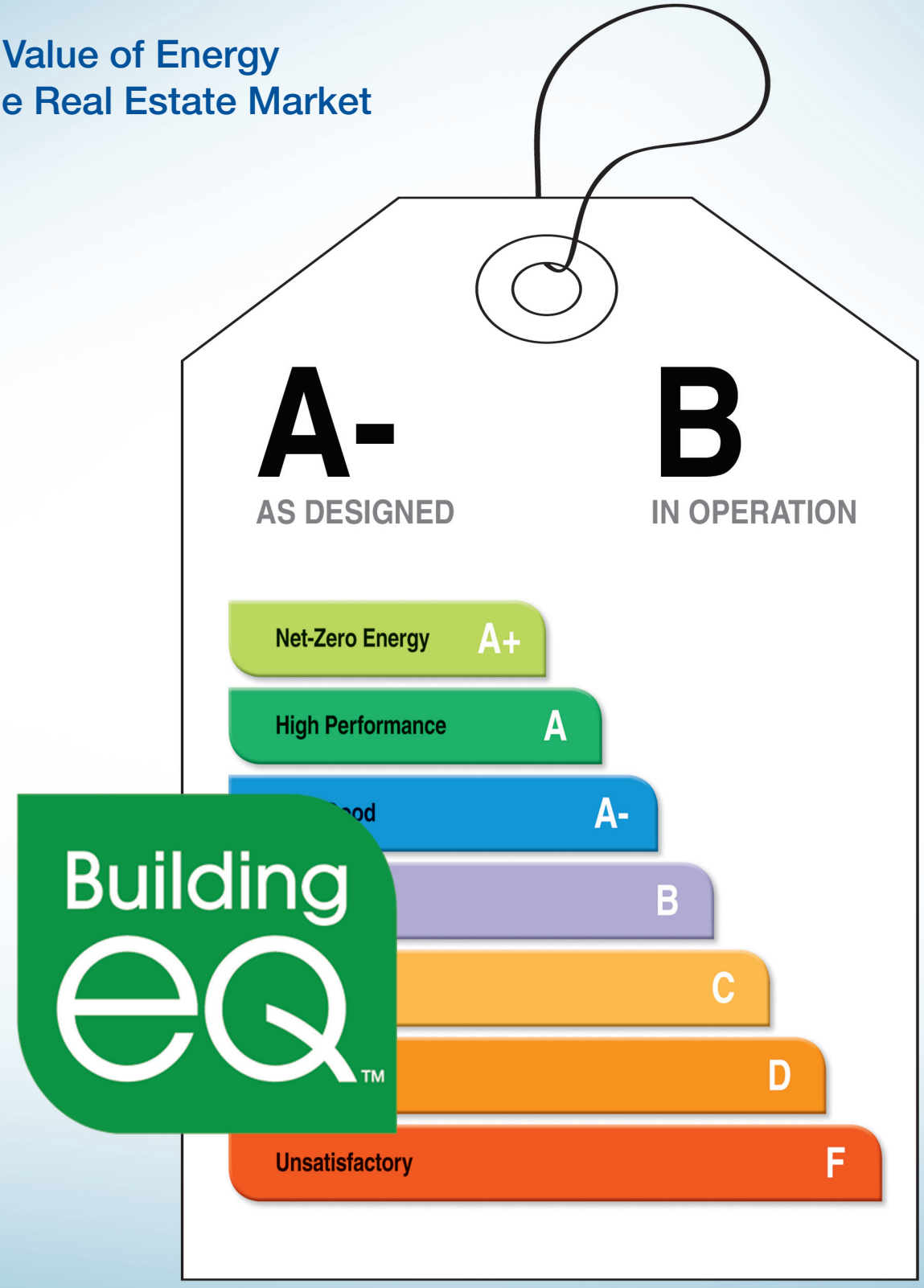
Building Energy Quotient

Promoting the Value of Energy Efficiency in the Real Estate Market



ASHRAE Building Energy Labeling Program

Draft

Implementation Report June 2009

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Implementation Report

FINAL DRAFT
June 9, 2009

Table of Contents

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Executive Summary

This ASHRAE Building Energy Labeling Implementation Report updates the original report approved by the ASHRAE Board of Directors in June, 2008. The committee recommends implementation of an Advanced Building Energy Labeling (ABEL) program to drive both existing and new buildings towards the NZEB target outlined in ASHRAE's strategic documents. The term "Advanced Building Energy Label" reflects the additional benefits and features of the ASHRAE label compared to existing labeling schemes. The rating will be named the Building Energy Quotient, or Building EQ (bEQ), which is a new building energy labeling brand protected by trademark, based on technical performance, and related to the target of net zero energy buildings.

This report outlines the steps necessary to deliver the Building EQ and makes further recommendations on delivery of the bEQ. Further work will be necessary by various ASHRAE committees and councils, as well as ASHRAE staff, in order to fully implement the bEQ program.

To ensure that ASHRAE meets the needs of its many members around the globe, the committee recommends adopting a rating scale for the ABEL program that closely matches existing work going on outside North America, particularly in Europe.

The ASHRAE Advanced Building Energy Labeling (ABEL) program is based on the Building Energy Quotient (bEQ) label, together with a supporting certificate. The label is applicable to existing buildings, using the As Operated (Operational) Rating, and to new buildings using the As Designed (Asset) Rating. The ratings are designed to support regulatory energy use disclosure requirements, and are supported by a user instruction manual and forms for use and development during the prototype phase of the program.

The ABEL program uses a new rating system and methodology, in which the best scores indicate net zero energy buildings. This does not correlate with the ENERGY STAR® rating and scoring, which is based on the current statistical energy use of buildings as recorded in the CBECS database, so the user cannot currently make a connection between the two systems.

While the energy ratings do not relate to each other, ASHRAE recommends that if the building has earned an ENERGY STAR rating, that this additional information be highlighted on the label. ASHRAE has also developed two Building Certificates to accompany the Building EQ label- one of which reports the EPA ENERGY STAR score as part of the documentation.

While additional work needs to be completed by ASHRAE before a formal launch of the ABEL program, the committee recommends that the program be initiated as a pilot program, with an initial prototype "As Designed" building label being issued to the ASHRAE Headquarters building at the Louisville meeting. This will provide an opportunity to initially expose the ASHRAE Building Energy Quotient (bEQ) to ASHRAE members.

Key Recommendations

The ASHRAE Building Energy Labeling Implementation Committee is pleased to offer the following recommendations to the ASHRAE Board for approval:

1. An initial prototype label will be awarded at the Louisville meeting to introduce and expose the program to ASHRAE members.
2. Initial Funding of up to $50K for initial website, marketing, committee meetings, program support, etc. to be included in the 2009-2010 budget.

3. The rating will be named the Building Energy Quotient, or Building EQ (bEQ) and be trademarked to protect ASHRAE.
4. Implementation of the labeling program will be done initially as a pilot program in order to allow for planned testing and rollout of the program.
5. The label will be referred to as the Advanced Building Energy Label to reflect the additional features and coverage compared to existing labels.
6. The rating scale will be constructed so that the best scores are assigned to Net Zero Energy Buildings and the rating will tend to drive owners towards more efficient buildings. The scale will place net zero at the top and poor performing buildings at the bottom of the label and certificate.
7. The rating scale for operational ratings will be normalized on the median source EUI for the building type rated, with the median source EUIs initially derived from CBECS.
8. The display label will be designed to be similar to those being used in the EU to standard EN 15217 and other parts of the world to ensure applicability globally.
9. The ABEL program will use and display the ENERGY STAR® rating on ABEL certificates produced in the United States (when appropriate), and will also use the ENERGY STAR rating on Canadian ABEL certificates if and when the Canadian government adopts the ENERGY STAR rating process in Canada in addition to the ABEL rating.
10. Further work on the ABEL program should be assigned to a committee made up of people from Publishing and Education Council and Technology Council.
11. An ASHRAE Guideline will be developed to describe the procedure for calculating scores and ratings.
12. A business plan for building out the ABEL program should be developed by ASHRAE staff.
13. To support the use of the ABEL rating system use outside the United States ASHRAE will assist countries where there are ASHRAE chapters or Associate Societies in implementing building energy rating systems based on the ABEL Building Energy Quotient (bEQ) approach.

ABEL Label and Certificate

Why an ASHRAE Label and Certificate?

A building energy labeling program provides the general public, building owners and tenants, potential owners and tenants, and building operations and maintenance staff with information on the potential and actual (measured) energy use of buildings. This information is useful for a variety of reasons:

- Building owners and operators can see how their building compares to peer group buildings, as measured against the highest performing buildings, to establish a measure of their potential for energy performance improvement.
- Building owners can use their energy rating differentiate their building from others to secure potential buyers or tenants.
- Potential buyers or tenants can gain insight into the value and potential long-term cost of a building.
- Operations and maintenance staff can use the results to inform their decisions on maintenance activities and influence building owners and managers to pursue energy efficiency upgrades and demonstrate the return on investment for these projects.

Probably the greatest benefit from implementation of a building energy labeling program is the use of market-based forces to influence energy efficiency investment opportunities. Building owners will make investments in energy efficiency improvements when such investments will have the greatest

impact on their bottom-line. Also, owners will invest in the technologies and practices that make the most sense for their building. When potential building tenants and owners have information on the properties in which they are interested (particularly in a consistent format) they can understand the full cost of their investment and place a value on the energy efficiency of the building. The label will help building owners differentiate their product in a technically sound manner.

Beyond the benefit received by individual building owners and managers, the increased availability of building data—specifically the relationship between the design and operation of buildings—will be a valuable research tool for the building community.

As the world looks to reduce its energy use, information is the critical first step in making the necessary choices and changes. With labeling mandatory in Europe and disclosure of a building's energy performance becoming required by several states, now is the time to introduce a label that can provide both technical ratings of building energy performance and energy use disclosure for mandatory programs.

Improvements to the Initial ASHRAE ABEL Program Concept

The ASHRAE Advanced Building Energy Labeling (ABEL) program has refined the initial rating approach developed in the first phase of this effort in 2007-2008[1]. The major refinements in this phase include:

- Specification of an ASHRAE Building Energy Quotient, or bEQ, program
- Development of an ASHRAE bEQ certificate for building documentation and a label for public display of the rating
- Development of an ASHRAE Building Energy Certificate for compliance with regulatory energy use disclosure requirements
- Addition of building energy performance ratings using the bEQ rating scale consistent with labeling and rating programs in other countries
- Expansion of the energy efficiency features documented with the Certificate
- Inclusion of renewable energy and electric kW demand in energy use reporting
- Updating the ABEL Application Instruction Manual booklet and forms for the anticipated pilot phase of the program (See Appendix A)

These features are discussed in the report and in the Application Instruction Manual in Appendix A.

Type of Ratings

New buildings will be eligible to receive an asset rating, which will be called the "As Designed" rating for the bEQ label and certificate. An operational rating will be available once the building has at least one year of data on the actual energy use of the building. The operational rating will be called the "In Operation" rating on the bEQ label and certificate. Existing buildings would be eligible to receive both an asset and operational ratings.

The Asset (As Designed) rating provides an assessment of the building based on the components specified in the design—including mechanical systems, building envelope, orientation, and daylighting. The asset rating will be based on the results of a field inspection and a building energy model.

The Operational (In Operation) rating provides information on the actual energy use of a building and is based on a combination of the structure of the building and how it is operated. Information learned through subsequent years of operational labels can provide building owners and operations and maintenance staff with valuable insight into how the building performs, opportunities for improvement,

[1] See ASHRAE Building Energy Labeling Program – Promoting the Value of Energy Efficiency in the Real Estate Market, Report of an ASHRAE Presidential Ad-Hoc Committee, June 2008.

and where similar buildings fall in comparison. It also provides a means for owners of portfolios of several buildings to identify priorities for energy savings investment.

The key features of each rating are summarized in the Table 1.

Table 1 – Comparison of Operational and Asset Ratings

Operational Rating "In Operation"	Asset Rating "As Designed"
• Objective is to improve operations • Rating based on measured energy usage, adjusted for weather • No inherent requirement for field verification • Ratings sometimes adjusted based on levels of service • Good for use in existing building energy efficiency incentive programs • Good for managing building portfolios over time • Example: U.S. EPA's ENERGY STAR® Portfolio Manager	• Objective is to value property • Rates the building, not the occupancy and operation. • Focus is on the physical building characteristics - the "bricks & mortar" - plus permanent energy systems • Differences in operational behavior are ignored • Rating is derived from a model-based estimate of energy usage, compared to a stock median or building code baseline for the building type • Field verification is a requirement • Good for valuing building performance within a financial transaction • A basis for energy efficiency code compliance and beyond code new construction incentive programs. • Examples: RESNET and CEC Home Energy Rating Systems

The ASHRAE bEQ method can provide side-by-side asset and operational ratings for a given building. If comparative performance information is known for both the building property and its operations, it encourages the decision makers to investigate more specific energy efficiency opportunities. A building with good characteristics may be operated poorly, or a facility operator may be doing everything possible to optimize the operation of a building with relatively poor characteristics.

Rating Scale

There are two types of rating scales in general use for evaluating building energy performance. Statistical methods use a frequency distribution of the population of buildings represented and rate a building according to its percentile location in the distribution. ENERGY STAR™ ratings based on the CBECS database are the leading method for this type of rating in the US.

Technical rating methods compare a building's energy performance to technical potential reference points where Net Zero Energy performance is zero on the scale and the building type population median is set at 100. The ASHRAE bEQ is the same basic scale that is used in the European Union for commercial buildings and analogous to the scale used in North America for the residential asset rating system (known as HERS, the Home Energy Rating System). Comparisons of the two scales are shown in the Table 2 and in Figures 1 and 2.

The bEQ is proposed for the ASHRAE ABEL program for technical ratings of building energy performance .

Table 2 – Comparison of Rating Scales

Statistical Rating Scale	Technical Rating Scale
• Fit a regression model to a sample distribution of population data • Existing building population sample used to set low and high end of scale • Representative data required for the entire distribution of existing buildings of a particular type • Does not necessarily include energy policy goals in rating scale (e.g. zero net energy not differentiated on the scale)	• Rated buildings compared to stock median or code level of performance • Energy policy sets low end of scale (e.g. zero net energy or zero carbon) • Only stock median values are required for existing buildings of a particular type

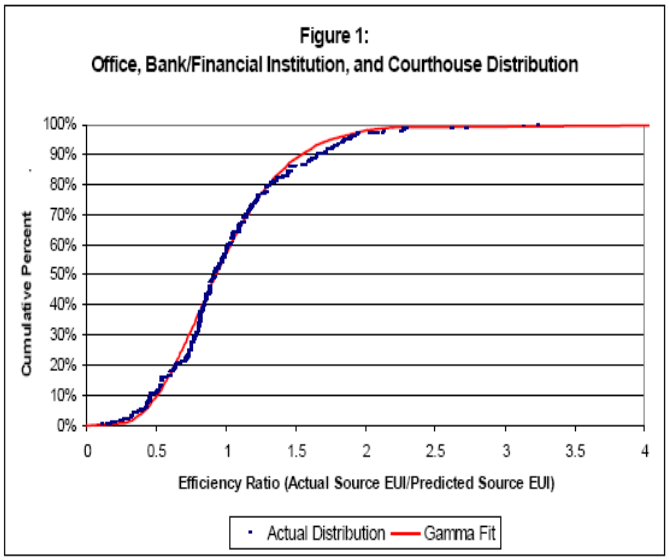

Figure 1 – Statistical Rating Scale

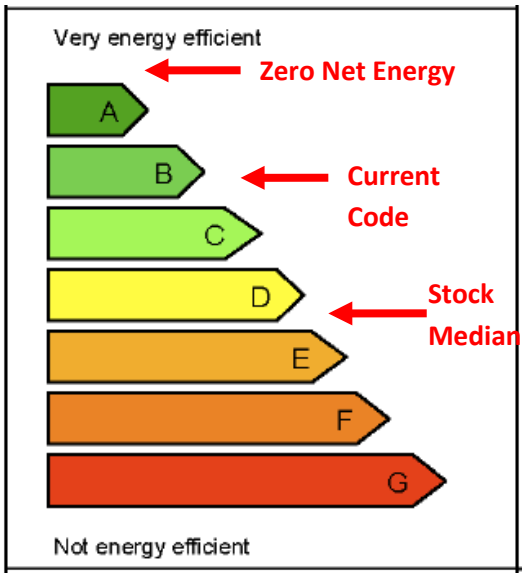

Figure 2 – Technical Rating Scale

The most significant difference between a technical and statistical rating scale is that a statistical scale is limited to the performance of buildings within the existing population. The technical rating provides differentiation on the scale for high performance buildings that are under-represented in the population sample used to derive the statistical scale. (See Figure 3)

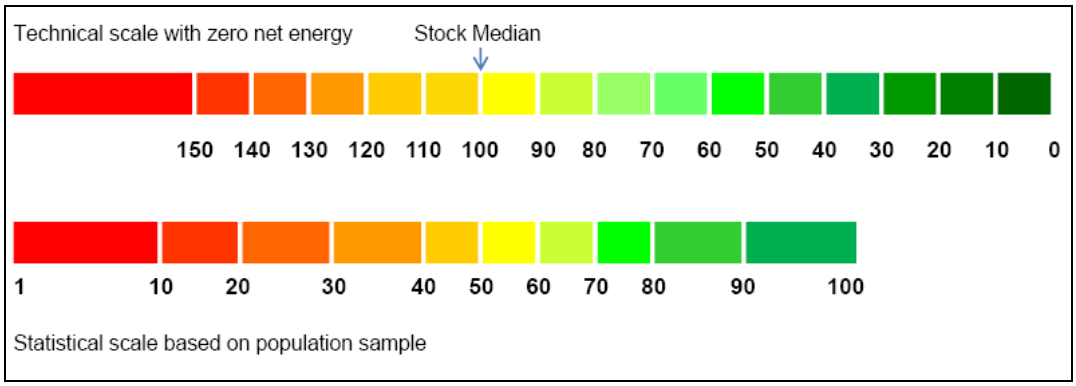

Figure 3 – Comparison of Technical and Statistical Scales

The ASHRAE ABEL bEQ Rating

The bEQ rating is the ratio of energy use of the rated building to the median energy use of its building type. This is shown conceptually in the figure above. Energy use is expressed as source energy EUI, or source Btus per square foot per year. The best energy performance on the bEQ is Net Zero Energy with a rating of zero. The median of building performance for that particular building type is set at 100. While there is no theoretical upper end to the scale to track poor energy performance, in this version of the Certificate, the upper limit is set at an bEQ rating of "Poor" for any score of 125 or greater. Net Zero Energy buildings that also produce an energy surplus can have a rating of less than zero. The ASHRAE ABEL bEQ scale is illustrated in the figure below along with the proposed Building EQ label. Note that the scale can include other benchmarking reference points such as building energy codes. (See Figures 4 and 5.)

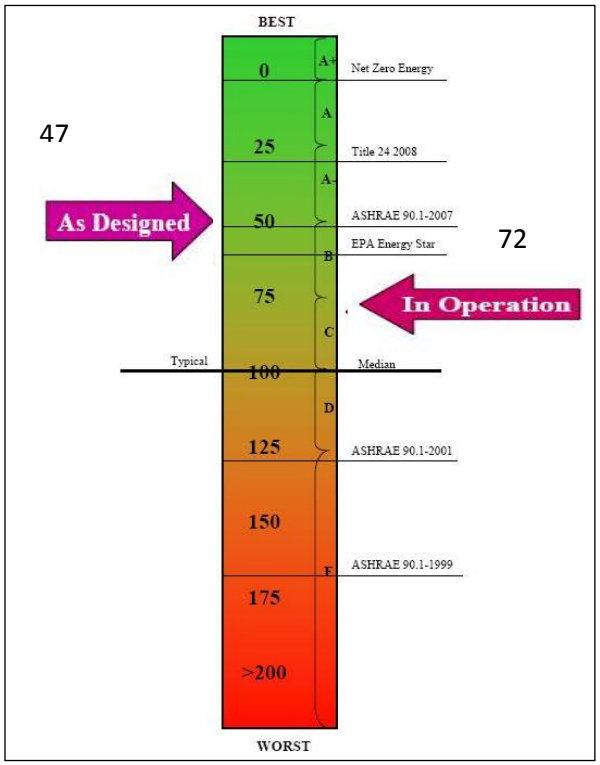

Figure 4 – ASHRAE bEQ Scale

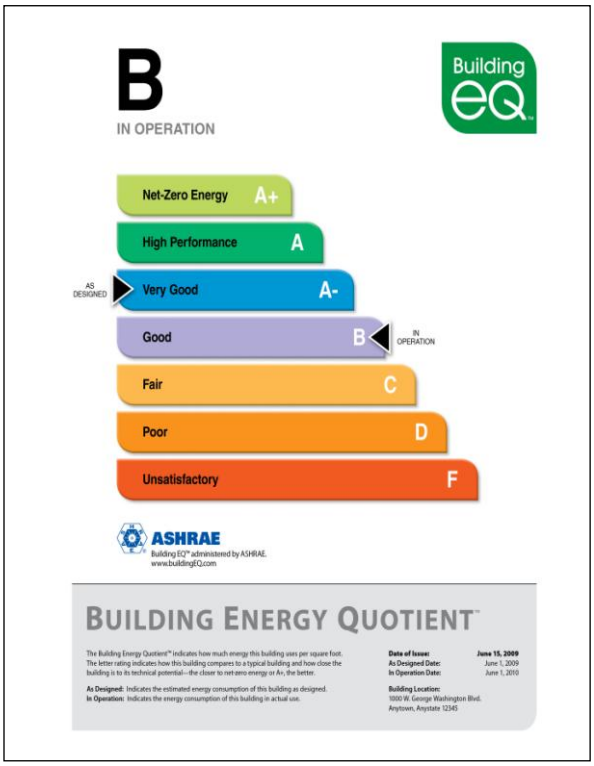

Figure 5 – Proposed ASHRAE Building Energy Quotient Label

Value added by ASHRAE to the rating and labeling process

The ASHRAE Building Energy Label will provide a mechanism for providing labels for an expanded set of building types. Also, buildings will receive a numerical and a qualitative score which is easily comparable across similar buildings.

The certificate will contain additional information of a technical nature that will explain the score on the label and provide information useful to the building owner, prospective owners and tenants, and operations and maintenance personnel.

The documentation accompanying the label and certificate will provide the background information useful for engineers, architects, and technically savvy building owners or prospective owners in determining the current state of the building and opportunities for improving its energy use. Table 3

shows the key value-added features ASHRAE brings to the building energy performance rating and labeling process.

Table 3 – ASHRAE ABEL "Value Added" Factors

General	Asset Rating "As Designed"	Operational Rating "In Operation"
• ASHRAE imprimatur of technical expertise • Asset and operational ratings under one cover • Set up to approve and include additional rating and labeling approaches within the ABEL methodology • Qualitative assessment of ratings (Poor, Excellent, etc.) • Uses the bEQ scale for technical rating • Reports use of renewable energy and electric kW demand	• QA through ASHRAE modeling protocols (Informative Appendix G) • Documentation of Energy Modeler Qualifications • IBPSA/ASHRAE certification program in development • Provides estimates of design energy end uses • Documentation of energy design features • Design criteria met (AEDG, ES, LEED, Green Globes) • Top 5 specific energy design features • Benchmarking to ASHRAE Standard 90.1 w/Appendix G • Rates envelope and lighting systems design with COMcheck	• Site visit required to verify energy performance • Documentation of key energy efficiency operational features • ENERGY STAR labels or LEED-EB earned in specific years • Building systems commissioning completed • Lists energy efficiency retrofits completed • Optional information on potential for energy efficiency improvements • Inspection and assessment of indoor environmental quality by licensed PE (assuming development of ASHRAE procedures for this purpose)

Asset (As Designed) Rating

The ABEL asset rating is intended to be a measure of the energy efficiency quality of the as-built, fixed physical components of a building. It differs from the current LEED Energy and Atmosphere Credit 1 in that it is intended to allow comparison among similar buildings, within a size range and of the same occupancy type within a climate zone. The asset rating is designed to have a particular relevance for real estate transactions, in that it expresses an integral measure of the building's inherent energy efficiency. The ABEL asset rating will be designated "As Designed" on the ABEL Label.

Following are some of the desired characteristics for this rating:

1. The scale should be readily understandable by the real estate marketplace and the public and have general cultural consistency (for example an ascending letter scale wouldn't be good: A as worst and G as best would be culturally inconsistent).
2. The top end of the scale should be consistent with the Net Zero Energy building movement, and the Architecture 2030 Challenge.
3. The scale should have some consistency with other building labels around the world.
4. The top end of the scale should be immediately recognizable as connoting excellence. There should be no ambiguity about what is a good score, and what is a better score.

5. Because the Asset (As Designed) Rating methodology is somewhat similar to a LEED EA Credit 1 submission, there should be some milestone within the rating that would indicate likely compliance with current energy code. This milestone would be recognizable by consumers. An asset rating higher than a certain level on the scale would be better than code, and lower on the scale would be worse than code.
6. The scale should be compatible with state and local requirements being implemented for building energy disclosure to improve the marketability of the label.
7. The scale should have a consistent logical relationship with the Operational (In Operation) Rating scale, so that different levels of achievement for the two scales by the same building could have a consistent meaning for users of the scale.
8. The scale should be based upon source energy, rather than site energy, to provide a stronger relationship to energy consumption related green-house gas (GHG) emissions.

Creating a method of comparing buildings for energy efficiency is the primary intent of this rating. In order for this comparison to be valid, certain non-regulated, non-fixed variables that affect building energy consumption would be kept fixed, so that all of the variation of energy use among comparable buildings would be the result of the building's fixed physical parameters. To achieve this end, the asset rating methodology proposes to normalize completely for the major unregulated variables that have significant affect on the energy consumption of a building. These variables include:

- Schedule of operation
- Schedule of occupancy
- Occupant density
- Occupant installed energy consuming equipment
- Specific climate data related to a location
- Outdoor air ventilation rates

The Asset (As Designed) Rating achieves this normalization by utilizing standard occupancy and operational schedules, and standard equipment and occupant densities that have been developed for each occupancy type. These parameters will be developed as part of the National Energy Protocol Specification (NEPS) by COMNET (Commercial Energy Services Network) project sponsored by the New Buildings Institute (NBI). The products of the COMNET project are not expected to be delivered until after the initiation of ABEL, so an interim source for standardized non-regulated occupancy, operational variables, and model building procedures will be sought. Candidates for these standardized inputs are the California Title 24 ACM Manual, which lists receptacle loads and schedules for a number of different building occupancy types. Another candidate is the Commercial Building Benchmark Model project of the U.S. Department of Energy Net-Zero Energy Commercial Building Initiative. The next ABEL committee will need to review these alternatives and determine an appropriate plan.

The model upon which NEPS could be developed is the California Alternative Calculation Method (ACM) and the successful Residential Energy Services Network (RESNET) energy rating program for homes, which is recognized by the ENERGY STAR® program, USGBC's LEED for homes, the IRS and DOE for residential builder tax credit qualification, utility energy efficiency programs, and by more than a dozen states for code compliance. The Commercial Energy Services Network (COMNET), would become the organizational framework analogous to RESNET to develop a more consistent and high quality energy assessment approach across a number of commercial building-related energy standards platforms noted above in addition to the EPAct 2005 tax incentives compliance component.

The NEPS would essentially be a set of rules for performing a building energy simulation to evaluate the fixed variables of a building design. This protocol would include:

- Standards for accuracy and capability for acceptable energy analysis programs
- Standard Modeling Assumptions for the above non-regulated variables

- Standard modeling assumptions for operational procedures for conventional building systems
- Standards for modeling advanced energy conservation measures and commissioning
- Standards for energy analysis reporting that facilitates verification and comparison with other projects

Additionally ASHRAE will develop a certification procedure for building energy modelers to ensure that the tools are competently used. Please see the Certification section of this report for information on the building energy modeling certification efforts in development.

The Asset (As Designed) Rating would be one hundred (100) times the ratio of the as-built Source Energy Use Index (EUI) for the building as calculated in a building energy simulation using the NEPS procedures and a "standard" Source Energy Use Index (EUI) for that building type of the same size range and in the same climate. This "standard" Source EUI is currently planned to be the same as the standard Source EUI used for normalizing the operational rating. ASHRAE recommends that for building types covered under the Energy Star program, this value can be found using the EPA Target Finder program and entering 50% as the percentile target, with occupancy inputs consistent with the standard schedules. A building whose EUI was equal to the standard would have an Asset (As Designed) Rating score of 100. A Net Zero Energy Building would have a score of 0. A building with a NEPS calculated EUI twice that of the "standard' would have a score of 200. For mixed use buildings, the "standard" EUI for a particular building would be developed by pro-rating the EUI's of the different occupancy types according to the floor area of that particular occupancy.

$$bEQ_{Asset} = \frac{EUI_{As\text{-}built}}{EUI_{standard}} \quad x\ 100$$

Perhaps the most difficult part of developing the Asset (As Designed) Rating methodology is coordinating the standard Source Energy use Indices (EUI's) for the different building occupancy types, size ranges and climate zones with the values for the non-regulated variables and schedules.. The schedules and occupancy densities for each building type as developed in the NEPS process should be configured such that a building with "average" values for the energy-code regulated construction variables, when simulated using the NEPS non-regulated variables, would achieve an Energy Use Index approximately equal to the "median" Energy Use Index used to normalize the Operational Index for that building type and size in that climate zone. Thus, a building of "average" construction when simulated with the standard NEPS schedules and occupancy variables, would give an EUI approximately equal to the "median" EUI used to calculate the operational rating. This relationship is extremely important because it enables the analytical comparison of asset and operational ratings. For example, if a building were to achieve a very good Asset (As Designed) Rating, yet have a mediocre Operational (In Operation) Rating, one could conclude that the building operations, either density or duration of daily use or possibly operational difficulties were the reason for its Operational (In Operation) Rating performance.

Operational (in Operation) Rating

Operational ratings will apply to existing commercial buildings that have been in operation and normal use for at least 12 consecutive months. The rating will provide an energy performance indicator for building owners investigating opportunities to improve the energy efficiency of their operations or tracking their energy performance over time. The operational rating will be designated as "In Operation" on the ABEL Label.

Operational Rating Defined

An operational rating identifies how much energy an existing building is actually using relative to a set of benchmark metrics. This may be broken down by fuel type over an area of conditioned space in a building, and may compare site energy consumed to source energy as an indicator of green-house gas (GHG) emissions or carbon footprint, and compare efficiencies of energy using systems within buildings to gauge operational performance. Operational ratings require at least 12 months of utility metered data, provided directly by the customer or through the customer's energy service provider.

Features of the Operational (In Operation) Rating

- Provides an existing building with a comparative energy performance rating based on like type buildings in similar regions with similar characteristics. This will allow building owners to "measure" improved building performance over time, while investing in operation and equipment improvements.
- Includes energy consumption by major energy using system categories, if measured data is available, thus providing a building system comparison (e.g. envelope, lighting, heating, cooling, ventilation, and service hot water) with those systems in comparable building types.
- Includes peak demand and fraction of energy provided from renewable sources
- Encourages the undertaking of a building survey (site visit) used to identify measures to improve energy performance. The building survey will inform and educate building owners and operators of discretionary operational choices which will improve both occupant comfort and reduce energy usage and will verify that performance measurement protocols have been properly applied and operating data is valid.
- Identifies opportunities for optimizing building energy systems and reducing energy consumption and peak demand for building owners and operators.
- Utilizes the same scale for a direct comparison with the asset rating scale.
- Provides a value for both site and source energy used for common building energy using systems.
- Leads building owners to invest in energy audits which may provide an inventory of energy using equipment or initiate energy end uses to be measured.

Operational (In Operation) Rating Scale

The scale will be based upon the measured Energy Use Intensity (EUI) of the building as determined by inputting measured energy use and other building characteristics into the ABEL database. This measured EUI will be compared to the median EUI for that building type (information on determining the median EUI is presented below). The results of this comparison are then placed on the "EQ scale (See appendix A for additional information)."

$$bEQ_{Operationsl} = \frac{EUI_{Measured}}{EUI_{Median}} \; x \; 100$$

Using an Energy Use Index approach (EUI), the Rating Scale will compare weather normalized measured energy use to that of similar building types in the same climatic region. This comparison will allow building owners to use benchmarks to further their energy management goals.

Rating End Use Components

Components of the Operational (In Operation) Rating will provide the annual whole building energy use and end use energy consumption of major building systems such as heating, cooling, fans, lighting, service water heating, and so on. Over time, the data base of systems will grow and become more robust as the number of buildings "labeled" through ASHRAE's program continues to grow.

Expected Resources Required by Building Owner
While the minimum level of effort required for completing the assessment of commercial buildings applying for an ABEL Program Label and Certificate will vary somewhat depending on the size of the building and complexity of the systems, it is generally anticipated to be:

- *Qualified Energy Assessor:* 20 hours
- *Professional Engineer:* 10 hours for completing, sealing and submitting the ABEL application form
- *Building Operator or Representative:* 10 hours to assist with interview(s), site verification of data and application completion

The related costs for both building owners' resources and third party work will vary depending upon country and region, economic climate, building type, size and building complexity.

Roles and Responsibilities
Building Owner

- Commits to attaining an Operational (In Operation) Rating
- Provides operational data and site access to the Qualified Energy Assessor
- Releases one to three years of utility data as needed by the Qualified Energy Assessor to populate the ABEL Certificate requirements

Professional Engineer

- Reviews scope of work with building representatives
- Manages the overall project and ensures completeness and correctness of ABEL application for Operational (In Operation) Rating
- Reviews level of effort required for the building survey and determines a time line for deliverables
- Discusses findings of site assessment with Qualified Energy Assessor to complete a list of recommendations for both operational and capital cost projects
- Note that the roles and responsibilities of the Qualified Energy Assessor (detailed below) may be assumed by a Professional Engineer

Qualified Energy Assessor (Optional)
(*Note that these roles and responsibilities may be assumed by a Professional Engineer, in lieu of a separate Qualified Energy Assessor.)*

- Surveys building and energy using systems
- Interviews building operations staff to determine maintenance procedures
- Reviews existing utility data, building working drawings, specifications building automation systems and previous audits, if available
- Ensures that building type, occupancy profiles and location are all accurately identified for application submission
- Works with building operations and accounting staff to populate the Application Instruction Manual forms required for the buildings Operational (In Operation) Rating application
- Identifies areas of opportunity such as discretionary building operations and retrofit projects
- Determines measurement-based IEQ indicators, consistent with the *Performance Measurement Protocols for Commercial Buildings* document to be published by ASHRAE in late summer 2009.
- Note that these roles and responsibilities may be assumed by a Professional Engineer, in lieu of a separate Qualified Energy Assessor.

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Building Operator

- Participates in and assists Qualified Energy Assessor with building site survey and walkthrough

- Participate in building operator interview
- May assist in filling out the Application Instruction Manual forms for the Operational (In Operation) Rating

Detailed forms required to be populated by the building energy assessor, should be developed by the appropriate ASHRAE Technical Committee (TC), who may elect to "outsource" this work or take it upon themselves to utilize existing TC member expertise, including assignment of the work to a task force of the TC with input from related TCs. This work by the TCs will need to be coordinated by the next ABEL Committee.

The forms required for achieving the level of effort to provide the desired outcomes (Technical Performance Ratings) will in essence ask for the minimum amount of information, in the proper units, to allow for the program to compare the building and its major energy using systems with like type buildings and occupancies. This requirement will ensure that the owner's building will be accurately compared to other buildings so as to provide an "apples-to-apples" approach in determining where a buildings operation can be improved and what the potential benefits could be. References for guidance on the survey and assessment include:

- Standard 55
- Standard 62.1
- Standard 100
- Standard 105
- Special Publication: Procedures for Commercial Building Energy Audits

Procedures for Obtaining an Operational (In Operation) Rating

The procedures for obtain an Operational (In Operation) Rating are outlined below.

1. Building Owner downloads the ABEL Application Instruction Manual and forms from the ABEL web site. Templates for the submission will also be available from the site. These forms will need to be fully populated to achieve the Certificate or Label. Forms will include:
    - Site visit check lists
    - Building operator survey
    - Building system drawing and specification review
    - Utility data review
    - Submission of annual energy use (by electricity and fuels) to ENERGY STAR® Portfolio Manager and obtaining an EUI and a percentile rating score (i.e. ENERGY STAR). The EPA score is for use only on the certificate and is not used to derive an ASHRAE score.
    - Benchmark selection and existing building requirements.

2. Building Owner hires a Professional Engineer to conduct the assessment and complete the Rating Application with the assistance of a separate Qualified Energy Assessor, if required.

3. Qualified Energy Assessor conducts a site visit of the building.

4. Qualified Energy Assessor completes the survey of the building energy using systems, environment, occupancy and utility data. This building survey may also be referred to as a walk-through assessment (Level I energy audit) as defined in the 2007 Applications Handbook, Chapter 35.

5. Qualified Energy Assessor fills out and submits web based forms to the ABEL website and database. A mechanism for signing of the submission by both the Professional Engineer and Building Owners Representative may be developed.

This initial process will provide the technical detail and robustness to achieve the desired outcomes listed above. The system level energy use approach will be delivered through the next level of detail of the Certificate including a list of potential opportunities for improvement to meet the existing building requirements.

The energy using systems would be displayed (as site end use EUIs and percentage of total site use) as pie charts of energy use for:

- Lighting
- HVAC
- Heating
- Cooling
- Plug loads
- DHW
- Miscellaneous

An example of the energy use break down is shown Table 4 and Figure 6.

Table 4 – Energy Performance for Large Office

Facility Category: Large Office		
End Use	**Demand** (kW/sq ft)	**Energy Use** (kBtu/sq ft-yr)
Lighting	0.17	25.0
Plug Loads	0.08	13.0
Miscellaneous		3.0
Cooling	0.11	6.0
DHW		0.4
HVAC	0.15	16.0
Heating		4.0
End Use Intensity	**0.51**	**67.0**

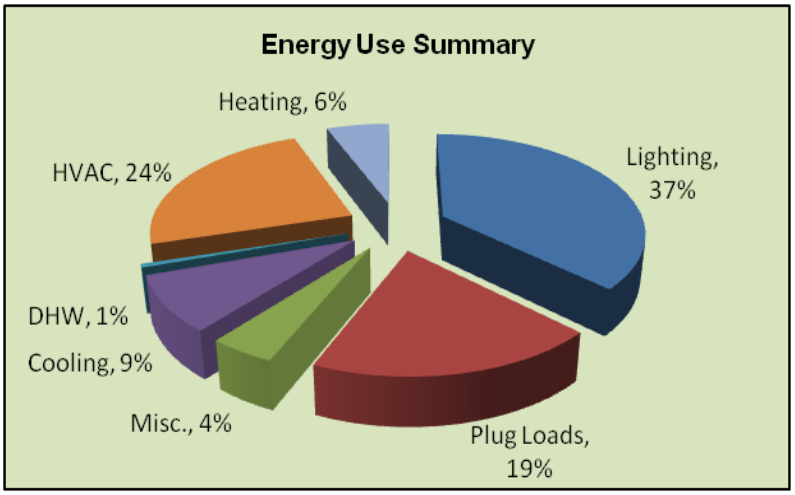


Figure 6 – Energy Performance for Large Office

Typical Site Energy Use Breakdown

This site energy use will be provided in units such as kBtu/year/sq.ft. and as a percentage of total end use energy. The fraction of energy supplied from renewable energy sources will also be provided.

Additional Certificate Information

An additional step or phase of the Operational (In Operation) Rating Certificate will require a higher level of effort and will provide a 3 to 6 page summary of opportunities. The summary should contain a

description of each opportunity including an energy savings estimate, budget implementation costs, simple payback, and the next steps approach to pursue the "project".

At the end of this effort a formal acceptance of the audit and ABEL forms by the owner is needed prior to submission of the application to ASHRAE.

Future Level of Detail

As the ASHRAE ABEL program evolves, an additional level of energy savings intensity may be considered. This would include in-depth approaches, such as "system benchmarks" which could be developed as a premium assessment effort for the building owner. System or overall efficiency may be expressed in EER or COP, which is a prime indicator for system or equipment performance.

Components of this level of effort, detail and guidance should be comprised of metrics such as:

- Individual system COP's
- kW/ton cooling
- W/cfm
- Cooling Btu/sq.ft.
- Heating Btu/sq.ft.
- kBtu/sq.ft./year for domestic water
- kBtu/sq.ft./year /per person

Again, the efforts required to look at a more in-depth system analysis by providing the "next stage" approach in developing the procedures, process and forms in identifying the above metrics should be assigned to the appropriate TC(s) within ASHRAE.

Onsite Verification

Data quality is vital to the quality and integrity of the whole building energy labeling program. Experience in European States indicates that a key element in the delivery of quality data is the on-site collection and verification of data.

The need is to ensure that data is collected by suitably qualified personnel (a Qualified Energy Assessor), operating under appropriate management structures which cover procedures for ensuring they are suitably qualified and follow proper procedures.

It is essential that the data required for the calculation of the Operational (In Operation) Rating is collected by competent personnel, who understand not only what data is to be collected, but also understand why it is collected, how it is used in the calculation, and have some understanding of the sensitivity of the outcome to the various data collected. There is an obvious question over whether such data needs to be collected by someone competent visiting the site, or whether it can be gathered up by local energy or facilities managers and sent remotely to the person producing the Operational (In Operation) Rating.

Experience in Europe suggests that if the data are to be collected in a consistent and reliable manner across many sites, then it is necessary for the data to be collected in person from the site by personnel with some training and assessed competence in doing this. Such personnel need not be the same as those who produce the Operational (In Operation) Rating and the Building Label, but they must competent and they must work to agreed protocols for the collection of data.

There is an important role in the energy certification market for who are not full Qualified Energy Assessors, where they work under the control of assessors within appropriate contractual and quality control arrangements.

This requires a mechanism for training and assessing competence of data collectors to work on the Labeling Program. This requirement also applies to the collection of data for an Asset Rating, where it is arguably even more important to ensure that the data collection is properly managed within a suitable quality system. Both Ratings must be protected from "garbage in, garbage out".

The training should cover the scope of the data collection exercise and educate the collectors in the use to which the data is put and the relative importance of the various items of data to the rating calculation and the overall output.

There are also implications for training those who actually produce the Ratings and Labels (the Qualified Energy Assessor), and employ the services of data collectors. In particular, they should:

- Complete and document checks that the data collector is suitably trained and experienced to undertake the role, and any limits on the types of buildings on which they are competent to work

- Ensure that data collectors work to documented procedures, including appropriate quality assurance provisions and records of the site visit(s) undertaken

- Declare the use of data collectors and identify everyone who has worked on a label or certificate

- Take full responsibility for the work of any data collectors

Use of inappropriate personnel for the production of a label or certificate should be deemed to invalidate any label or certificate on which the inappropriate personnel have worked.

Where these conditions are met then there will generally be limited benefit from any requirement for the Qualified Energy Assessor to visit each site. However, preparation of energy labels or certificates without a site visit by one of the personnel producing them should not be permitted.

Initial Building Rating and Label Rollout

In order to demonstrate the application of the label and test the methods for obtaining the label, the committee has agreed to provide a prototype of the label for the 2009 Annual Meeting in Louisville. The ASHRAE Headquarters Building will receive the prototype label.

The prototype of the label will be presented to the membership by ASHRAE President Bill Harrison during the plenary session of the Annual Meeting. Additionally, information on the label including a poster of the label and key facts will be posted in the meeting registration area.

Following release of the prototype label in Louisville and once the initial program is finalized and approved by the Board, a broad press event revealing the label will be scheduled (possibly in Washington, DC or New York). ASHRAE staff and members of the next ABEL committee will work with the owners of buildings that could serve as the site of the first public release of the label and the start of the pilot program.

Certification

Given the complexity of energy modeling and the need to assure quality and repeatability in the execution of the ASHRAE building energy label, the committee has recommended the development of personnel certifications. Initial areas of certification would be for building energy modelers and building energy assessors. Due to the possible limited applicability of a building energy assessor

certification, the committee is initially considering recognition of existing programs that meet the desired level of competence with the requirement of specific experience or an additional course in order to qualify to perform assessments under the ABEL program.

In moving forward in the determination of minimum competency for energy assessors, ASHRAE needs to recognize that certifications from other organizations may have "big picture" policy and political implications particularly for individuals outside of the United States and Canada. Some of these implications include:

- How would ASHRAE determine which other certifications to recognize?
- Who would be responsible for analyzing those certifications, making recommendations, and determining which ones will be acceptable?
- How will the the rigor and integrity of local or regional credentials be determined particularly for those individuals and programs outside of the United States and Canada?

Other considerations include:

- Opportunities to attract new members
- Opportunity to generate revenue from program
- Enhancement of PR and ASHRAE visibility

Certification Process

The ASHRAE Certification Committee has a process in place for creating a certification program. Based on input from the ABEL ad hoc and an independent request from IBPSA, a program for certifying building modelers has already been approved by that committee. The final name for that certification will be determined as part of that process. The process includes:

- Setting up a subcommittee of subject matter experts
- Creating the body of knowledge for the certification
- Developing the outline of topics for approved certification program
- Developing the unique and specific eligibility criteria for that program

Eligibility Requirements

In establishing eligibility requirements for the modeling and assessor tasks within the building labeling program, it is important is to create those that are narrow and specific enough to ensure a given baseline level of knowledge and competency, but that are not so narrow and specific that they define too small a pool of candidates. This can be done using established resources and procedures within ASHRAE. Doing so establishes the credibility and integrity for the ABEL program, and does not rely on the work of other organizations, over which ASHRAE has no control

The Certification Committee will help determine whether a separate assessor certification is necessary and what that might look like. One possibility is to use individuals who have completed the High-Performance Building Design Professional (HBDP) certification program. While the HBDP does not directly evaluate competency for performing building assessments, it does evaluate competency in understanding high-performance building design principles, which may be sufficient during the launch of the energy labeling initiative.

The published eligibility criteria for the HBDP program are: Any individual who meets **one** of the following sets of academic and work experience requirements will be eligible to take the examination for the HBDP certification.

- Government-issued license as a professional engineer
- Minimum of Bachelor's degree in engineering or a related field from an accredited institution of higher learning and a minimum of 5 years' experience in HVAC&R design
- Associate's degree or Technical degree or certificate in design, construction, or a related field from an accredited institution of higher learning and a minimum of 7 years' experience in HVAC&R design

- High School diploma or equivalent and a minimum of 10 years' experience in HVAC&R design

The Commissioning Process Management Professional (CPMP) certification program requires that an individual must have been involved in at least three commissioning projects prior to applying to participate in the CPMP program. Initially, this type of eligibility criteria may be sufficient for the launch of any required qualification for the building labeling initiative.

Education

ASHRAE will need to ensure adequate educational opportunities to support competent issuance of labels for all building types and particularly for small or simple buildings. The Professional Development Committee (PDC) is responsible for working with TCs, SPGs, and other Society groups to develop instructor-led courses that meet member and industry needs. The eLearning subcommittee of the Publication & Education Council (PEC) has similar responsibilities for online, interactive, asynchronous courses.

The Certification Committee already has formalized communication channels in place with the PDC and eLearning to help identify any "gaps" in ASHRAE's educational offerings that would be supportive of certification program efforts. In addition, all of ASHRAE's certification programs have renewal requirements to ensure that ASHRAE certification-holders remain up-to-date in their knowledge and understanding in the area(s) in which these individuals are certified.

The ABEL Committee will work within ASHRAE's current structure and with the processes in place for the PDC, eLearning subcommittee, and Certification Committee to establish appropriate continuing education opportunities in support of the energy labeling initiative.

Infrastructure/Resource Needs

The proposed ASHRAE Building Energy Labeling program will be developed utilizing weather normalized source energy use data (median EUI) that can be exported from EPA's Target Finder tool. ASHRAE is interested in working with EPA to automatically secure the energy use data that will be needed for calculation of the ASHRAE rating. In addition to produce the ASHRAE Building Certificate, which contains different data than necessary for the label and bEQ, there is a section to report an EPA ENERGY STAR® score. ASHRAE wishes to make it easy for its users to insert their ENERGY STAR score on the certificate, and may pursue an automated exchange mechanism with EPA to accomplish this. Note that the ENERGY STAR score is not related to the ASHRAE rating.

Asset (As Designed) Rating

For receiving an asset rating, the simulation results would be used as input to the ENERGY STAR Target Finder and to fill in the Estimated Building Design Energy Use portion of the certificate. Methods would need to be developed to assure that the estimated energy performance results are in a format that allows for an appropriate comparison with the measured energy data of the Operational (In Operation) Rating.

In support of the Asset (As Designed) Rating, the building simulation models used would be in accordance with a rule set, currently being developed by COMNET and based on the requirements of Appendix G2.2 (Simulation Program) of ANSI/ASHRAE/IES Standard 90.1-2007. For quality control, the simulation would need to be done under the supervision of a certified energy modeler. (See Certification Section for additional information.)

Operational (In Operation) Rating

ASHRAE will include additional requirements to create a technical rating. ASHRAE would work with EPA to obtain energy data on buildings in Target Finder as input to generate the ASHRAE rating, and

any other data that can meet the needs of the ASHRAE Building Energy Label. ASHRAE will require collection of additional data through an ASHRAE supported database. ASHRAE will identify opportunities to provide labels for all building types by establishing procedures to accept median energy use for particular building types from non-CBECS datasets assuring that the dataset is sufficiently representative and meets requirements for statistical accuracy.

The added value from the ASHRAE Label and Certificate includes:

- Fuel and energy end use breakdowns
- Energy system and component comparative ratings
- A peak demand reduction and capability for demand management score
- The fraction of energy use from on-site renewable sources
- A list of operational features, such as commissioning activities and energy efficiency improvements plus indication of how performance can be improved
- Measurement-based IEQ indicators to assure level of service is maintained (tied to *Performance Measurement Protocols for Commercial Buildings* that will be published by ASHRAE in late summer 2009)
- Documented field inspection
- Side-by-side comparison of operational and asset ratings

An option to be considered is the development of a certification program of "Qualified Energy Assessor". This will include site visits as the program gets fully implemented. A similar accreditation is used in England to qualify persons for their "competent persons" registry. If this option is incorporated in the energy labeling program, ASHRAE would develop and manage this certification program. In lieu of developing a full certification program, ASHRAE may choose to recognize existing programs that meet the desired level of competence and require an additional course to qualify to perform assessments under the ABEL program. (See Certification section for additional information.)

To assess the impact of the ABEL ratings on ASHRAE resources/staff and infrastructure, the following information is a list of functions that will need to be performed to develop and process applications, record and analyze the data, develop and administer the certification programs, and market the program.

Program Development:

- Develop the above ASHRAE enhancements (ASHRAE value added) through relevant ASHRAE Technical Committees and with input from EPA.
- Work with EPA to implement an Automated Benchmarking System data exchange system or a customized report when that feature is added to Portfolio Manager in late 2009, to assure that the source energy data needed for the ABEL rating is provided and to determine how to automatically import the EPA rating into the appropriate field in the ABEL Certificate.
- Develop additional requirements, beyond those characteristic of a PE that would be associated with the "Qualified Energy Assessor" responsibilities.
- Develop requirements for the certified energy modeler (name of certification TBD).
- Develop requirements for ABEL software used to generate ABEL ratings from EUIs.
- Develop software to manage the ABEL applications, processing, and archiving activity (registry).
- Develop an ABEL Application Instruction Manual to include requirements for the label and certificate, roles and responsibilities for the energy assessor and modeler certification, forms and templates, and the requirements for the ABEL rating software.
- Develop an ABEL website.

Ongoing Management and Operation:

- Develop and manage certified energy modeler (name of certification TBD) and "Qualified Energy Assessor" (QEA) certification programs.

- Develop and maintain a list of approved building energy simulation programs as developed in collaboration with other organizations.
- Develop an application process (including forms) and solicit applications.
- Monitor application submissions into the database, collect and process fees.
- Review applications for proper interpretation of modeling rules (energy modeler's report) and utility data submitted (meter boundary, proper floor area, etc. – energy assessor's report).
- Submit energy use data to ENERGY STAR program to obtain a median source EUI.
- Receive ENERGY STAR median EUI and assign a rating.
- Issue the ASHRAE ABEL bEQ label and certificate.
- Maintain database of submission and labels in force.
- Develop process for renewals.
- Update ABEL Application Instruction Manual and certification programs as necessary.

Marketing/Outreach:

- Create awareness
- Identify and advertise to selected building owner/operator/designer communities.
- Seek approval as an approved compliance method in various jurisdictions
- Develop education programs to support ABEL program.
- Maintain ABEL website.

Impact on ASHRAE Infrastructure

Anticipated impacts on ASHRAE staff and resources are presented on a three-phase schedule:

Program Initiation (09/10):

During this phase a pilot program will be developed that focuses on the Operational (In Operation) Rating. Beginning July 1, 2009, an ABEL Committee will be convened to initiate a pilot program aimed at selected buildings and building owners, e.g., Durst Corp. BOMA, New York and other states. Building energy labels will be targeted to higher-end performing buildings (on the order of 100 buildings) at no cost to the applicant.

This phase will allow for evaluation of the Operational (In Operation) Rating and development of the Asset (As Designed) Rating. Because of extremely limited financial resources in the 09/10 year, current ASHRAE staff will support this development effort. Only the certification for the energy modeler (name for certification TBD) will be launched in preparation for initiation of the Asset (As Designed) Rating in (10/11). Functions of the Qualified Energy Assessor will be served by persons certified as High- Performance Building Design Professional and other qualified persons.

Thus the budget impacts during this first year are expected to be:

- Establish ABEL Committee to develop program structure and documentation. This would logically be implemented through an Advanced Building Energy Labeling Committee reporting to the existing Building Performance Metrics Steering Committee of Technology Council, or directly to Technology Council. Cost = $15K.
- Develop ABEL web page. This will be conducted by ASHRAE staff within its existing (09/10) budget supplemented with input from a consultant to assist with the initial web site, marketing, and database. Cost = $35K.
- Launch basic marketing program using existing staff within the existing (09/10) budget.
- Launch the certified energy modeler (name for certification TBD) as recently approved and budgeted by the Certification Committee.

Total cost =$50K

Program Development and Refinement (10/11):

During this phase the Operational (In Operation) Rating will be refined and the Asset (As Designed) Rating launched. A fee structure will be established, supplemented by program sponsorships, to provide for a revenue stream. The ABEL Committee will continue and a half-time program manager will be hired. Also a consultant will be engaged to begin enhancement of the web site and a marketing program.

The budget impacts are expected to be:

- ABEL Committee operation: Cost = $10K.
- ABEL Program Manager (half-time staff equivalent): Cost = $40K.
- Web site and marketing consultant for initial development of an enhanced marketing program: Cost = $ 60K.
- Database development (in house or consultant): Cost = $20K
- The certified energy modeler program (name for certification TBD) will be covered under the existing certification program budget

Total cost = $130K

Mature Program (11/12 and beyond):

- ABEL Committee operations including travel and meeting costs for the duration of the program: Cost = $10K
- ABEL Program Manager on ASHRAE staff – probably a full time manager (or asst mgr). Duties would include maintenance of ABEL database. Cost: $85K.
- Management of certified energy modeler program (name for certification TBD) will be covered under the existing certification program budget.
- Marketing and web site consultant to develop enhanced marketing program. This cost likely would be incurred only in the third year of the program. Cost = $100K

Total cost = $195K

On the demand side of the equation, the number of ratings given in a particular year can vary widely depending on regulatory activities, buy-in by the real estate community, and other factors. ASHRAE staff and leadership will need to work with the various target groups to assure that the label reaches its full potential.

Partnerships

ASHRAE intends to work in partnership with a number of parties and interest groups in the further development and application testing of the ABEL program. Some of these important partnerships include:

EPA ENERGY STAR® Program

The ASHRAE ABEL project has benefitted from continuing technical support and guidance provided by ENERGY STAR® staff to the committee. As the pilot program progresses ASHRAE will pursue options that EPA has available for 3rd party organizations to establish electronic information transfer for the elements from Portfolio Manager related to ABEL documentation.

COMNET

This is a joint effort of RESNET and the New Buildings Institute (NBI) to develop protocols and rule sets for building energy modeling required by regulation, codes and standards. COMNET plans to develop computer model input specifications for operating schedules, occupancy, plug loads, etc. The ASHRAE ABEL committee needs to maintain regular contact with COMNET to share information and consider COMNET specifications for use with ABEL.

Regulators

It is likely that the early use of ABEL may be for building energy use disclosure compliance. ASHRAE should seek approval of the ABEL documentation as an approved compliance form in those jurisdictions with disclosure regulations and those planning it.

ASHRAE Domestic Chapters
In the pilot phase of ABEL the local ASHRAE chapters could provide ratings for energy use disclosure compliance in jurisdictions where it it's required. Many ASHRAE members could offer ABEL ratings as a professional service.

ASHRAE International Chapters and Associate Societies
The ABEL program can now provide ratings using the Building EQ (bEQ) which is similar to rating scales used in the European Union, Australia and in other applications. ASHRAE has the opportunity to support development of ABEL-based rating systems in countries where there are chapters or affiliates. ASHRAE can provide guidance on development of reference energy use values for country-specific building types.

International Engineering Organizations
CIBSE has made a number of key recommendations to the committee based on experience with mandatory rating systems in the UK and EU. The ABEL Committee should maintain a working technical relationship with CIBSE and participate in international technical forums on building energy ratings.

Natural Resources Canada
The ABEL Committee will be establishing a working relationship with Natural Resources Canada (NRCan) regarding energy labeling programs in order to collaborate on the direction, structure, application and resources needed to complete each other's Building Energy Labeling Programs.

User Groups
In the pilot phase the committee should work to develop interest among certain real estate industry groups to use the ABEL ratings with their memberships. This would be an important part of future ABEL marketing efforts.

Target User Groups

While the public is a critical audience in the development of the label, it is not the main target group for the implementation of the label. There are three main audiences for implementation of the label:

- Governments (both as regulators and as building owners)
- Current and prospective building owners and tenants
- Existing green building rating programs.

From the regulatory aspect, federal, state, and local governments have a significant opportunity to influence the uptake of a labeling program in general and ASHRAE's program in particular. We already have seen requirements for public display or disclosure of building energy performance upon sale of the building in the US (e.g. California and Washington, DC), in Europe, and in other parts of the world. Other legislative bodies including the New York City Council, the Maine State Legislature and the U.S. Congress are considering such mandates. The ABEL implementation committee is aware of these efforts and has structured the label to accommodate local disclosure requirements. ASHRAE Washington Office staff and others from the ABEL committee have been working with various stakeholders to identify the value of an ASHRAE developed labeling program. Upon launch of the formal program, advocacy packets focused on ABEL will be distributed to chapters to assist them in seeking adoption of local requirements.

As a significant (and often forward-thinking) building owner, governments are in an ideal position to implement a building energy labeling program. Agencies typically are looking for tools to show the responsible expenditure of taxpayer funds and to provide valuable input into their building operations and maintenance program. The logical initial organizations for widespread adoption of the ASHRAE label are federal agencies with a large building stock (General Services Administration or Department of Defense). The U.S. Congress already is considering requirements for the public display of energy performance of federal buildings. Upon finalization of the label content, these significant building owners should be contacted about formal adoption of the ASHRAE Building Energy Label as their preferred display mechanism.

Current and prospective building owners and tenants are a critical audience in the implementation of the labeling program. Initially, resources would best be spent on engaging building owners with large portfolios. This could either be through organizations like the Building Owners and Managers Association (BOMA) and the Real Estate Roundtable or to the largest owners directly. ASHRAE leadership has regular contact with these organizations and will discuss the inclusion of the ASHRAE developed label within their existing programs. Contact with other organizations that would be involved in implementation of the program requirements including International Facility Management Association (IFMA), APPA (Association of Higher Education Facilities Officers), and the Association for Facilities Engineering (AFE) would be beneficial.

Green building rating systems (like LEED and GreenGlobes) already have captured significant interest in the marketplace. Effort should be made to have ABEL recognized as a component of the energy requirements in these systems. It also should be recognized that a program like ABEL can contribute to addressing some of the concerns regarding the discrepancies in energy use between the building design and the actual building.

Other potential audiences that could benefit from the information contained in the ABEL program include insurers, mortgage bankers, realtors, and others on the financial side of building ownership and operations. These groups typically are outside the scope of ASHRAE's interests, but could be valuable partners in the widespread implementation of the label. Encouraging inclusion of the ABEL data within databases like the CoStar Group database system (provider of commercial real estate information) can bring added interest and raise awareness. Also, energy service companies (ESCOs) should be approached as possibly providing the label to its customers as a value-added feature and a method for demonstrating energy savings.

Marketing Strategy

As ASHRAE continues to refine its Building Energy Labeling program, the first phase – a prototype of a label will debut this summer at the 2009 Annual Conference. The Asset (As Designed) Rating will begin its pilot phase in late 2009 with a widespread launch in 2010. The following is an outline of activities regarding promotion of ABEL at the Louisville Conference.

- Creation of a label for presentation to ASHRAE Headquarters.
- Presentation of the label to the ASHRAE membership during the Plenary Session on Saturday with a brief explanation of the proposed program.
- Reproduction of the label as a poster with a supporting poster of key facts and figures about how the program will be developed, both of which will be displayed in the registration area. Again, PR staff will work with meetings staff and ABEL committee representative on this.
- News release for trade and energy press addressing the FAQs about the program.
- Expand www.ashrae.org/energylabeling and develop www.buildingEQ.com to include the press release; possible sample label; and FAQs. Possibilities include: a form for interested

parties to leave their contact information if they want information once the program launches or a blog/comment area on energy labeling. Note that a blog/comment area would either have to be members only or be policed by staff to remove any spam or commercialism.

Talking points
Stress that this is a prototype label and a pilot program and that the ABEL Committee will be seeking feedback on the initial approach.

Why are we doing this? It's the right time. As the nation looks to reduce its energy use, information is the critical step in making the necessary choices and changes. With labeling mandatory in Europe and disclosure of a building's energy performance becoming required by several states, now is the time to introduce a label that can serve as a model for mandatory programs.

Why ASHRAE? Given the strong technical expertise of our members, our historic focus on consensus-based documents and the respect and credibility we've earned within the building community, ASHRAE has the ideal combination of features.

How is ABEL different from existing programs? ASHRAE's program focuses solely on a building's energy use. This allows greater concentration on building energy use and opportunities for improvement. The bEQ label also is designed to encourage the development of net-zero energy buildings and as indicated elsewhere in the report, the scale and additional information provide further features different than the existing EPA ENERGY STAR® program.

Implementation Schedule

The committee recommends the following schedule for implementation activities:

June 2009	Prototype Operational (In Operation) Label Revealed (Louisville)
	Label and Certificate Graphics finalized
	Preliminary list of additional technical needs identified and sent to relevant TCs (Including data sources for building types)
	Initiation of ASHRAE ABEL Committee to take over management of the program
August 2009	Identify criteria for Qualified Energy Assessor
	Preliminary Website launched
	Identify Education and Publication Needs
	Develop web-based submission tools and background database set-up
	Establish QC criteria
	Publish checklists and other support documents
September 2009	Publish Operational (In Operation) Rating Instruction Manual
	Launch Operational (In Operation) Rating portion of the Label
November 2009	Begin Marketing Campaign
	Work with other organizations to implement
	Identify requirements for modeling software to produce label documentation
January 2010	Launch certified energy modeler program (name for certification TBD)

	Initiate ASHRAE Guideline on Technical Rating Process
	Implement Operational (In Operation) Rating Renewal Process
March 2010	Launch Asset (As Designed) Rating portion of the Label
	Publish Asset (As Designed) Rating Instruction Manual
June 2010	Finalize program

Issues

In developing the implementation recommendations for the ABEL program the following issues were noted that should be noted for guidance to those completing the implementation process:

Issue 1: Avoid marketplace confusion with building energy labels

The committee feels that it is important to avoid market confusion over building energy labels. Efforts were made to differentiate the ABEL program to achieve different objectives that meet the of ASHRAE members and that reflect the objectives of ASHRAE's strategic documents.

Issue 2: Provide for distinctive market positioning for ASHRAE

An industry marketing firm was engaged to make recommendations on the brand as well as the ultimate label. The marketing firm provided several iterations of potential labels that could convey the message desired by ASHRAE. The brand mark recommended by ASRHAE staff and the committee is being trademarked to protect ASHRAE's interests. Recommendations on marketing programs have been made by the firm, but will need to be implemented in an incremental manner as resources become available.

Issue 3: Develop a business model to support ABEL program

To support the ABEL program a business model needs to be developed that will ensure continuation of the program. The committee feels that this is best done by ASHRAE staff who have greater insight into the costs as well as any potential revenues that might be derived from the program. A key question will be whether building energy labeling becomes mandatory under U.S. legislation. If so, this may change the business model.

Issue 4: Additional cost burden to building owners for gaining a label

Building owners are concerned about the additional cost to obtain a building energy label. In the case where labeling is voluntary, as with the ABEL program, this concern may result in owners being reluctant to obtain Asset (As Designed) ratings due to the additional cost for building energy modeling. It might also affect the desire to obtain Operational (In Operation) labels depending on any costs for the label itself as well as the cost for energy assessments and evaluations on IEQ that are required.

Issue 5: Proposed Rating Scale implications

The proposed rating scale is likely to result in lower scores for many buildings. Specifically, buildings may be rated more attractively on other scales (such as ENERGY STAR) and receive a rating with a more negative connotation on the ABEL scale. The proposed scale will need to be evaluated during the pilot stage and adjusted accordingly. The evaluation may need to include the impressions of the public and the implications for participation by building owners.

Appendix A

ABEL Certificate Application Instruction Booklet

[Note: Instructions meant for Pilot Program Implementation.]

[NOTE: This version of the ASHRAE Certificate provides a reference point for what can be done now to rate buildings with available methods and data. Future development of the technical capabilities of the ABEL program will improve its accuracy and ease of use.]

Version 2.1

Preface

The information in this document has been developed for the ASHRAE Advanced Building Energy Labeling Ad-Hoc Committee to initiate the pilot program and to facilitate discussion of technical and administrative issues pertinent to ASHRAE's efforts to explore building energy labeling concepts. These materials include a mock-up or prototype of an energy labeling concept with an accompanying Application Instruction Manual booklet and forms. The intent of these materials is to provide methodology to initiate a pilot program and to propose label and certificate content as well as technical and administrative procedures to determine through committee deliberation how different issues are to be resolved.

Purpose

The proposed purpose of this label is*: to provide a credible protocol for disclosure of the energy performance of a commercial building that influences the value of the property in the marketplace.*

The concept is to take advantage of market forces that could provide a market advantage to commercial buildings that have been designed and operated with energy efficiency in mind. Such a label could be used in voluntary real estate programs, time-of-sale regulatory programs and other transactions that require energy benchmarking disclosure.

The functions of the ASHRAE Advanced Building Energy Label (ABEL) Certificate are to:

- Provide a meaningful summary of a commercial building's energy performance that can be disclosed or presented to parties engaged in real estate transactions;
- Provide an energy efficiency rating that places the energy performance of the subject building into the context of the performance of similar buildings, normalizing for factors such as: building type, climate location, building size, occupancy, operating hours, purchased energy sources, and other relevant characteristics;
- Provide an energy efficiency rating for the building design and its projected energy consumption;
- Provide an energy efficiency rating for the building's operation and it's actual energy consumption;
- Provide meaningful indicators of the building's impact on the environment and its projected and actual greenhouse gas emissions;
- Document major energy efficiency features and characteristics of the building;
- Summarize the building's design and operational features that contribute to acceptable indoor environmental quality.

Scope

The ASHRAE ABEL Certificate is applicable to both new and existing buildings and significant renovation projects (new portions of buildings and their systems.) It is intended that the Certificate be applicable to buildings within the scope of *ANSI/ASHRAE/IES Standard 90.1-2007: Energy Standard*

for Buildings Except Low-Rise Residential Buildings. Thus, the requirements of this Certificate do not apply to: (a) single-family houses, multi-family structures of three stories or fewer above grade, manufactured houses (mobile) or manufactured/modular houses, and (b) buildings that do not use either electricity or fossil fuel. This Certificate shall not be used to circumvent any safety, health, or environmental requirements.

The Certificate may be applied to a single building or individual buildings within a group of buildings, which utilize a single submittal for a construction permit or which are within the boundary of a contiguous area under single ownership.

Each existing building rated for operational performance with this Certificate must be configured so that each energy source supplying the building is directly measurable and data available, i.e. engineering estimates or computer simulations of actual energy use are not acceptable.

The building types and subtypes within the scope of this version of the Certificate are those listed in Attachment 3 with a reference Energy Utilization Index. In this version of the certificate the reference EUIs for the ASHRAE Building Energy Quotient (bEQ) rating are national median source energy EUIs. For certain building types EPA ENERGY STAR Target Finder can be used to obtain a reference EUI adjusted for weather location and certain building characteristics.

In future versions of the Certificate, ASHRAE anticipates that weather and technical adjustments to the national median source energy EUIs will provide customized reference EUIs for the bEQ rating.

ASHRAE, as the Certificate Administrator, expects that over time additional building types and/or additional Approved Rating Methods covering additional building types will be approved.

Definitions, Abbreviations and Acronyms

Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this Certificate. These definitions are applicable to all sections of this Certificate. Terms that are not defined herein, but that are defined in standards that are referenced herein (e.g. ASHRAE Standard 90.1) shall have the meanings as defined in those standards. Other terms that are not defined shall have their ordinarily accepted meanings within the context in which they are used. Ordinarily accepted meanings shall be based upon American Standard English language usage as documented in an unabridged dictionary accepted by the Authority having jurisdiction.

Definitions (More to be added)

Approved Rating Method.

As Designed (Asset) Rating – As Designed (Asset) Ratings are intended to convey the energy efficiency effectiveness of the physical construction of the building, normalizing for the specific occupancy and operational characteristics, and allowing comparison of similar buildings regardless of operational differences. They are of value for both new and older buildings, particularly for purposes of real-estate evaluation

Authority having jurisdiction

Building Energy Compliance Certificate

Certificate

Certificate Administrator – The Administrator for this Certificate is ASHRAE. The Certificate Administrator is responsible for continuous maintenance of the Certificate, specification of procedures and criteria, and approval of new Rating Methods.

Certified energy modeler (The actual name for the certification will be determined by the ASHRAE certification committee creating the certification.)

COMcheck

In Operation (Operational Performance) Rating

Energy Utilization Index

EPA ENERGY STAR Portfolio Manager
EPA ENERGY STAR Target Finder
Certified Energy Modeler – As used in this version of the Certificate, any modeler found qualified by the Licensed Professional Engineer after reviewing the information on the Energy Modeler Qualifications Form in Attachment 4. Future versions of the Certificate will require certified energy modeler qualifications.
Qualified Energy Assessor
Significant Renovation – Construction changes to an existing building that trigger compliance with the current energy code in the local jurisdiction.
Reference EUI
Site energy
Source energy
Statement of Energy Design Intent
Statement of Energy Performance

Abbreviations and Acronyms *(More to be added)*

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
bEQ	Building Energy Quotient
CBECS	Commercial Building Energy Consumption Survey
EPA	Environmental Protection Agency
EQ	ASHRAE Building Energy Quotient rating method
EUI	Energy Utilization Index, Btu/sq.ft./yr

Administration and Enforcement

Use of this Certificate shall be in accordance with ASHRAE procedures effective at the time of the rating. Users should check the ASHRAE web site for updates.

ASHRAE may modify the Certificate and procedures as required by an authority having jurisdiction. Users should confirm that they are using the correct version of the Certificate for their jurisdiction.

This Certificate must be completed by a Licensed Professional Engineer licensed in the state where the building is located, or licensed in a state with reciprocity with the subject state.

The Building Owner shall review the Certificate as completed by the Licensed Professional Engineer and sign-off for acceptance.

Qualified Personnel to Complete the ASHRAE Certificates and Label

For this version of the Certificate a Licensed Professional Engineer is deemed qualified to oversee, approve and perform the technical work necessary to complete the Certificate and its ratings.

If energy modeling is required for an As Designed (Asset) Rating, the Licensed Professional Engineer may assign a qualified person to perform this work. Energy modelers must complete the ASHRAE Energy Modeler Qualifications Form in Attachment 4 for review and approval by the Licensed Professional Engineer. The Licensed Professional Engineer shall determine to her/his satisfaction that the energy modeler is qualified, and shall review and sign-off on any energy modeling results.

Future versions of the Certificate will include requirements for Certified Energy Modelers (pending an available certification program) and Qualified Energy Assessors. There is no requirement in this version of the Certificate for a Qualified Energy Assessor.

Procedures to Complete the ASHRAE Certificates and Label

The ASHRAE ABEL program emphasizes the documentation of both energy performance and energy design and operational features to highlight the energy efficiency attributes of building designs and

buildings as-operated. The ASHRAE Certificates and Labels have their best applications in buildings that wish to communicate notable energy performance to the public, the marketplace or peer group. For these applications, For technical ratings of building energy performance ASHRAE recommends the ASHRAE Building Energy Quotient method using the bEQ scale.

The ASHRAE Certificate can also be used, where approved by the *authority having jurisdiction*, as a compliance method where building energy use disclosure is required by regulation. For these applications the Certificate uses ENERGY STAR rating methods (Target Finder, Portfolio Manager) as required by many jurisdictions.

Note that the ASHRAE bEQ scale provides a technical rating of the subject building's energy performance and is accompanied by documentation of its key energy efficiency features. This rating cannot be directly compared to statistical rating methods such as ENERGY STAR which compares the subject building to the statistical distribution of the US commercial building stock using CBECS data. Both ratings are important for a comprehensive understanding of a building's energy performance. information.

Types of documentation

This ASHRAE ABEL certificate program provides three means of documenting building energy performance:

- ***ASHRAE Building Energy Quotient Certificate:*** This is intended to document building energy performance and key design and operational feature for high performance buildings. It can also be used as alternative compliance documentation where approved by the authority having jurisdiction for that use.
- ***ASHRAE Building Energy Quotient Label:*** This is intended for public display of the bEQ rating.
- ***Building Energy Certificate***: This is intended as a compliance procedure where approved, in jurisdictions that require energy use disclosure through regulation.

Information provided to complete the Building Energy Certificate will also generate the bEQ Label and Certificate.

Approved Rating Methods

This Certificate shall be completed using an Approved Rating Method. Methods for producing an As Designed (Asset) Rating and an In Operation (Operational Performance) Rating are approved by the Certificate Administrator. ASHRAE anticipates that future versions of the Certificate may include additional methods to handle specialty building type applications, especially with the bEQ scale

There are two types of rating scales in general use for evaluating building energy performance. Statistical methods use a frequency distribution of the population of buildings represented and rate a building according to its percentile location in the distribution. ENERGY STAR ratings based on the CBECS database are the leading method for this type of rating in the US. ENERGY STAR ratings are often required for compliance with building energy use disclosure regulations.

Technical rating methods compare a building's energy performance to technical potential reference points where Net Zero Energy performance is zero on the scale and the building type population median is set at 100. The ASHRAE bEQ scale provides this type of rating and is similar to scales used in the European Union, Australia and in the US with the residential RESNET scale.

Approved Rating Methods for this version of the Certificate are shown in Table A-1:

Table A-1 Approved Rating Methods

Type of Rating Scale	Asset Rating	Operational Performance Rating
Statistical Building Population-based	EPA ENERGY STAR Target Finder	EPA ENERGY STAR Portfolio Manager
Technical Potential Rating	ASHRAE Building Energy Quotient – As Designed	ASHRAE Building Energy Quotient – In Operation

Enter the name of the Approved Rating Method used in the appropriate box on the Certificate for the type of rating being performed.

Completing Page 1 of the Building Energy Certificate

The first page of the Certificate documents the following items:

- Rated facility information
- Part 1 - Building Energy Performance Disclosure for Jurisdictional Compliance
- Part 2 - Building Energy Performance Rating using the Building EQ (bEQ) scale
- Part 3 - Building Energy Use Summary
- Professional Engineer approval

Rated facility information
Enter the building information required, using the appropriate EPA *Statements*:

Part 1 - Building Energy Performance Disclosure for Jurisdictional Compliance

Use of EPA procedures where required by the Authority having jurisdiction: For this version of the Certificate EPA ENERGY STAR procedures shall be used to demonstrate compliance with energy disclosure requirements or regulations as required by the Authority having jurisdiction. The Certificate can be used to document both an As Designed (Asset) Rating and an In Operation (Operational Performance) Rating. Instructions for each are found below.

The party completing the information on the Certificate should use EPA ENERGY STAR rating procedures to the extent possible such as *The 2007 Professional Engineer's Guide to the ENERGY STAR Label for Commercial Buildings*. EPA has additional technical guidance available for numerous building types.

It is recommended that the EPA ENERGY STAR Target Finder be used to produce a Statement of Design Intent for the building design As Designed (Asset) Rating. This information should be retained with the building design records for future use. It is also recommended that the EPA ENERGY STAR Portfolio Manager be used to produce a Statement of Energy Performance for the building In Operation (Operational Performance) Rating which should also be retained with the building design records for future use. Much of the information that is entered on to the Certificate is taken from these two statements.

Use of Building Energy Models for EPA procedures: ENERGY STAR Target Finder requires an estimate of annual energy use by fuel type (and energy prices) to be entered into the “Estimated Design Energy” input box.

Building energy simulation models can be used to make this design estimate when done by a Qualified Energy Modeler.

Building energy models shall be used in accordance with the latest version of ASHRAE Standard 90.1, Informative Appendix G, Performance Rating Method. Building simulation programs shall meet the requirements of Informative Appendix G, Section G2.2 Simulation Program.

The simulation results for the "proposed building performance" shall be used as input to the ENERGY STAR Target Finder.

The simulation results are also used to fill in the Estimated Building Design Energy Use, by End Use table on Page 2 of the Certificate.

As Designed (Asset) Rating for Design Specifications: As Designed (Asset) Ratings are intended for newly constructed buildings to characterize their as-built energy efficiency design features in the year that construction was completed. As noted on the Certificate, the Rating is given for that specific year only. The As Designed (Asset) Rating is valid for the lifetime of the building or until the building undergoes Significant Renovation.

For As Designed (Asset) Ratings of building designs, use the EPA ENERGY STAR Target Finder available on the internet at:
http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder

Follow the instructions on the ENERGY STAR Target Finder web site and its help files to produce a Statement of Energy Design Intent. This report will provide the Energy Performance Rating (1-100) for the subject building.

Enter the rating information from the report on to the Certificate as appropriate.

In Operation (Operational Performance) Rating for Building as Used: For In Operation (Operational Performance) Ratings, use the EPA Portfolio Manager available on the internet at:
https://www.energystar.gov/istar/pmpam/

Follow the instructions on the EPA Portfolio Manager web site and its help files to produce a Statement of Energy Performance. A full 12 months of energy consumption data is required. This report will provide the Energy Performance Rating (1-100) for the subject building for a specific year. Enter the rating information from the report on to the Certificate as appropriate.

Part 2 - Building Energy Performance Rating using Building Energy Quotient (bEQ)
For this version of the Certificate the procedures in this section shall be used to document both an As Designed (Asset) Rating and an In Operation (Operational Performance) Rating using the ASHRAE Building Energy Quotient (bEQ) scale. Instructions for each are found below.

The ASHRAE bEQ rating is the ratio of energy use of the rated building to the median energy use of its building type. Energy use is expressed as source energy EUI, or source kBtus/sq.ft./yr. The best energy performance on the bEQ scale is Net Zero Energy with a rating of zero. The median of building performance for that particular building type is set at 100. While there is no theoretical upper end to the scale to track poor energy performance, in this version of the Certificate, the upper limit is set at an bEQ rating of "Unsatisfactory" for any score of 125 or greater. Net Zero Energy buildings that also produce an energy surplus can have a rating of less than zero.

For a particular building type the bEQ rating (or Energy Quotient, EQ) is calculated using the following equation:

$$EnergyQuotient(EQ) = \frac{EUI_{Actual}}{EUI_{Median}} \text{ X } 100$$

The SIS rating scale for building energy performance with the ASHRAE bEQ method is shown in Table A-2.

Table A-2 bEQ Rating Scale

Scale Range	Rating	Description
≤0	A+	Net Zero Energy
1-25	A	High Performance
26-50	A-	Very Good
51-75	B	Good
76-100	C	Fair
101-125	D	Poor
>125	F	Unsatisfactory

The median EUI values (expressed as source energy) for various building types for the denominator in this equations are provided in Attachment 3 or derived from the ENERGY STAR Target Finder as appropriate. The instructions in this section describe how to develop median EUI values to establish the 100 point location on the bEQ scale. This process is the same for both an As Designed (Asset) Rating and an In Operation (Operational Performance) Rating. The instructions develop comparable EUI values for the rated building as the numerator for both the As Designed (Asset) Rating and In Operation (Operational Performance) Rating.

Use of Building Energy Models for bEQ Ratings: Building energy simulation models shall be used to make design energy estimates for As Designed (Asset) Ratings when done by a Qualified Energy Modeler.

Building energy models shall be used in accordance with the latest version of ASHRAE Standard 90.1, Informative Appendix G, Performance Rating Method. Building simulation programs shall meet the requirements of Informative Appendix G, Section G2.2 Simulation Program.

For this version of the Certificate, modelers producing energy use estimates for bEQ *As* Designed (Asset) Ratings should also make use of the California Title 24 Alternative Calculation Method (ACM) default values to the extent possible for:

- Schedule of operation (lighting, HVAC, etc.)
- Schedule of occupancy
- Occupant Density
- Occupant installed energy consuming equipment
- Plug loads
- Outside air ventilation rates
- Other input values as appropriate

Building models that will be compared to reference EUIs generated with Energy Star Target Finder should also be consistent with Target Finder inputs for operating hours and other characteristics.

The simulation results for the rated building are used as input to a worksheet to convert the site energy EUI to source energy EUI as described below.

The simulation results are also used to fill in the Estimated Building Design Energy Use, by End Use table on Page 2 of the Certificate.

***Determining the Building Type Median EUI*:** The first step in the bEQ rating process is to select the appropriate EUI for the building type that best matches the rated facility. Source EUIs for the building types handled by this version of the Certificate are found in Attachment 3.

Some building types in Attachment 3 are noted "Target Finder". In these cases users can generate custom reference EUIs that are normalized for weather and certain building characteristics. The *EPA ENERGY STAR Target Finder* is available on the internet at:
http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder

Follow the instructions on the ENERGY STAR Target Finder web site. Complete the Target Finder input screen and use a value of "50" for the Target Rating in Box 3. Click the View Results button to find the source energy EUI for the building. Enter this value on to the worksheet below.

If using reference EUIs from Attachment 3, select the best match for the rated building and enter the building type, and source EUI values on to the worksheet below.

Users should take note that the source EUIs in Attachment 3 are median national values from the CBECS database and not average values, They are also not weather-adjusted or otherwise normalized for any building variables However, they are believed to be reasonable values to illustrate the bEQ rating procedure for this version of the Certificate.

As Designed (Asset) Rating for Building Designs and Property Valuation: As Designed (Asset) Ratings are intended to convey the energy efficiency effectiveness of the physical construction of the building, normalizing for the specific occupancy and operational characteristics of the buildings, and allowing comparison of similar buildings regardless of operational differences. They are of value for both new and older buildings, particularly for purposes of real-estate evaluation.

One focus for As Designed (Asset) Ratings is for newly constructed buildings to characterize their as-built energy efficiency design features in the year that construction was completed. The other focus for an asset rating is to determine the energy performance of an existing building and its energy systems independent of how the building is operated. This is important when valuing the energy efficiency of a building property within a financial transaction, such as a sale or lease. As noted on the Certificate, the As Designed (Asset) Rating is given for that specific year only. The Asset Rating is valid for the lifetime of the building or until the building undergoes Significant Renovation.

To perform an As Designed (Asset) Rating using the bEQ scale, use the following procedure:

- Model the annual energy performance of the building following the guidance provided under Use of Building Models above.
- Determine annual energy use by fuel type from the model results. Enter the results of the simulation into the worksheet below. If the model does not provide annual energy use results in kBtus, convert the results before entering.
- Complete the worksheet calculations to determine the rating
- Record electric kW demand information from model output for Part 3 Building Energy Use Summary

In Operation (Operational Performance) Rating For Building As Used: To perform an In Operation (Operational Performance) Rating using the Building Energy Quotient (bEQ) Scale, use the following procedure:

- Obtain and review energy use bills and records for all fuel types for the rated building.

- Determine annual energy use (or for the 12 most recent months) by fuel type from the energy records. Enter the results of the tabulation into the worksheet below after converting to kBtus using standard conversion factors
- Complete the worksheet calculations to determine the rating
- Record electric kW demand information from bills and energy records for Part 3 Building Energy Use Summary

Completing the bEQ Rating Worksheet:
The final step to determining the bEQ rating is to complete the worksheet in Table A-3. This worksheet can be used for both an As Designed (Asset) Ratings and In Operation (Operational Performance) Ratings. Complete the following:

- Make sure that the worksheet is fully populated with data from previous steps.
- Enter square footage for rated building
- Convert site energy by fuel type to source energy using the Source-Site Ratio on the worksheet
- Total up the fuel types and convert to site and source EUIs as indicated
- Divide the Source EUI for the subject building by the Source Median Reference EUI and multiply by 100
- Enter these values on the Certificate
- Check the Percent Electric value of the rated building against the value in Attachment 3 to see if it is within a reasonable range of the rated building.

Table A-3

Worksheet for Building Energy Quotient (bEQ) Scale As Designed and In Operation Ratings			
Energy Use by Fuel Type	Site Energy - kBtu	Source-Site Ratio*	Source Energy - kBtu
Electricity		3.340	
Natural Gas		1.047	
Fuel Oil (1,2,4,5,6,Diesel, Kerosene)		1.01	
Propane & Liquid Propane		1.01	
Steam		1.45	
Hot Water		1.35	
Chilled Water		1.05	
Wood		1.0	
Coal/Coke		1.0	
Other		1.0	
TOTAL	kBtu		kBtu

Building Square Footage:	Sq.ft.		
EUIs Site EUI:		Source EUI:	
Building Type (Attach. 3):		Median EUI:	
	bEQ Rating	(Source/Median)*100:	

*from EPA *ENERGY STAR Performance Ratings, Methodology for Incorporating Source Energy Use* , December 2007

Part 3 - Building Energy Use Summary
The Building Energy Use Summary can be completed for both the As Designed (Asset) Rating and the In Operation (Operational Performance) Rating.

When using ENERGY STAR procedures, the Statement of Design Intent and the Statement of Energy Performance can provide the necessary data including:

- Site Energy Use Summary – Design or Actual
  - Natural Gas (kBtu)
  - Electricity (kBtu)
  - Other 1 (kBtu)
  - Other 2 (kBtu)
  - Estimated Annual Energy Usage

- Energy Intensity – Design or Actual
  - Site (kBtu/sf/yr)
  - Source(kBtu/sf/yr)

- Estimated Annual Design Energy Cost or Actual Cost
  - Annual cost
  - Cost per square foot

- Estimated Annual Carbon Emissions

When using bEQ rating procedures, comparable data will be recorded from building energy model results. For this version of the Standard the user will have to perform side calculations to determine energy cost if not provided by the simulation model. In this case follow the energy cost guidance in the latest version of ASHRAE Standard 90.1, Informative Appendix G, Performance Rating Method.

Side calculations are also required at this time to estimate annual carbon emissions. Estimates of carbon emissions should follow the procedures and use the conversion factors in EPA's report *Greenhouse Gas Inventory and Tracking in Portfolio Manager*, October, 2008. The report is available at:
http://www.energystar.gov/ia/business/evaluate_performance/Emissions_Supporting_Doc.pdf.

Other information to be recorded includes:

- *Use of renewable energy*: Estimate the total usage of renewable energy in kBtus and estimate the percentage of total energy use met by renewable energy sources.
- *Peak electricity demand and load factor:* From the energy bills and records or computer model output determine the peak electrical kW demand and the month in which it occurred. Compute the load factor for the peak month as follows:

$$\textit{Load Factor} = \frac{\textit{(Actual kWh use in month)}}{\textit{(Actual Peak kW) * (Hours in month or Billing Period)}}$$

Professional Engineer approval: The Licensed Professional Engineer overseeing or performing the rating will sign and stamp the Certificate where noted.

Completing Page 2 of the Building Energy Certificate

The second page of the Certificate can be used for both the As Designed (Asset) Rating and the In Operation (Operational Performance) Rating.

This page of the Certificate documents the following items:

- Energy design features incorporated in to the building's design
- Operational features of the building related to energy efficiency
- Estimated building energy use (design or actual) by end-use
- Building subsystem design performance indicators (envelope and lighting)
- Energy models used
- Date of ENERGY STAR Statement of Energy Performance
- Sign-offs by Qualified Energy Modeler or Assessor, and the building owner

Energy Design Features

The Certificate provides entries to specify key energy efficiency design intent features. Check all that apply from the following:

- Designed to meet minimum state energy code (specify code version)
- Designed to meet ASHRAE Advanced Energy Design Guide (AEDG) for a building type
- Designed for USGBC LEED rating (specify rating and number of EA points)
- Designed for Green Globes (specify rating)
- Designed to Earn the ENERGY STAR
- Designed to meet NBI Core Criteria
- Designed to meet another new construction program (specify name of program).

Top Five Energy Efficiency Design Features

The As Designed (Asset) Rating also allows a summary list of the top five specific energy efficiency features of building design. List them in the appropriate spaces. This could include features such as:

- Day lighting
- Efficient windows and solar control
- Increased envelope insulation
- High efficiency HVAC equipment
- Cool roof
- Etc.

Optional Benchmarking to ASHRAE Standard 90.1

As an option to building owners, the Certificate provides for benchmarking the design energy performance of the subject building to the current version of ASHRAE Standard 90.1. For this version of the Certificate, this benchmarking is accomplished by following the procedures in Informative Appendix G, Performance Rating Method, in ASHRAE Standard 90.1-2007, Section G1.2 Performance Rating. The Performance Rating is expressed as a percentage improvement of the proposed building performance compared to the baseline building performance. See Appendix G for details.

Operational Features

The In Operation (Operational Performance) Rating provides entries to specify key energy efficiency operational features. Check all that apply from the following:

- Has the building earned the ENERGY STAR Label or a LEED-EB rating? For what years?
- Were building systems commissioned or re-commissioned? Which ones and when?
- Has the building had any energy efficiency improvements since it was built? What was done and when?
- Does the building meet EPA's ENERGY STAR Indoor environmental quality requirements?

- Is optional Information on potential energy improvements provided? The Building Owner may provide on a voluntary basis (unless required by the authority having jurisdiction) additional information on the potential for energy efficiency improvements to the building. There is no specified format or content for this information in this version of the Certificate.

Indoor Environmental Quality - Inspection and Assessment
The Professional Engineer must also verify through a site visit that the subject building conforms to current industry standards for:

- Indoor thermal environment including temperature and humidity
- Illumination
- Outside air ventilation
- Control of indoor air pollutants.

These standards are meant to provide general guidance for a comfortable and healthy work environment. Given nuances in the feasibility of some buildings to renovate and conform to these strict standards, it us up to the Professional Engineer's professional judgment as to whether the building as a whole provides a suitable work environment for those subject to the respective working conditions. The Professional Engineer should follow the guidance and procedures in *The 2007 Professional Engineer's Guide to the ENERGY STAR Label for Commercial Buildings* to perform this assessment.

Estimated building energy use (design or actual) by end-use
Building energy simulation models can be used to make energy end-use estimates when done by a Qualified Energy Modeler in accordance with Use of Energy Models guidance above. The simulation results are used to fill in the Estimated Building Design Energy Use, by End Use table on Page 2 of the Certificate.

Building Subsystem Performance Indicators
Building envelope and lighting systems can be evaluated for relative efficiency through use of standard US Department of Energy *COMcheck* software used for energy code compliance. COMcheck is available from: http://www.energycodes.gov/comcheck/

Refer to the COMcheck documentation for proper use of the software. Enter building envelope and lighting system data as instructed and run the evaluation. From the *COMcheck* reports record the following information on the Certificate:

- COMcheck Version
- Baseline Reference Code used in evaluation
- Building Envelope System comparison to baseline reference code (%)
- Building Lighting System comparison to baseline reference code (%)

Energy models used
Provide the name and version of the energy model used to complete the certificate.

Date of ENERGY STAR Statement of Energy Performance
Provide date from EPA report.

Required Sign-offs
The Certified Energy Modeler or Qualified Energy Assessor, and the building owner will provide their sign-offs on the Certificate where indicated.

Informative References

- ENERGY STAR® Performance Ratings Technical Methodology document

- The 2007 Professional Engineer's Guide to the ENERGY STAR Label for Commercial Buildings
- ASHRAE Standard 90.1-2007, Informative Appendix G, Performance Rating Method
- ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy
- IESNA, Lighting Handbook: Reference & Application, 9th Edition
- ANSI/ASHRAE Standard 62.1-2007, Ventilation for Acceptable Indoor Air Quality
- Standard 15-2007

[*Prototype of Building Energy Certificate for Initiation of Pilot Program*]

Building Energy Certificate

Facility	Facility Owner	Primary Contact for Facility
Building Type:	Year Built:	Gross Area (sq.ft.):

Part 1 - Building Energy Performance Disclosure for Jurisdictional Compliance

As Designed Rating **(Asset per Design Specifications)** **50** (on a scale of 1-100) For the Year of **2006**	**In Operation Rating** **(Operation for Building as Used)** **50** (on a scale of 1-100) For the Year of **2008**
Method Used: ***EPA ENERGY STAR Target Finder***	Method Used: ***EPA ENERGY STAR Portfolio Manager***

Part 2 - Building Energy Performance Rating using ASHRAE bEQ

As Designed Rating **(Asset per Design Specifications)** **100** This building is **As Designed Rated** as: **MEDIAN** For the Assessment Year of 2006	**In Operation Rating** **(Operation for Building as Used)** **100** This building is **In Operation Rated** as: **FAIR** For the Assessment Year of 2008
Method Used: ***ASHRAE Building Energy Quotient***	Method Used: ***ASHRAE Building Energy Quotient***

Part 3 - Building Energy Use Summary

Site Energy Use Summary - Design Natural Gas (kBtu) Electricity (kBtu) Other 1 (kBtu) Other 2 (kBtu) Estimated Annual Energy Usage:_____[kBtu]	Site Energy Use Summary - Actual Natural Gas (kBtu) Electricity (kBtu) Other 1 (kBtu) Other 2 (kBtu) Estimated Annual Energy Usage:_____[kBtu]
Renewable Energy Use – Percent of Total: Renewable energy produced on-site (kBtu):	Renewable Energy Use – Percent of Total: Renewable energy produced on-site (kBtu):
Energy Intensity - Design Site (kBtu/sf/yr): Source(kBtu/sf/yr):	Energy Intensity - Actual Site (kBtu/sf/yr): Source(kBtu/sf/yr):
Peak Electricity Demand: kW _____ Month _____ Load Factor (%):_____	Peak Electricity Demand: kW _____ Month _____ Load Factor (%):_____
Estimated Annual Design Energy Cost: _____ [$] Energy Cost ($/sf/yr):	Actual Annual Energy Cost: _____ [$] Energy Cost ($/sf/yr):
Estimated Annual Carbon Emissions: _____ (tons CO_2 based on site energy)	Approximate Annual Carbon Emissions: _____ (tons CO_2 based on site energy)
Professional Engineer Approval Name: _____ State License No. :_____ _____ Signature	*Stamp of Licensed Professional Engineer*

Building Energy Certificate
Performance Features and Design Details

PAGE 2

Facility:

Energy Design Features

Check all that apply:

☐ Designed to meet minimum state energy code: _____

☐ Designed to meet ASHRAE AEDG for building type: _____

☐ Designed for USGBC LEED rating. Rating _____ EA Points ____

☐ Designed for Green Globes. Rating: _____

☐ Designed to Earn the ENERGY STAR

☐ Designed to meet NBI Core Criteria

☐ Designed to meet a new construction program (specify) _____

List Top Five Energy Efficiency Design Features:

1. _____
2. _____ _____
3. _____
4. _____
5. _____

☐ This building design has been benchmarked to ASHRAE Standard 90.1-2007 following the procedures in Informative Appendix G. This building design achieves a ___% improvement over the baseline.

Operational Features

Check all that apply:

☐ This building earned the ENERGY STAR Label or other rating for these years (list): _____

☐ Meets LEED-EB: Yr___Rating___EA Points__

☐ Building systems that were commissioned or re-commissioned: Specify system and year

_____ _____

_____ _____

☐ This building meets EPA's ENERGY STAR indoor environmental quality assessment requirements including temperature and humidity, Illumination, outside air ventilation, and control of indoor air pollutants

☐ This building has had the following energy efficiency improvements since construction:

Item: _____ Date: _____

Item: _____ Date: _____

☐ Recommendations for Energy Efficiency Improvements attached.

Estimated Building Design or Actual Energy Use, by End Use

Energy End Use	kBtu/sf/yr
Heating	
Air-Conditioning	
Ventilation	
Lighting	
Domestic Water Heating	
(Other)	
(Other)	
(Other)	
Total:	

Energy Modeling Software Used to Calculate Design Energy Usage:

Date of ENERGY STAR Statement of Energy Performance:

Building Subsystem Design Performance Indicators

COMcheck Version: _____
Baseline Reference Code: _____

Building Envelope System

☐ This building envelope design achieves a _____% improvement over the baseline reference code.

Building Lighting System

☐ This building lighting design achieves a _____% improvement over the baseline reference code.

Building HVAC System
(Space Reserved)

Name of certified energy modeler Name: _____

Signature: _____

Name of Qualified Energy Assessor Name: _____

Signature: _____

Building Owner Acceptance

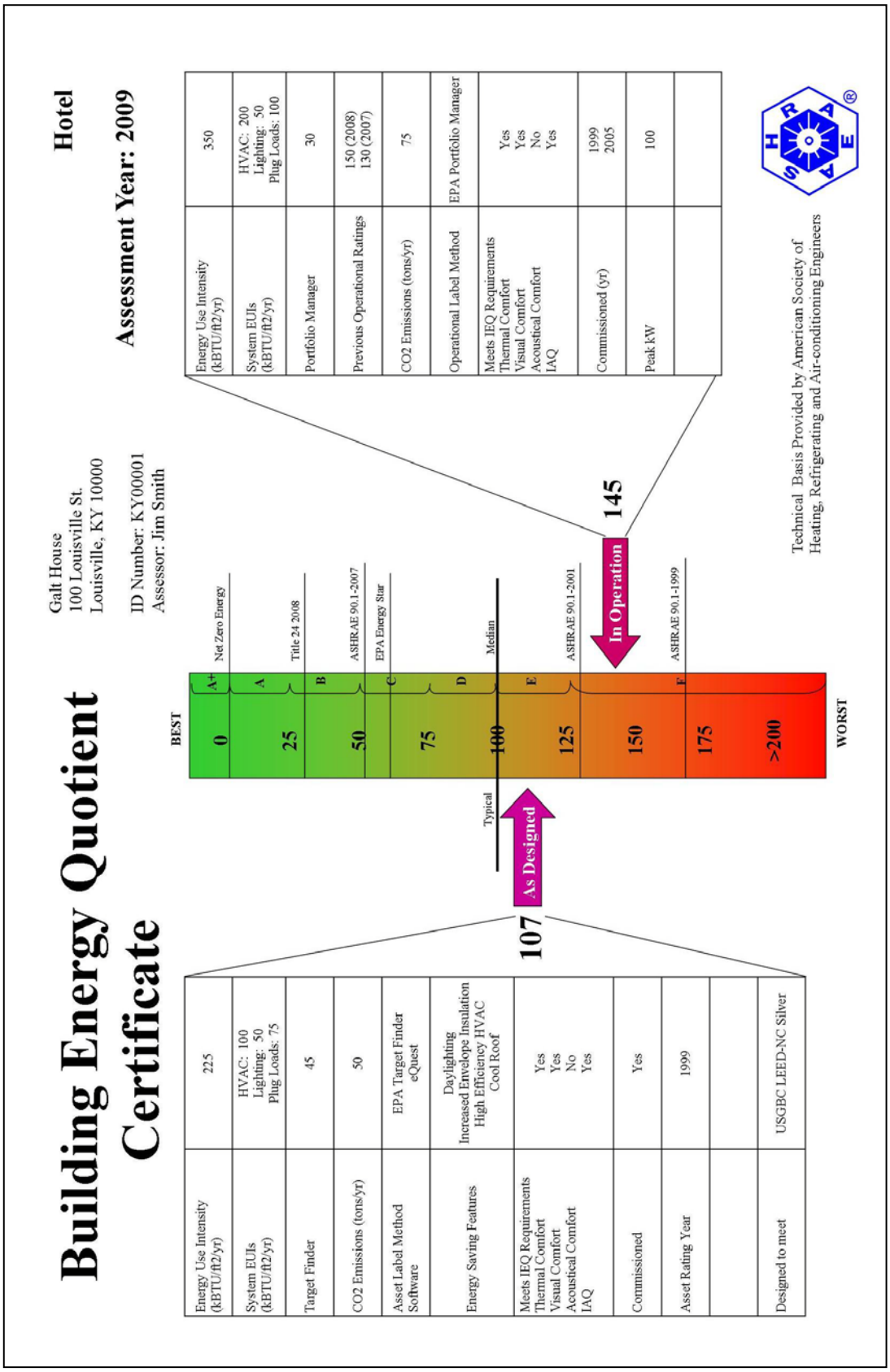
Name: _____

Signature: _____

Attachment 1

ASHRAE Building EQ Certificate

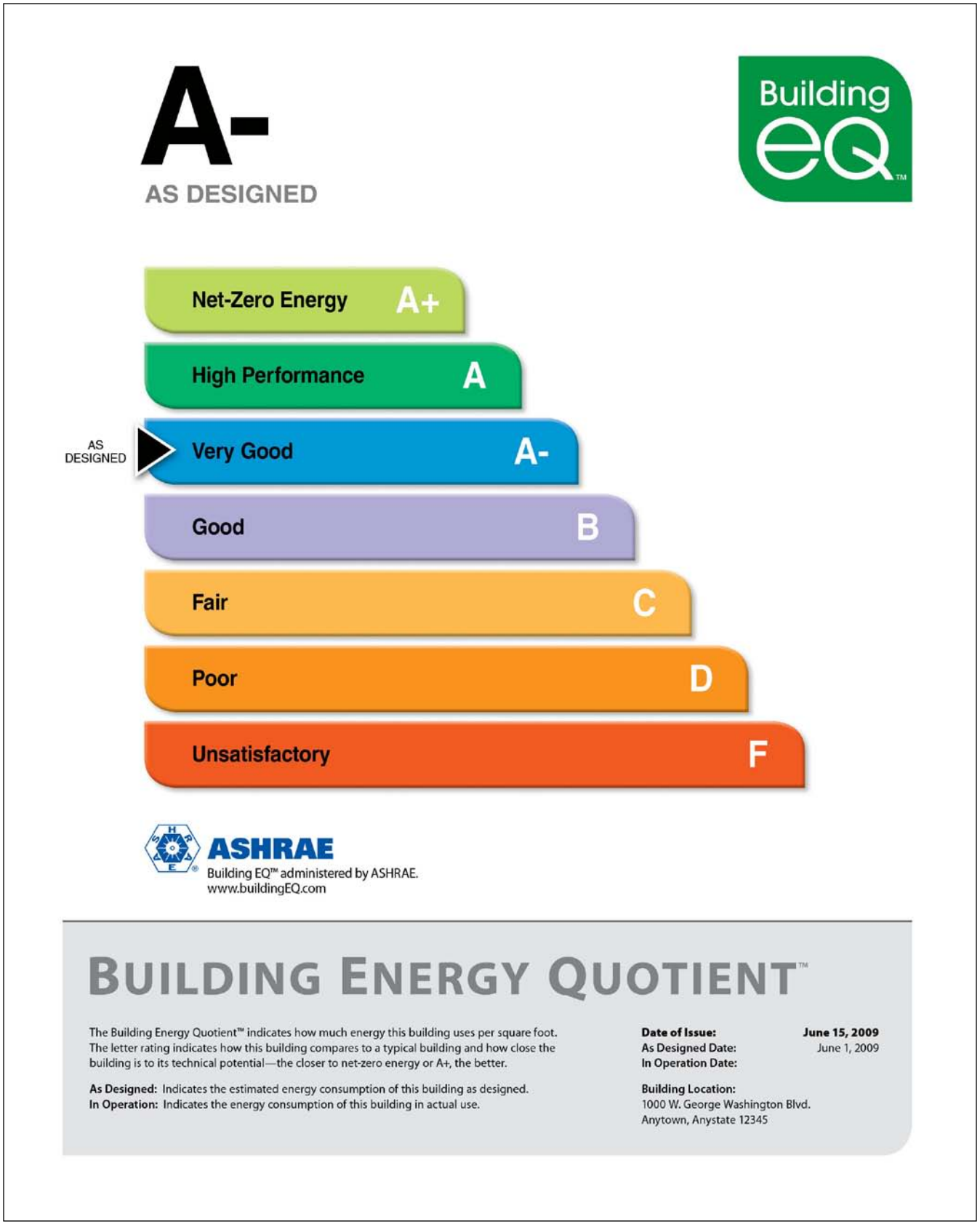
[Prototype of Energy Certificate for Initiation of Pilot Program]



Attachment 2

ASHRAE Building EQ Label

[Prototype of Building EQ Label for Initiation of Pilot Program]



Attachment 3

Reference Source Energy EUIs for ASHRAE bEQ Rating

How to Use Table A-4:
The building types listed **bold type** define a broad building activity category. Some of the broader building type categories are broken down into more specific building activities.

Some building types are noted as "Target Finder." For these cases, EPA's Target Finder can be used to develop reference EUIs according to the instructions in the booklet.

When identifying your building within this table, first identify where your building's function falls within the broader categories. Then determine if you are able to identify your building's function more specifically by the sub-categories underneath. Matching your building's main use activities most closely with the building use descriptions below, will give you the most accurate reference EUI for the rating. Please note all source and site EUI values displayed below are annual figures.

Table A-4

2003 CBECS[1] National Median Source Energy Use and Performance Comparisons by Building Type	
Building Use Description[2]	**Median Source EUI[3] (Kbtu/Sqft)**
Education	
K-12 School	Target Finder
College/University (Campus-level)	283
Elementary/Middle School	146
High School	150
Other Classroom Education	95
Preschool/Daycare	155
Food Sales	
Grocery Store/Food Market	Target Finder
Grocery Store/Food Market	503
Convenience store (without Gas Station)	773
Convenience store (with Gas Station)	761
Other Food Sales	153
Food Service	
Fast Food	1207
Restaurant/Cafeteria	545
Other Food Service	377
Health Care: Inpatient	
Hospital/Inpatient Health	414
Hospital, Acute Care and Children's'	Target Finder
Health Care: Long Term Care	
Nursing Home, Assisted Living	248
Health Care: Outpatient	
Clinic/Other Outpatient Health	194
Medical Office	Target Finder
Medical Office (non-diagnostic)	133

2003 CBECS[1] National Median Source Energy Use and Performance Comparisons by Building Type	
Building Use Description[2]	**Median Source EUI[3] (Kbtu/Sqft)**
Medical Office (diagnostic)	129
Laboratory	610
Lodging	
Hotel, Motel or Inn	Target Finder
Hotel	191
Motel or Inn	168
Dormitory/Fraternity/Sorority	116
Dormitory/Fraternity/Sorority	Target Finder
Other Lodging	177
Malls	
Enclosed Mall	249
Strip Shopping Mall	247
Office	
Office	Target Finder
Administrative/Professional Office	152
Bank / Financial Institution	273
Bank / Financial Institution	Target Finder
Government Office	184
Mixed-Use Office	167
Other Office	158
Other[4]	129
Public Assembly	
Entertainment/Culture	55
Library	246
Recreation	110
Social/Meeting	86
Other Public Assembly	86
Public Order and Safety	
Fire Station/Police Station	161
Courthouse	237
Courthouse	Target Finder
Religious Worship	76
Retail	
Retail Stores (non-mall stores)	Target Finder
Retail Stores (non-mall stores)	128
Other Retail	274
Vehicle Dealerships/Showrooms	158
Service	
Vehicle Repair/Service Shop	95
Vehicle storage/maintenance	55
Post Office/Postal Center	162
Repair Shop	106

2003 CBECS[1] National Median Source Energy Use and Performance Comparisons by Building Type	
Building Use Description[2]	**Median Source EUI[3] (Kbtu/Sqft)**
Other Service	194
Storage/Shipping/Non-refrigerated Warehouse	
Self-storage	24
Non-Refrigerated Warehouse	44
Non-Refrigerated Warehouse	Target Finder
Distribution/Shipping Center	81
Refrigerated Warehouse	281
Refrigerated Warehouse	Target Finder
Vacant	25

Source: ORNL analysis of 2003 EIA CBECS database (reprinted with permission)

Notes:

1. Commercial Building Energy Consumption Survey (CBECS), conducted in 2003, was used to calculate values presented in this table. The data is gathered from the Dept. of Energy's – Energy Information Administration (EIA). Please note all source and site EUI values displayed are annual figures.

2. Buildings Use Descriptions are taken from valid building activities as defined by EIA in the 2003 CBECS data. The average Source EUI and Site EUI are calculated in kBtu/sqft as weighted averages across all buildings of a given type in the 2003 CBECS data set. The building type listed in **bold** is defined according to the CBECS variable for "Principal Building Activity" (PBA8) which is a broader defined category. The subset of building types listed below those broader categories are defined according to the CBECS variable for PBAPLUS8. These are defined as a more specific building activity within the broader PBA8 category. Note all building type definitions can be found at: http://www.eia.doe.gov/emeu/cbecs/building_types.html

3. Source Energy is a measure that accounts for the energy consumed on site in addition to energy consumed during generation and transmission in supplying energy to the site. Converting site to source energy:

   Source energy value are calculated using a conversion factor for electricity of 1 kBtu site energy = 3.34 kBtu source energy; a conversion factor for natural gas of 1 kBtu site energy = 1.047 kBtu source energy; a conversion factor for district heat of 1 kbtu site energy = 1.40 source energy; and a conversion factor for fuel oil of 1 kbtu site energy = 1.01.

   Explanation of Source Energy: The source energy intensity target cannot simply be converted into an equivalent site energy value because different design strategies may yield different fuel mixes. Thus the different fuel mixes translate into the corresponding site to source ratios for a specific building. It is important to note that reducing source energy by 50% is not always mathematically equivalent to reducing site energy by 50%. For the most equitable peer comparison, the associated fuel mix should be used to convert the modeled site energy into the total source energy. The source energy use can then be compared to the values in this table.

4. Other: For all building types not defined by the list above, these buildings may choose to use the performance benchmark categorized by "other". Note that this category is not well defined therefore source energy use varies greatly with source EUI ranging over 1500 kBtu/sqft. As categorized by EIA, "other" may include airplane hangers, laboratory, crematorium, data center, etc

Attachment 4

Concept Modeler Qualification Form
[Prototype Modeler Qualification Form for Initiation of Pilot Program]

ASHRAE Energy Modeler Qualifications Form
Energy Analyst's Name, Contact Information, and AI, PE, or CEM Certification:
Describe the qualifications of the Energy Modeler responsible for the accuracy of the energy model and the Energy Analysis Reports:
Description of previous experience with the computerized, hourly building simulation tool used for energy analysis for this project. How recent is this previous experience?
List computer modeling programs with which the energy analyst has experience including years of experience with each modeling program:
Provide three reference contacts for energy modeling experience:
List name(s) of others who have worked on the model and report and describe what their roles have been:
List previous projects on which the Energy Analyst has performed computer modeling. List up to five projects:
Number of years of equivalent full-time modeling experience (provide dates):
Has the Energy Modeler taken any energy modeling workshops or training in the building simulation tool used in the analysis submitted in support of ASHRAE Label? Dates of training: