

JUNE 2, 2015

# APB VALUATION ADVISORY 6: VALUATION OF GREEN AND HIGH PERFORMANCE PROPERTY: BACKGROUND AND CORE COMPETENCY





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## **APB Valuation Advisory #6**

### ***Valuation of Green and High Performance Property: Background and Core Competency***

**This document is intended to offer voluntary guidance on recognized valuation methods and techniques.**

**Date Issued: June 2, 2015**

**Application: Residential and Commercial, Multifamily and Institutional Real Property**

**Issue: As part of its ongoing responsibilities, the Appraisal Practices Board (APB) is tasked with identifying where appraisers and appraisal users believe additional voluntary guidance is required. One such issue identified by the APB is *Valuation of Green and High Performance Property: Background and Core Competency*.**

What is a “green” building? A significant challenge of this voluntary guidance has been to address this very broad reference and specifically focus on the knowledge and skills necessary to apply recognized valuation methods and techniques. “Green” and “sustainability” have been defined by so many, applied for such different purposes and nuanced for varied property types that just using the word invites confusion. Every effort is made in this Valuation Advisory to narrow the discussion to what are currently the most prevalent characteristics associated with green buildings. In this context, a “high performance property” might use fewer resources, be more efficient, be more healthy and productive to its occupants and/or provide lower operational cost and ownership risk. Measuring “greenness” and performance relative to “conventional construction” (another challenging reference) is the ongoing focus of many groups discussed herein. As building operations become more precisely monitored and reported, it should become easier to define “green” within a specific assignment scope.

***The purpose of this document is to provide voluntary guidance to appraisers concerning the necessary background and core competency that is needed to value green, high performance or sustainable commercial and residential buildings (henceforth referred to as green buildings) as well as existing or new building stock that is not green (henceforth referred to as conventional buildings) yet may have green features or exist in a (local) market that values high performance and/or green buildings.***

This Valuation Advisory is the first in a series of three to be issued by the APB on green and high performance property. The APB intends to issue additional advisories on the *Valuation of Green and High Performance Property: Residential Properties*, and the *Valuation of Green and High Performance Property: Commercial, Multifamily and Institutional Properties*.

In that context, this advisory is to provide voluntary guidance as to the background and core competency issues from which the next two advisories will build upon. For purposes of this document, the terms “green” and “conventional” will be used, **although other terms may be used interchangeably**. It is important for the appraiser to determine the specific terms that will be applicable in an assignment.

**Subject Matter Experts:** The APB established a Subject Matter Expert Panel to assist it on this topic and addresses the rapidly evolving influence of green and sustainable building practices in the property valuation profession. The Appraisal Practices Board and The Appraisal Foundation wish to express our sincere gratitude to the U.S. Department of Energy and each of the following Subject Matter Experts for volunteering their time and expertise in contributing to this document:

|                 |              |
|-----------------|--------------|
| Mel Black       | Raleigh, NC  |
| James F. Finlay | Venice, CA   |
| Peter Rusin     | Denver, CO   |
| Evan Mills      | Berkeley, CA |

APB Liaisons: Alan Hummel and John Willey; APB Chair Rick O. Baumgardner; APB Vice-Chair Jay E. Fishman; and Director of Appraisal Issues John S. Brennan.

In addition, the Appraisal Practices Board and The Appraisal Foundation wish to thank the following individuals who volunteered their time and expertise in contributing to this document prior to April 30, 2013:

|                        |                   |
|------------------------|-------------------|
| Donald Briggs          | Emmitsburg, MD    |
| Theddi Wright Chappell | Park City, UT     |
| Timothy P. Runde       | San Francisco, CA |

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# *Valuation of Green and High Performance Property: Background and Core Competency*

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## Introduction

1 The real estate market is continuing to change as green and high performance technologies and  
2 regulations re-shape the construction and operation of commercial and residential real estate.

3 What is a “green” building? A significant challenge of this voluntary guidance has been to  
4 address this very broad reference and specifically focus on the knowledge and skills necessary to  
5 apply recognized valuation methods and techniques.

6 In the midst of these changes, real estate appraisers are facing challenges as they research and  
7 analyze appraisal assignments involving these properties. To keep up with this rapidly-changing  
8 field and with changes in the residential and commercial market, appraisers are encouraged to  
9 expand their knowledge base and skill set.

10 **The Advisory makes references and citations that are not intended to be all-inclusive,**  
11 **servicing as examples only, and acknowledges that other credible resources exist.**

12 Under the *Uniform Standards of Professional Appraisal Practice* (USPAP), appraisers are  
13 required to:

- 14 • Be competent to perform the assignment;
- 15 • Acquire the necessary competency to perform the assignment; or
- 16 • Decline or withdraw from the assignment.

17 Paths to competency include, but are not limited to, coursework and self-study, as well as  
18 attending professional seminars and presentations (in person and online). In addition, appraisers  
19 may also seek out general construction and/or building inspection and building system courses.  
20 Determining the threshold for core competency will depend to some degree on property type,  
21 geography, time, and the intended use of the appraisal opinions and conclusions.

22 However, while the level of rigor expected of an appraiser may vary, the basic criteria to judge  
23 competency for a green or high performance property follows the same basic steps that apply to  
24 any appraisal assignment:

- 25 • Problem definition and identification;
- 26 • Research and analysis; and
- 27 • Development and reporting of the value.

28 The Advisory lists and provides an extensive review of the following key terms and concepts:

- 29 • Sustainability
- 30 • Green Building
- 31 • Integration
- 32 • Rating Systems, Scores and Certifications
- 33 • Energy Modeling, Benchmarking and Auditing

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- 34 • Policy Initiatives and Regulations
- 35 • Financing Incentives
- 36 • Green Leases

37 Each key term and concept is followed by a description along with its relevance to appraisers.  
38 For each of these key terms and concepts, the overriding concern is for appraisers to accurately  
39 identify the specific features and attributes of a given property and properly gauge their effect on  
40 market value.

41 Appraisers need to recognize green and high performance buildings and building features in  
42 order to perform the appropriate scope of work, conduct relevant market research, and use  
43 appropriate valuation methodologies. Value recognition of property features can vary widely  
44 within markets. This can be true for an unusual improvement that does not clearly create  
45 positive income, operational cost savings or lower risk impacts and may therefore be a  
46 superadequacy (i.e., a cause of functional obsolescence).

47 The Advisory contains suggested minimum thresholds of competence for residential and  
48 commercial appraisers. It illustrates the specific types of knowledge and skills required of those  
49 appraisers who seek to value green and high performance property.

*NOTE: This Advisory is the first in a series of three to address green and high performance property. The next two advisories will focus on residential and commercial, multifamily and institutional properties, respectively.*

## Section I: Background

50 Green building awareness, knowledge and expertise is an area where appraisers may need a  
51 higher level of sensitivity as to possible impact on market value. In some markets, what was once  
52 an esoteric niche is becoming ingrained in mainstream building practices, building codes, and  
53 market behaviors. As market participants increasingly consider green and sustainable practices  
54 and expectations in their buy/lease decisions, it is important for appraisers to consider the  
55 perspective of the relevant market participants, in markets where such change impacts value.

56 ***This Valuation Advisory is intended to offer voluntary guidance to appraisers***  
57 ***and users of valuation services seeking to determine the necessary knowledge***  
58 ***and skills required to competently value green and high performance buildings.***

59 In some markets, the growing adoption of numerous green principles and the changing  
60 regulatory environment are creating a new normal against which properties are to be judged.  
61 Consequently, some properties are now being compared to others based on performance. To  
62 measure performance, a variety of metrics are being used:

- 63 • Sustainability (sustainable sites with lower environmental impact, proximity to transit  
64 and services, etc.)
- 65 • Water use (indoor water efficiency, landscaping, storm water management, etc.)
- 66 • Energy and atmosphere (optimal energy performance, renewable energy, green power,  
67 etc.)
- 68 • Building materials and resources (rapidly renewable resources, low environmental impact  
69 materials, etc.)
- 70 • Indoor air quality (air circulation, fresh air returns, etc.)
- 71 • Operations and maintenance (longevity of materials, maintenance costs, etc.)

72 As property performance increases in relevance, the potential for obsolescence increases for  
73 lower performing properties. Class A office space in certain urban areas may require LEED  
74 certification. New buyers can choose among multiple buildings with ENERGY STAR or various  
75 green labels in a growing number of areas across the United States, and various energy upgrade  
76 options are available to owners of existing buildings.

### 77 NEW CHALLENGES

78 This evolution in some real estate markets may present new challenges that appraisers must  
79 research and analyze as part of their assignment, such as:

- 80 1. ***Market share of green buildings:*** In a response to tenant demand and the increasing  
81 number of green building codes, landlords in the commercial sector are increasingly  
82 incorporating green features and pursuing green certification in new construction and  
83 major renovations.

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- 84 2. ***Green building codes, benchmarking and mandates for green space:*** An increasing  
85 number of jurisdictions are instituting or expanding green building codes and ordinances,  
86 and/or requiring periodic benchmarking of certain classes of commercial buildings. The  
87 U.S. General Services Administration is requiring that federal buildings conform to green  
88 standards. It is important for appraisers to have an understanding of new building  
89 technologies and the value implications of new building code standards. These new  
90 standards affect not only new buildings and retrofits but also conventional buildings that  
91 do not comply with current building codes.
- 92 3. ***Prevalence of conventional buildings upgraded with green features such as energy-***  
93 ***efficient Heating, Ventilating, and Air Conditioning (HVAC) systems, solar***  
94 ***photovoltaic (PV) systems, or water-efficient fixtures:*** These types of upgrades, even in  
95 conventional buildings, could yield value impacts. Appraisers performing this type of  
96 work must identify and value such features with market-supported adjustments.
- 97 4. ***Potential for obsolescence, also known as the brown discount, for existing buildings***  
98 ***that don't "green up":*** Just as green buildings that outperform the market may show a  
99 value premium, conventional buildings that underperform relative to their market may  
100 show a discount.
- 101 5. ***New sources of revenue and new encumbrances to the property:*** On-site generation  
102 assets may actually produce revenue streams, not just energy savings associated with  
103 lower energy consumption. Certain types of financing for energy efficiency and  
104 renewable energy (Property Assessed Clean Energy (PACE) or On-Bill Repayment) also  
105 stay with the property in the event of a transfer of ownership.

## Section II: Core Competency

106 The transition toward green buildings, green building codes and technologies, and the growing  
107 awareness of the relevance of sustainability to the marketplace can be viewed as part of the  
108 natural evolution of the real estate industry as it adapts to environmental, societal, and economic  
109 changes.

110 *Just as the building sector evolves, so too must the appraiser's skill set in order*  
111 *to accurately see the property through the eyes of the market, and thus render a*  
112 *competent valuation based on market-supported conclusions.*

### 113 Key Terms and Concepts

114 It is important for appraisers to familiarize themselves with the following list of key terms and  
115 concepts, which is intended to be illustrative and not exhaustive:

- 116 • Sustainability
- 117 • Green Building
- 118 • Integration
- 119 • Rating Systems, Scores and Certifications
- 120 • Energy Modeling, Benchmarking and Auditing
- 121 • Policy Initiatives and Regulations
- 122 • Financing Incentives
- 123 • Green Leases

### 124 SUSTAINABILITY

125 Sustainability is a very broad concept that lacks a single definition. It is most often defined with  
126 reference to the 1987 United Nations Brundtland Commission Report<sup>1</sup> which defines sustainable  
127 development as that which “meets the needs of the present without compromising the ability of  
128 future generations to meet their own needs.” When considering the application of this concept to  
129 a business setting, Elkington’s “triple bottom line” (TBL) is commonly cited, which states that  
130 one must balance the economic, social and environmental objectives across current and future  
131 generations.<sup>2</sup> The TBL concept is also sometimes framed as “People, Planet, Profit” in the same  
132 work.

133 While neither of these definitions speak specifically to the built environment, the Royal  
134 Institution of Chartered Surveyors (RICS) Global Property Sustainability Survey strongly echoes  
135 the TBL concept by “...equat[ing] sustainability with the goal of balancing economic,

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<sup>1</sup> United Nations General Assembly, *Report of the World Commission on Environment and Development*, General Assembly Resolution 42/187, 11 December 1987.

<sup>2</sup> Elkington, J, *Cannibals with Forks: The Triple Bottom Line of 21st Century Business* (Stony Creek, CT: New Society Publishers, 1998), 20.

136 environmental and social objectives at global, national and local levels in order to meet the needs  
137 of today without compromising the ability of future generations to meet their needs.”<sup>3</sup>

138 ***Relevance to Appraisers***

139 Sustainability’s influence on real estate purchase and lease decisions is clear and growing. As  
140 evidenced by a survey by CoreNet Global/JLL, 92% of real estate executives consider  
141 sustainability criteria in their location decisions.<sup>4</sup> Most notably, sustainability has been a driving  
142 force behind the construction of green and high performance property. As will be discussed in a  
143 subsequent section, the key aspects of the major green building rating systems, scores and  
144 certifications derive from the principles of sustainability.

145 In addition, the concept of sustainability presents a set of risks to the market value of real estate.  
146 These risks can be categorized as follows:<sup>5</sup>

- 147 • Resource Use: Operational and Construction/Renovation
- 148 • Obsolescence
- 149 • Transparency & Stakeholder Influence
- 150 • Externalities

151 The following exhibit illustrates examples of each of the above risks and the potential for impact  
152 on value. Note that the exhibit includes up and down arrows, which are abbreviations. The  
153 arrows pointing up should be read as “increasing,” and the arrows pointing down should be read  
154 as “decreasing.”

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<sup>3</sup> Royal Institution of Chartered Surveyors (RICS) Global Property Sustainability Survey (Q4 2009).

<sup>4</sup> CoreNet Global and Jones Lang LaSalle, “Perspectives on Sustainability: Results of the 2010 CoreNet Global and Jones Lang LaSalle Global Survey on Corporate Real Estate and Sustainability,” Jones Lang LaSalle (March 2011).

<sup>5</sup> Runde, T.P. and S. Thoyre, “Integrating Sustainability and Green Building into the Appraisal Process,” *Journal of Sustainable Real Estate* (2010, 2): 221–48.

| RISK CATEGORY                        | EXAMPLES OF SUSTAINABILITY RISKS   | POTENTIAL PROPERTY VALUE IMPACTS  |   |
|--------------------------------------|--|---|---|
|                                      |  | Direct  | Indirect  |
| RESOURCE USE                         | <ul style="list-style-type: none"> <li>▪ ↑ global demand for materials vs. fixed supply</li> <li>▪ ↑ energy cost, volatility; ↑ water cost, rationing</li> </ul>   | <ul style="list-style-type: none"> <li>▪ ↑ replacement cost; ↑ TI &amp; future renovation costs</li> <li>▪ ↑ operating expenses, ↓ NOI; Energy efficiency becomes paramount</li> </ul>                                | <ul style="list-style-type: none"> <li>▪ ↑ replacement cost may ↑ market barriers to entry; Renovate preferred over new construction; Life cycle costing</li> </ul> |
| OBSOLESCENCE                         | <ul style="list-style-type: none"> <li>▪ Consumption rate ↓, or patterns shift</li> <li>▪ ↑ need for properties to adapt to future uses and users (not yet identified)</li> <li>▪ Increased rate of change expected in future</li> </ul> | <ul style="list-style-type: none"> <li>▪ ↓ demand for retail; change in type/location</li> <li>▪ ↑ rate of depreciation; ↑ TI, cap ex cost for less adaptable properties</li> </ul>                                   | <ul style="list-style-type: none"> <li>▪ ↓ economic growth due to ripple effect of consumer (70% GDP)</li> <li>▪ ↑ risk for special-purpose improvements</li> </ul> |
| TRANSPARENCY & STAKEHOLDER INFLUENCE | <ul style="list-style-type: none"> <li>▪ ↑ disclosure of energy efficiency</li> <li>▪ Non-financial stakeholders influence investor decisions</li> </ul>   | <ul style="list-style-type: none"> <li>▪ GRI reporting that triggers green-up of REIT portfolio; carbon reporting</li> </ul>  | <ul style="list-style-type: none"> <li>▪ Stigma for poor performers</li> <li>▪ Supply chain reporting requirements</li> </ul>                                       |
| EXTERNALITIES                        | <ul style="list-style-type: none"> <li>▪ Greenhouse gas (GHG) and climate change legislation</li> <li>▪ Community charges back project externalities</li> <li>▪ Poor indoor air quality</li> </ul>                                       | <ul style="list-style-type: none"> <li>▪ Carbon taxes, cap &amp; trade; Project GHG emissions used as reason not to allow development</li> <li>▪ Impact fees; assessments</li> <li>▪ Health risk liability</li> </ul> | <ul style="list-style-type: none"> <li>▪ Stigma: ↓ marketability</li> </ul>   |

Source: Runde, T.P. and S. Thoyre. Integrating Sustainability and Green Building into the Appraisal Process. *Journal of Sustainable Real Estate*, 2010, 2.

155 For core competency, an appraiser should understand general sustainability concepts related to  
156 real estate. The appraiser next determines how the local market is applying these various ideas  
157 in the buy/sell/lease decision process regarding value and risk.

## 158 GREEN BUILDING

159 There are wide-ranging definitions for the term “green building” and to date, no single agreed-  
160 upon definition. The term can be used to mean a structure with sustainability-related features  
161 (noun) and/or the process of constructing or remodeling of a structure with sustainability-related  
162 features (verb).

163 An important feature of green buildings is that the essential attributes are based in the principles  
164 of sustainability, and therefore encompass more than just energy-efficiency features. This  
165 distinction is important to the appraiser and, despite the fact that the terms “green” and “energy  
166 efficient” are often incorrectly used as synonyms, they reflect different building attributes. In

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167 practice, a green building will incorporate features that address more than just energy use, such  
168 as: water efficiency, sustainable site selection, indoor environmental quality, material selection,  
169 and operations and maintenance. A building that is said to be “energy efficient” may not be a  
170 green building if the only distinguishing characteristic of the building is that it uses less energy  
171 than a comparable building does. Likewise, one cannot assume that a green building will  
172 necessarily be more energy efficient than a conventional building.

### 173 ***Relevance to Appraisers***

174 Green buildings, or conventional buildings with green features, can contain special materials or  
175 equipment, can have design advantages and can be less (or more) expensive to operate. Such  
176 buildings may have high performance technologies or characteristics that may have additional  
177 value. Solar panels, high-efficiency HVAC, and Building Management Systems or Building  
178 Automation Systems (BMS or BAS) are examples of green technologies, while siting, passive  
179 heating and cooling, or a green certification are examples of green qualities. These  
180 characteristics may affect a property’s value due to the initial cost of construction as well as the  
181 potential impact on operating costs, lower/higher risk, improved/diminished marketability or  
182 change in rental income.

183 ***As green building codes continue to proliferate, and as existing (conventional)***  
184 ***buildings incorporate green technologies, the distinction between what is a green***  
185 ***building and what is not will likely become more difficult to pinpoint. This is***  
186 ***not to say that a given market may not value a green label, but the overriding***  
187 ***concern to the appraiser should be to accurately identify the specific features***  
188 ***and attributes of a given property and properly gauge the effect on market value.***

189 By focusing too much on the potential value impacts of green building labels/certifications,  
190 appraisers may miss the value impacts of straightforward building performance improvements to  
191 an otherwise conventional existing building, such as efficiency upgrades to an HVAC system or  
192 water-saving plumbing modifications. The upgraded property may lack a certification or label,  
193 and may not technically be considered a “green building,” but the green upgrades could have a  
194 discernible effect on market value and, as such, need to be noted and appropriately valued. As  
195 with any property characteristic, appraisers should remain focused on the characteristics,  
196 performance and risk profile of a given property, and the degree to which those characteristics  
197 impact value.

198 ***Appraisers should also be aware that the terms green and energy efficient are***  
199 ***not synonymous. Energy-efficient buildings are not necessarily green. While***  
200 ***green buildings are typically expected to be more energy efficient than their***  
201 ***conventional counterparts, it is important for the appraiser to ascertain to the***  
202 ***extent possible whether or not a green building is more energy efficient than its***  
203 ***peers, and appropriately consider the implications of modeled versus actual***  
204 ***energy performance.***

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205 **INTEGRATION**

206 The concept of integration is central to green building. It encompasses building design and  
207 construction (commonly referred to as the Integrated Design Process (IDP)), as well as the  
208 concept of creating synergies that improves the buildings function on a variety of levels.

209 IDP is a departure from the conventional “Design-Bid-Build” model. IDP incorporates key  
210 stakeholders from various disciplines working collaboratively from the outset of the design  
211 process through the completion phase. Rather than thinking about a building as discrete parts, an  
212 integrated design approach encourages consideration of a building as a whole system. IDP is  
213 sometimes referred to as “whole building design” or “whole house approach.”

214 The table below summarizes some of the key differences between IDP and the conventional  
215 Design-Bid-Build model:

| <b>Integrated Design Process</b>              |    | <b>Conventional Design Process</b>                             |
|---|----|--|
| Inclusive from the outset                     | vs | Involves team members only when essential                      |
| Front-loaded — time and energy invested early | vs | Less time, energy, and collaboration exhibited in early stages |
| Decisions influenced by broad team            | vs | More decisions made by fewer people                            |
| Iterative process                             | vs | Linear process   |
| Whole-systems thinking                        | vs | Systems often considered in isolation                          |
| Allows for full optimization                  | vs | Limited to constrained optimization                            |
| Seeks synergies                               | vs | Diminished opportunity for synergies                           |
| Life-cycle costing                            | vs | Emphasis on up-front costs                                     |
| Process continues through post-occupancy      | vs | Typically finished when construction is complete               |

Source: Developed for the British Columbia Green Building Roundtable 2007 by Busby, Perkins & Will.

216 By viewing the building as a system and by involving a wide range of viewpoints and skills on  
217 the design team, integrated design can achieve synergies between the building components. For  
218 example, installing water-efficient plumbing fixtures not only saves water, but saves energy  
219 because as less water is used, less energy is needed to heat and move the water throughout the  
220 building. A vegetative (green) roof can both reduce storm water runoff and decrease a building’s  
221 heat island effect, which can optimize heating/cooling requirements. In a commercial building,  
222 window designs utilizing overhang or specialty glazing enable passive solar heating while also  
223 reducing unwanted solar heat gain, and possibly reducing artificial lighting requirements. Done  
224 properly, this design element can reduce energy used for heating, cooling and lighting. Further,  
225 reduced lighting, or changing to a light source that generates less heat, can further reduce cooling

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226 needs. These elements have measurable initial cost impacts, as well as ongoing operational cost  
227 impacts.

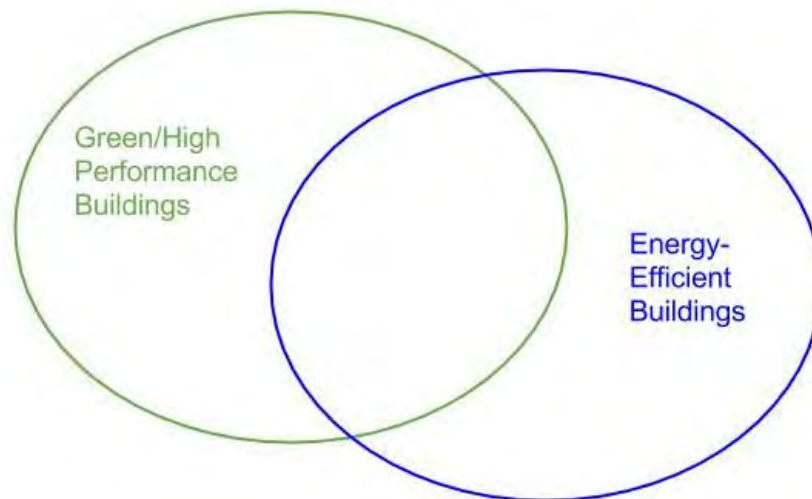
### 228 ***Relevance to Appraisers***

229 These types of design and operational synergies may generate measurable construction and/or  
230 operating cost savings -- yet may be virtually invisible even to those familiar with sustainable  
231 building practices. Appraisers may need assistance from the design team in identifying and  
232 describing integrated design strategies and the resulting synergies. In some cases, the cost  
233 savings can be substantial. For example, in the proposed renovation of a 45,000 square foot  
234 office/flex building to net-zero status (reduce energy use to only that which can be produced on-  
235 site by renewable means), the integration of a ground-source heat pump system with passive  
236 ventilation and BMS-controlled mechanical windows may eliminate the need for \$600,000 of  
237 duct work. Additional operational savings will likely accrue by eliminating the need for fans to  
238 move the air through the building for heating, cooling and ventilation. In this case, the integrated  
239 design had implications in the Cost, Sales Comparison, and Income Approaches.

### 240 **RATING SYSTEMS, SCORES AND CERTIFICATIONS**

241 There are several widely acknowledged green building rating standards/systems for commercial  
242 buildings in the United States, and a larger number for residential properties. The residential  
243 standards are more plentiful and, with few exceptions, tend to be more regionally specific.

244 Green building rating systems are intended to set a baseline for new construction, retrofitting and  
245 operational requirements and to distinguish buildings that have received certification from those  
246 that have not. Green building rating systems are distinguished from energy-efficiency scores and  
247 certifications -- such as ENERGY STAR or Home Energy Rating System (HERS) -- in that the  
248 latter focus solely on energy efficiency, while green building rating systems are intended to rate a  
249 building's design and/or performance across a broader spectrum of sustainability criteria (i.e., the  
250 triple bottom line). In addition, there are some rating systems that address both green and high  
251 performance buildings, as well as energy-efficient buildings, as illustrated below:



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252 Green and high performance rating systems award cumulative points across a range of common  
 253 sustainability metrics that include the following core categories:

- 254 • Energy Efficiency
- 255 • Materials and Resources
- 256 • Water Efficiency
- 257 • Indoor Environmental Quality (IEQ) and Indoor Air Quality (IAQ)
- 258 • Site Efficiency/Community
- 259 • Operations and Maintenance

260 Some green building rating systems include additional categories. Points are typically awarded  
 261 in a cumulative fashion across all categories. Most green building rating systems incorporate  
 262 energy efficiency as a minimum threshold for certification. For example, in some green building  
 263 programs, the energy-efficiency category may provide performance thresholds such as ENERGY  
 264 STAR benchmarking or obtaining a minimum HERS rating for homes (the lower the HERS  
 265 rating number, the more energy efficient the home).

266 The charts below summarize a selection of rating systems, scores and certifications,  
 267 differentiating between those which are considered to be green or high performance, and those  
 268 which are related only to energy efficiency:

|   |
|---|
| <b>GREEN/HIGH PERFORMANCE</b><br><i>Measures overall spectrum of sustainability</i> |
| LEED  |
| Green Globes  |
| National Green Building Standard  |
| Passive House Institute US  |
| Living Building Challenge   |

|   |
|---|
| <b>ENERGY-EFFICIENT RATINGS</b><br><i>Measures energy efficiency only</i> |
| ENERGY STAR   |
| HERS  |
| Building Energy Asset Score   |
| Home Energy Score   |
|   |

269 The various rating systems, scores and certifications can also differ from each other based upon  
 270 the types of property that are eligible for the respective programs. Certain programs apply only  
 271 to residential property, some only to commercial property, and some apply to both. ENERGY  
 272 STAR includes programs for both residential and commercial buildings. The HERS rating  
 273 system applies only to single-family residential property. These differences are illustrated with a  
 274 selection of rating systems, scores and certifications in the chart below:



| <b>Commercial / MultiFamily Only</b> | <b>Residential Only</b> | <b>Both Commercial and Residential</b> |
|--------------------------------------|-------------------------|--|
| LEED                                 | LEED for Homes          | ENERGY STAR                            |
| Green Globes                         | HERS                    | National Green Building Standard       |
| Building Energy Asset Score          | Home Energy Score       | Passive House Institute                |
|                                      | WaterSense              | Living Building Challenge              |

275 The following green building rating systems, scores and certifications summarize some of the  
276 characteristics of the various standards:

277 **LEED**

278 The Leadership in Energy and Environmental Design (LEED) rating system is, at the time of this  
279 writing, the most widely utilized comprehensive commercial green building rating system in the  
280 United States. It is a voluntary rating system provided by the Green Building Certification  
281 Institute (GBCI) that requires third-party verification for certification. Version 1.0 of the  
282 standard was launched by the U.S. Green Building Council (USGBC) at its Membership Summit  
283 in 1998. After extensive modifications, Version 2.0 was released in 2000. LEED Version 3.0  
284 was released in 2009. LEED Version 4.0 was released in late 2013. The rigor required to  
285 achieve certification increases with each version, as does the focus on energy efficiency and, by  
286 extension, minimization of carbon pollution.

287 Certification is based on a point system and is awarded for basic LEED certification, as well as  
288 LEED Silver, LEED Gold and LEED Platinum -- with each ascending level of certification  
289 requiring a higher number of points. Points can be earned in the following five core categories:

- 290 • Sustainable Sites
- 291 • Water Efficiency
- 292 • Energy and Atmosphere
- 293 • Materials and Resources
- 294 • Indoor Environmental Quality

295 There are two additional categories: Innovation and Design Process and Regional Priority  
296 Credits.

297 LEED offers a variety of tracks for certification of various property types, including New  
298 Construction, Core and Shell, Healthcare, Homes, and Existing Buildings Operations &  
299 Maintenance (EBOM), among others. In LEED versions prior to Version 4.0, only the EBOM

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300 track measured actual building performance. In LEED Version 4.0, certified buildings are  
301 required to have energy meters and building owners must commit to sharing the resulting data  
302 with the USGBC for a period of five years. Each track has both common and unique credit  
303 categories, which makes direct comparisons between them difficult. Further, since each track  
304 offers alternate paths to achieve credits, and the credit totals are cumulative, properties that  
305 achieve similar points and certification levels may be difficult to compare in a meaningful way  
306 for valuation purposes.

307 For more information, visit: [www.usgbc.org](http://www.usgbc.org)

### 308 **Green Globes**

309 Green Globes is a recognized comprehensive green rating system for commercial buildings in  
310 the United States. It has gained momentum in recent years due to its adoption by several federal  
311 agencies, including the Department of Veterans Affairs and the State Department. Growth in the  
312 rating's level of adoption has been credited to Green Globes becoming the first green building  
313 program to achieve accreditation as a Standards Developing Organization by the American  
314 National Standards Institute (ANSI).

315 It was originally designed as a self-certifying standard, but moved to third-party certification to  
316 enhance credibility and gain wider market acceptance. Green Globes awards cumulative points  
317 in categories including:

- 318 • Energy
- 319 • Water
- 320 • Resources
- 321 • Indoor Environment
- 322 • Emissions
- 323 • Project/Environmental Management
- 324 • Site

325 Green Globes offers multiple tracks and standards, including New Construction and Existing  
326 Buildings. For more information, visit: [www.thegbi.org](http://www.thegbi.org)

### 327 **ENERGY STAR**

328 This system is designed to rate buildings solely on energy efficiency. ENERGY STAR is the  
329 Environmental Protection Agency's (EPA) voluntary rating system created to promote energy  
330 efficiency and reduce greenhouse gas emissions. Unlike LEED and Green Globes, which focus  
331 on multiple aspects of building construction and performance, the ENERGY STAR program

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332 focuses on a property's energy performance characteristics and how efficiency can be improved  
333 and maximized.

334 ENERGY STAR has been widely adopted across both the commercial and residential sectors in  
335 the United States and extends well beyond real estate into a variety of other products (such as  
336 residential and office equipment, heating and cooling systems). LEED utilizes the ENERGY  
337 STAR rating and the Portfolio Manager software to award points in the EBOM track.

338 It is important to note that an ENERGY STAR score for a commercial building differs from the  
339 ENERGY STAR rating for a home.

340 ENERGY STAR for commercial properties rates actual energy usage relative to a building's  
341 peers -- adjusted for climate and occupancy use.

342 ENERGY STAR for homes uses an energy modeling program that produces a Home Energy  
343 Rating System Index Rating and estimates projected energy use.

344 ENERGY STAR for commercial properties applies only to existing buildings, while ENERGY  
345 STAR for homes is only applicable to new construction.

346 For more information, visit: [www.energystar.gov](http://www.energystar.gov)

### 347 **The Building Energy Asset Score**

348 The U.S. Department of Energy's Building Energy Asset Score is a national standardized tool for  
349 assessing the physical and structural energy efficiency of commercial and multifamily residential  
350 buildings. The Asset Score generates a simple energy-efficiency rating that enables comparison  
351 among buildings and identifies opportunities to invest in energy-efficiency upgrades. The Asset  
352 Score uses a 10-point scale to evaluate the energy efficiency of a building's physical  
353 characteristics and major energy-related systems. The point value is assigned based on a  
354 building's predicted source energy use intensity (EUI) according to the energy simulation results.  
355 Scores are rounded to the nearest half-point increment (i.e., "6", "6.5", "7", etc.). A score of 10  
356 represents the lowest expected energy use for a building of a particular use type that is  
357 achievable using current building energy-efficiency technologies without renewables. For more  
358 information, visit: <http://energy.gov.eere.buildings/building-energy-asset-score>

### 359 **Home Energy Rating System**

360 Created by the Residential Energy Services Network (RESNET), the HERS rating reflects a  
361 home's energy performance through an analysis utilizing energy modeling and proprietary  
362 software. The results of the analysis are presented as a HERS score, which is an Index rating  
363 number. This Index rates the home's energy performance compared to a reference home built to  
364 standard code requirements. It should be noted that the details of the HERS rating are just as  
365 important as the HERS rating itself. The appraiser needs to understand what features of the  
366 home contribute to the HERS rating. The appraiser should also know if the HERS rating is  
367 based on projections (plans and specifications, anticipated remodeling, etc.) or on actual testing.

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368 For example, a home that meets standard code requirements would typically receive a HERS  
369 Rating of 100. For every percentage point difference in performance from standard code  
370 requirements, the HERS Rating varies proportionately. A home that is 35% more efficient than a  
371 code-built home would have a HERS Index of 65; a home that is 35% less efficient than a code-  
372 built home would have a HERS Index of 135. A HERS Index of zero would indicate the home is  
373 Net Zero -- producing as much energy as it uses.

374 Certified RESNET HERS raters calculate a home's energy rating/HERS Index Score. A  
375 "reference home" is not a home that is just similar to the subject property in size and shape,  
376 rather it actually is the subject property, hypothetically designed to meet the 2004/2006 IECC  
377 energy building code.

378 In comparing the HERS Index to the ENERGY STAR label, a couple of factors should be  
379 considered. To receive a HERS Index score, a home doesn't need to meet any performance or  
380 prescriptive requirements. However, to qualify for an ENERGY STAR label, the home has to  
381 meet the requirements of the ENERGY STAR checklist, plus all the requirements of the  
382 program's appropriate prescriptive or performance path.

383 For additional information, visit: [www.hersindex.com](http://www.hersindex.com)

### 384 **The Home Energy Score**

385 The U.S. Department of Energy's Home Energy Score is similar to a vehicle's miles-per-gallon  
386 rating. It helps homeowners and homebuyers understand how much energy a home is expected  
387 to use and provides suggestions for improving its energy efficiency. It also allows homeowners  
388 to compare the energy performance of their homes to other homes nationwide. The Home  
389 Energy Score is comprised of three parts including: 1) the Score itself, 2) facts about the home  
390 including data collected and energy use breakdown, and 3) recommendations to improve the  
391 Score and the home's energy efficiency. The one-hour scoring process begins with Home Energy  
392 Score Assessor collecting energy information during a brief home walk-through. Using the  
393 Home Energy Scoring Tool, developed by Lawrence Berkeley National Laboratory, the assessor  
394 scores the home on a scale of 1 to 10. A Score of 10 represents the lowest expected energy use  
395 for a home that is achievable using current building energy-efficiency technologies without  
396 renewables. A score of 1 indicates the home needs extensive energy improvements.

397 For more information, see <http://energy.gov/eere/buildings/home-energy-score>

### 398 **National Green Building Standard**

399 The National Green Building Standard (NGBS) is the first point-based system for rating green  
400 residential construction, remodeling, and land development to be approved by ANSI.

401 NGBS was developed in 2007 by the National Association of Home Builders (NAHB) and the  
402 International Code Council (ICC) and it has been widely implemented throughout the housing

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403 industry. Home Innovation Research Labs certifies homes (new and remodeled), multi-family  
404 buildings (new and remodeled), and land developments.

405 The 2012 NGBS version updated energy requirements (anticipating an improvement in energy  
406 performance of approximately 15 percent above the previous version) and restructured the  
407 scoring for remodeling and renovation projects. It also increased point allowances for greener  
408 approaches to lot development and design. This Standard is expected to be updated periodically.

409 For more information, visit: <http://www.nahb.org/page.aspx/generic/sectionID=2510> or  
410 [www.homeinnovation.com/Green](http://www.homeinnovation.com/Green).”

411 While the NAHB website features general information about the NGBS, the Home Innovation  
412 website is the best resource for information about certification requirements, certified homes, and  
413 the professionals who are currently seeking NGBS Green certification for their projects. Of  
414 particular importance is the NGBS Certification Activity webpage  
415 (<http://www.homeinnovation.com/ngbsgreenstats>), which includes a real-time counter of NGBS  
416 Green certified units and a downloadable spreadsheet with addresses of certified  
417 homes/buildings. The webpage could be used by an appraiser to confirm that a particular  
418 property has been certified by Home Innovation Research Labs.

#### 419 ***Additional Rating Systems and Concepts***

420 The following, while not an inclusive list, are examples of some other rating systems and  
421 concepts used throughout various parts of the United States. The appraiser should be aware of  
422 all rating systems and concepts used in the subject property’s geographic location.

423 EPA also manages the WaterSense program, which measures the water efficiency of products  
424 and homes. For more information, go to <http://www.epa.gov/WaterSense/index.html>. EPA’s  
425 Portfolio Manager tool can be used by building owners to measure resource consumption,  
426 including energy and water.

427 Passive House Institute US, which began in Germany as the Passivhaus-Institute, is a program  
428 that certifies buildings based on specific performance criteria including ultra-low energy use and  
429 airtight, super-insulated building envelope integrity. The intent is to design and build structures  
430 that use very little energy for heating and cooling, while maintaining a high level of interior air  
431 quality. Despite its name, non-residential buildings (office buildings, schools and other  
432 commercial buildings) in a variety of countries and climates have been certified.

433 The Living Building Challenge is a rigorous, performance-based green building certification  
434 sponsored by the International Living Future Institute. The program certifies the performance of  
435 a wide variety of building types across seven performance areas, called “Petals”: Place, Water,  
436 Energy, Health & Happiness, Materials, Equity and Beauty. Projects can be certified in one or  
437 more of the performance areas. For more information, go to <http://living-future.org/lbc>

438 Net Zero Energy, Zero Net Energy, and Zero Energy Buildings all refer to buildings that are  
439 designed, built and operated to use fewer outside energy resources, with the balance of energy

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440 needs provided by an on-site, renewable source of energy, such as a solar PV system. There are  
441 various terms for Net Zero Energy and no single, universally accepted definition, but it generally  
442 refers to buildings where on-site generation is equal to consumption over a one-year period. For  
443 more information, go to the National Renewal Energy Laboratory website at [www.nrel.com](http://www.nrel.com).

444 ***Comparison of Residential Green Building Rating Systems***

445 The rating systems for residential development are more numerous than those for commercial  
446 properties, making consistent comparisons across systems challenging. The following table  
447 gives examples of product, training and building rating systems directed primarily to residential  
448 green buildings (although some apply to both residential and commercial property):

| <b>Program</b>  | <b>Sponsor</b>                               | <b>Brief Program Description</b>  | <b>Where Prevalent</b>                   |
|---|--|---|--|
| <i>Home Energy Score</i> (existing homes)                   | U.S. Department of Energy                    | Energy efficiency score compared to national averages   | Nationwide                               |
| <i>WaterSense</i>   | U.S. EPA                                     | Water efficiency compared to peer national averages   | Nationwide                               |
| Home Energy Rating System<br><i>HERS</i> and <i>HERS II</i> | Residential Energy Services Network (RESNET) | Energy efficiency   | HERS Nationwide except CA. HERS II in CA |
| National Green Building Standard (NGBS)                     | Home Innovation Research Labs                | Energy, water, resource conservation, indoor environmental quality, site  | Nationwide                               |
| LEED – Homes  | U.S. Green Building Council (USGBC)          | Site impact, water, energy, materials, indoor environment   | Nationwide, International                |
| GreenPoint Rated  | Build It Green                               | Energy, indoor air quality, resource conservation, water<br>New and existing homes, multifamily   | CA (primarily)                           |
| Earth Advantage   | Earth Advantage Institute                    | Energy, water, health, materials and land   | Portland, OR                             |
| Built Green   | Master Builders Association                  | Energy, health and indoor air quality, materials, site, water   | Seattle Area                             |
| Earthcraft  | Greater Atlanta Builders & Southface         | Site, energy, appliances/lighting, materials, indoor air quality, water   | 6 states across the Southeast            |
| Green Built Texas   | Dallas Builders Association                  | High performance, healthy   | Texas                                    |
| Passive House (in Europe Passivhaus)                        | Passive House Institute US                   | Energy, building envelope, interior air quality   | Mostly in European Union, starting in US |
| Living Building Challenge                                   | International Living Future Institute        | Place, water, energy, health & happiness, materials, equity and beauty  | US, International                        |
| WELL Building Standard                                      | International WELL Building Institute        | Aspects of building performance that impact occupant health and well being  | US, International                        |
| Zero Energy Ready Home Program                              | U.S. Department of Energy                    | This program considers whether systems for high performance homes are energy efficient through energy consumption and renewable energy. | Nationwide                               |

449 Each program varies in its minimum category requirements, rigor, requirements for performance  
450 testing, pre-drywall inspection, third-party or self-certification, and whether the program applies  
451 to new or existing houses.

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452 Other rating standards are more focused on commercial and investment property or multifamily  
453 properties. Additional detail will be provided in the voluntary guidance related to both the  
454 valuation of residential, as well as commercial, multifamily and institutional green and high  
455 performance buildings.

456 ***Relevance to Appraisers***

457 Green building rating systems/certifications are designed to offer market participants an easy-to-  
458 read label that purports to convey a building’s sustainability attributes. In simple terms, these  
459 rating systems seek to answer the question: How green is this building, if it is “green” at all?

460 ***It is important for the appraiser to determine if the local market recognizes a***  
461 ***particular certification label, score, or rating, and if it has an impact on the***  
462 ***appraisal process.***

463 In many cases, the green-label sensitivity of market participants may be uncertain and/or difficult  
464 to substantiate. In such cases, the various rating systems are best used as a framework to assist  
465 the appraiser in understanding how the green or energy-efficient building is different from the  
466 comparables.

467 In some cases, appraisers may not be able to make direct comparisons between buildings that are  
468 rated or not, nor between similar buildings rated at different levels (LEED Silver versus LEED  
469 Gold, for example). Due to the cumulative nature of the point system, two buildings at the same  
470 rating level may have different value-impacting characteristics from an appraisal standpoint.

471 Each potential improvement should be assessed to determine if it could create a differential to  
472 the operational, overall performance and/or risk characteristics of the property and whether this  
473 differential constitutes a market advantage/disadvantage. This should include analysis of the  
474 design intent of the various strategies, and the degree to which these goals meet the needs of  
475 relevant market participants. Properties rated by market-recognized, third-party certified  
476 standards have generally been subject to a more rigorous level of scrutiny and, as a result, many  
477 believe that they reflect a higher overall asset quality than unrated buildings. For example,  
478 properties certified under LEED require at least a basic third-party commissioning (quality  
479 assurance process). Likewise, residential rating systems that mandate a pre-drywall inspection  
480 for thermal bridging and quality insulation installation reflect an added level of third-party  
481 review of the construction -- over and above basic code-compliance building inspections.

482 It is worth noting that a number of building owners/developers can, and sometimes do, elect to  
483 follow LEED and best practices of green and performance building guidelines without incurring  
484 the effort and costs of formal certification. These buildings are sometimes referred to as “LEED-  
485 compliant” versus “LEED-certified.” While these buildings do not bear an actual label, the in-  
486 house documentation referencing equivalency may be of value to an appraiser.



487 ***Given the wide variety of residential standards, the appraiser's responsibility is to***  
488 ***familiarize him/herself with the specifics of the relevant standards in their***  
489 ***respective markets and to objectively analyze whether or not these factors create***  
490 ***potential differentials in market value for higher performing properties.***

491 This analysis would consider market factors and trends regarding these standards and whether or  
492 not a particular market recognizes the standards as creating a benefit for properties adopting  
493 them. Key differences among the programs that might impact value include the sponsor (such as  
494 the home building industry vs. an independent organization), whether third-party certification is  
495 mandatory, and whether third-party and/or performance testing is mandatory.

496 The dissemination of necessary information may be impacted by the filtering process of the  
497 appraisal engagement. The need for an appraisal -- albeit from the lender directly or through an  
498 Appraisal Management Company (AMC) or from a private individual or governmental agency --  
499 requires communication to the appraiser of the property's relevant facts and characteristics. The  
500 Scope of Work depends upon a well-defined appraisal problem. The valuation of green buildings  
501 has unique factors and components that impact an appraiser's competency requirements.  
502 Competency to perform any appraisal involves both knowledge and experience in the property  
503 type and in the applicable analytical methods (see USPAP COMPETENCY RULE). It is  
504 imperative that both the users of the appraisal service and the appraiser recognize the need to  
505 have meaningful, relevant communication when seeking to engage in valuation services for  
506 green properties. In the strictly regulated world of residential appraisals, a particular challenge is  
507 for lenders to correctly flag orders to the AMC, who must post a special request for proposal  
508 scope (perhaps requiring an Income Approach) to a panel of competent appraisers.

509 There are useful tools available to properly inform all stakeholders of any special considerations  
510 involving a property, such as the *Residential Green and Energy Efficient Addendum* and the  
511 *Commercial Green and Energy Efficient Addendum*.<sup>6</sup>

512 These considerations demonstrate the potential impact that various green strategies and practices  
513 might have on the market value analysis. If the valuation professional completing an assignment  
514 on a green building does not have the skills and experience to understand and analyze the various  
515 green strategies employed, then he/she may not have the competency to perform an accurate  
516 analysis of the property.

## 517 **ENERGY MODELING, BENCHMARKING AND AUDITING**

### 518 ***Energy Modeling and Benchmarking***

519 Energy modeling is similar to cash flow modeling used in appraisal practice. Instead of modeling  
520 cash flows, engineers, designers, and energy raters use a computer program to model energy  
521 flows within and throughout a structure. Energy models consist of a computer program that  
522 requires a variety of inputs pertaining to the building envelope, mechanical systems, construction  
523 materials, equipment, climate, occupancy and use. The output of an energy model is a prediction  
524 of the building's energy use. The reliability of the output is highly dependent on the quality of

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<sup>6</sup> Appraisal Institute, Chicago, Illinois  
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525 the inputs, the sophistication of the software, and the skill of the operator. Therefore, to be  
526 properly used, energy models typically require specialized training. The more advanced models  
527 -- such as those used in the commercial sector -- may require more advanced training and/or  
528 degrees in engineering or similar disciplines.

529 Energy models are widely used in new construction for code compliance with energy codes and  
530 to comply with energy ratings like ENERGY STAR and voluntary green building rating systems  
531 such as LEED. Energy models are also used in existing homes and commercial buildings to  
532 identify opportunities for energy-efficiency upgrades and to estimate potential energy savings  
533 from a proposed retrofit or energy-efficiency upgrades. This is sometimes called an asset rating,  
534 as it predicts the building's performance with limited input on occupant behavior. Examples of  
535 asset rating in buildings include the HERS Index Rating and the U.S. Department of Energy's  
536 Building Energy Asset Score for commercial buildings. Energy modeling can be performed on  
537 any type of building, including both green and conventional buildings.

538 The Department of Energy's Building Performance Database (BPD) is a repository of  
539 information about the physical and operational characteristics of existing buildings. The BPD  
540 enables users to perform statistical analysis on an anonymous dataset to:

- 541 • examine specific building types and geographic areas,
- 542 • compare performance trends among similar buildings,
- 543 • identify and prioritize cost-saving, energy-efficiency improvements, and
- 544 • assess the range of likely savings from these improvements.

545 For more information, visit <http://energy.gov/eere/buildings/building-performance-database>

546 In contrast to modeling, benchmarking analyzes actual energy use data, providing a method to  
547 quantify the performance of a subject non-residential property in relation to typical energy-  
548 performance levels. While modeling analyzes a single building in isolation, benchmarking  
549 compares its performance to that of a comparable peer group. Benchmarking requires much less  
550 subject-matter expertise than energy modeling. The most widely used commercial buildings  
551 energy benchmarking tools are EPA's Portfolio Manager and Energy IQ  
552 (<http://EnergyIQ.lbl.gov>), developed by Lawrence Berkeley National Laboratory.

### 553 ***Relevance to Appraisers***

554 Use of energy modeling data in the valuation process requires the appraiser to be aware of the  
555 predictive limitations of energy modeling, as well as how an energy model differs from an  
556 energy audit. Just as with car mileage, actual results rarely match modeled predictions, and in the  
557 built environment, occupant behavior can significantly impact actual energy use. Further, as the  
558 sophistication of the energy model increases, so do the required inputs that may or may not be  
559 reliably known or supportable. The skill level and experience of the energy modeler also must  
560 be consistent with the sophistication of the software and the complexity of the building.

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561 ***While most appraisers lack the specialized training necessary to perform energy***  
562 ***modeling, appraisers may be expected to review and understand reports that***  
563 ***result from energy modeling. These reports typically require an understanding***  
564 ***of basic energy modeling concepts and terminology such as EUI as well as what***  
565 ***kWh and kBtu measure, and how to convert between the two measures.***

566 The appraiser’s basic knowledge of energy modeling and benchmarking concepts, practices and  
567 terminology is required to effectively interact with the professionals responsible for creating the  
568 energy model and/or the report, and to incorporate the results, as appropriate, into the appraisal.  
569 Appraisers should further be aware of the USPAP requirements relating to relying on the work of  
570 others when contemplating the use of energy modeling analysis in valuation settings. (See the  
571 Comment to Standards Rule 2-3.)<sup>7</sup>

### 572 ***Energy Audits***

573 An energy audit – sometimes referred to as a Building Performance Assessment (BPA) -- differs  
574 from energy modeling because it measures how a building is actually performing, not how it is  
575 intended to perform. Energy audits are routinely performed on all types of properties, including  
576 both green and conventional buildings. Typically, an energy audit involves, at a minimum, a  
577 walk-through inspection of the building by a trained inspector or rater, a basic equipment  
578 assessment, and an analysis of utility usage and energy-efficiency upgrade recommendations.  
579 More advanced audits may include building envelope testing (blower door test) and/or  
580 mechanical systems and combustion safety energy modeling. Energy audits in the residential  
581 sector may include a BPA, and for more comprehensive results, can be combined with a HERS  
582 rating. In the commercial sector, the typical standard is an American Society of Heating,  
583 Refrigerating and Air Conditioning Engineers (ASHRAE) Level 1, 2 or 3 energy audit --  
584 progressing from a Level 1 walk-through inspection with upgrade recommendations to an  
585 “investment grade” Level 3 report that may include advanced energy modeling and analysis of  
586 systems interactions.

### 587 ***Relevance to Appraisers***

588 Potential uses of energy audits by appraisers and underwriters include comparing similar  
589 properties based on their predicted energy use as well as for ranking or assessing proposed  
590 energy-efficiency upgrades or retrofits. HERS ratings may be used to adjust residential  
591 comparables for predicted energy use. Energy audits in the commercial sector may point the  
592 user to areas of potential cost-effective upgrades as well as to identify areas where the subject  
593 property differs, positively or negatively, from the comparables. In both residential and  
594 commercial settings, the basic equipment assessment can provide meaningful insight to the  
595 appraiser as to the anticipated performance and remaining useful life of the components.

596 As with energy modeling, most appraisers lack the specialized training required to perform an  
597 energy audit. However, appraisers should review and have a basic understanding of energy audit

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<sup>7</sup> Uniform Standards of Professional Appraisal Practice (USPAP) – 2014-15 edition, (Washington, D.C.: The Appraisal Foundation, 2014), U-27.

598 reports, such as a HERS report or a BPA. A basic understanding of energy audit concepts,  
599 practices and terminology is also required in order to effectively interact with the professionals  
600 responsible for creating the energy audit report. The details of a HERS rating are just as  
601 important as the rating itself. It is very important for the appraiser to understand the features of  
602 the home that contributed to the HERS rating and to note whether the rating is based on  
603 projections (plans and specifications, anticipated remodeling, etc.) or on actual testing.  
604 Appraisers should understand whether an ENERGY STAR rating is positively or negatively  
605 correlated with actual energy use. Clients may also require the appraiser to review and  
606 understand a basic ASHRAE audit ([www.ashrae.org/greenstandard](http://www.ashrae.org/greenstandard)). As with energy modeling,  
607 appraisers should be aware of the USPAP requirements relating to relying on the work of others  
608 when contemplating the use of energy audits/building performance assessments in valuation  
609 settings.

## 610 **POLICY INITIATIVES & REGULATIONS**

611 Government policy and regulations concerning green building have proliferated in recent years.  
612 Policy is generally broad in nature while regulations target specific market segments and  
613 behaviors. Both can serve to shape market behaviors in ways the market would not otherwise  
614 address.

615 Policy and regulations concerning green building can come from the federal, state and/or local  
616 governments. The federal government has a variety of policies relating to sustainability,  
617 including a 2009 Executive Order (EO13423 “Strengthening Federal Environmental, Energy,  
618 and Transportation Management”), requiring that agencies must buy products that contain low or  
619 no toxic or hazardous constituents, contain the highest percentage of recovered materials  
620 practicable, use energy-efficient products, and reduce indoor and outdoor water use, among other  
621 requirements. At the state level, state-mandated renewable portfolio standards may specify how  
622 much of a state’s electricity must be derived from renewable sources. At the local level, green  
623 building codes may have been enacted.

### 624 ***Relevance to Appraisers***

625 Appraisers should be aware of and familiar with green building policies and regulations so that  
626 they can differentiate between market-driven demand and policy-driven demand. For example,  
627 for an appraiser unfamiliar with local green building codes, the widespread use of energy-  
628 efficiency technologies might be interpreted as market-driven demand, due to the market  
629 participants’ embrace of sustainability principles. While this market-driven demand may be a  
630 factor, the appraiser should also consider the possible role of increasingly stringent energy  
631 portions of local or state building codes in generating demand for energy-efficient technologies.

632 Changing policies and regulations concerning the energy use and performance of buildings can  
633 also have implications in the adjustment process of older comparables constructed to less  
634 rigorous code standards. Energy codes might also affect the level at which energy costs are  
635 stabilized for purposes of direct capitalization.

636 Disclosure of building energy use can vary depending upon the jurisdiction in which the property  
637 is located. Some jurisdictions require disclosure at all times, while others may require disclosure  
638 at the time of sale, lease or financing. Numerous exclusions by building type and/or size exist,  
639 but this growing trend is helping buyers, sellers and lenders better understand building  
640 performance risk. Disclosure requirements may include due diligence documents generated by  
641 tools like ENERGY STAR Portfolio Manager for commercial property or a HERS report for a  
642 residential property. The Institute for Market Transformation, in association with CBRE,  
643 provides a website tracking the latest energy use disclosure rules (see Addendum: Selected  
644 Resources.) Like vehicle mileage ratings and restaurant inspection letter grades, energy  
645 disclosure information has the potential to affect market participant behavior. As a result,  
646 appraisers should be aware of and consider any potential value influence of energy use disclosure  
647 requirements that may affect their market.

## 648 **FINANCING INCENTIVES**

649 While mandates like building codes and regulations are the “stick” used to implement policy,  
650 incentives are the “carrot” meant to motivate behaviors consistent with policy. Incentives are  
651 available at the federal, state and local level, primarily from government entities, but also from  
652 regional and local utilities. The incentives include preferential tax treatment such as credits and  
653 deductions, financing products, and direct rebates. Each of these incentives is targeted to  
654 encourage a particular policy, and/or incorporation of specific building practices, protocols  
655 and/or characteristics. The program funding availability and qualifications may change over  
656 time, and the state and local incentives vary widely in their availability and nature, based on the  
657 particular location.

658 The following are examples of federal, state, and local incentive plans:

- 659 • Mortgage financing products tailored to energy efficiency and/or renewable energy, such as  
660 the Federal Housing Administration’s (FHA) Energy Efficiency Mortgages (EEM) and  
661 PowerSaver loans.
- 662 • The DSIRE/Database of State Incentives for Renewables and Efficiency ([www.dsireusa.org](http://www.dsireusa.org).)  
663 website provides a listing of current state, utility and local incentives for renewable energy  
664 and efficiency programs.
- 665 • At the state level, direct rebates for energy-efficiency renovations and/or solar and renewable  
666 energy generating installations are available.
- 667 • Local and regional utility companies, charged with increasing the proportion of energy from  
668 renewable sources, may offer direct rebates to customers who install solar PV or solar  
669 thermal systems. In many cases, these incentives decline over time, in an effort to offset the  
670 higher initial cost to early adopters and mirror the typical price declines in new technology as  
671 it increases in scale.
- 672 • Some counties (Los Angeles, San Francisco and Sonoma Counties in California, to name a  
673 few) are experimenting with financing solar PV and other distributed renewable energy  
674 sources with PACE programs. These programs function much like a bond assessment where

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675 the property owner pays the cost of the renewable energy improvements over time, as a  
676 special assessment added to the property tax bill.

### 677 ***Relevance to Appraisers***

678 Appraisers who work with specialized financing products like EEM or PowerSaver loans will  
679 need to be familiar with these programs and the scope of work should detail how the assignment  
680 differs from an appraisal for conventional financing. PACE program characteristics vary by the  
681 local jurisdiction and should be analyzed in order to determine the appropriate scope of work.

682 Tax benefits typically are outside the consideration of a typical market value appraisal since they  
683 accrue to the property owner, not the real estate, and their value is dependent on the owner's tax  
684 situation. However, for appraisers providing consulting services including feasibility analysis  
685 for renewable energy, payback or return on investment analysis for upgrades and retrofits, tax  
686 benefits and rebates may be relevant depending on the particular assignment. Appraisers  
687 engaging in this area of work should seek the advice of outside professionals when needed,  
688 particularly with respect to tax implications that might be outside the appraiser's expertise.

### 689 **GREEN LEASES**

690 The term "Green Lease" refers to a broad range of real property leases that include language  
691 addressing sustainability and green building criteria, including the operation of a green building.  
692 They differ from conventional leases in the manner in which certain lease rights and  
693 responsibilities are aligned, particularly relating to energy and resource use. A primary feature  
694 of a green lease addresses expense allocations between tenant and landlord. It may include  
695 language, in the body of the lease or as attachments, that governs the tenant's use of energy  
696 and/or water, the timing of janitorial service, the type of products and equipment used, a  
697 requirement to use ENERGY STAR-labeled office equipment, desk fans, or LED task lighting,  
698 among others. Green lease clauses often address the "split incentive" issue where costs and  
699 benefits are shared by the landlord and the tenant.

### 700 ***Relevance to Appraisers***

701 It is important for the appraiser to consider identifying and discussing these clauses and report  
702 how the lease cost-saving measures will be calculated, as well as their value impact if any.

703 Operational cost savings may be extracted from operating statements, but this is a complex  
704 process. Such savings may be supported by historic operating statements, but ongoing  
705 performance monitoring may be the best strategy to ensure that they will continue. In addition to  
706 energy cost savings, lease terms might address on-site power systems (solar PV, fuel cell, co-  
707 generation, etc.) impacting the tenant's utility costs such as a Power Purchase Agreement or a  
708 PACE obligation on the tax bill.

709 There is a growing body of standardized green lease clauses. For information on the GSA's  
710 Green Lease Policies and Procedures, visit <http://www.gsa.gov/portal/content/103656>. For  
711 information on New York City's Energy Aligned Lease Clause, visit  
712 <http://www.nyc.gov/html/gbee/html/initiatives/clause.shtml>. The green lease library provides a  
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713 centralized site for commercial green leasing resources, including guidance, sample lease forms  
714 and case studies. For more information, visit: <http://www.greenleaselibrary.com> and  
715 <http://www.greenleaselibrary.com/green-lease-leaders.html>.

## Section III: USPAP Considerations

### 716 USPAP RULES AND STANDARDS

717 All USPAP sections relevant to the valuation of green and/or energy-efficient buildings must be  
718 considered in assignments where the scope of work dictates that such analysis is necessary for  
719 credible results.

720 Under the COMPETENCY RULE, appraisers must:

721 • ***Properly identify the problem to be addressed in markets where green features could***  
722 ***influence market value:*** Appraisers should be able to recognize green buildings and green  
723 features in conventional buildings in order to determine and perform the appropriate scope of  
724 work, conduct relevant market research, and use appropriate valuation methodologies. Green  
725 buildings and features are sometimes difficult to distinguish from conventional buildings and  
726 features. Appraisers must have enough basic competency to know whether or not the  
727 property being appraised requires specialized knowledge of green buildings.

728 • ***Have or be able to acquire the knowledge and experience to complete the assignment***  
729 ***competently:*** When appraising green buildings, appraisers must possess or take steps to gain  
730 the necessary knowledge and experience required to competently value green buildings and  
731 conventional buildings with green and/or energy-efficient features. Like any other property  
732 type or property characteristic, competence mandates that the appraiser be adequately  
733 familiar with the asset type/features, as well as the appropriate and most widely-used  
734 valuation techniques for the particular property/features. Potential scenarios where  
735 appraisers may encounter difficulty can occur in the following cases:

- 736 ○ The appraiser lacks competency to define an appropriate scope of work; and/or  
737 ○ The appraiser does not have adequate knowledge and experience to reach a credible value  
738 conclusion.

### 739 ***Insufficient Knowledge and Experience***

740 The following are examples of potential issues that can occur in the valuation of green buildings:

- 741 • *Assigning value, or no value, to green components without market support.*  
742 • *Assuming impacts on value that may not be market-supported.* Appraisers unfamiliar with  
743 green building concepts, features and practices may incorrectly assume that value impacts  
744 will be obvious in the comparable data, when, in fact, many data service providers do not  
745 specifically identify green features or labels.



746 • *Overlooking green features.* Appraisers may fail to observe green features in the appraisal  
747 because they either do not know how to address them, or simply fail to note their existence.  
748 Such oversight could result in an error of omission. Many green characteristics are virtually  
749 invisible on a typical inspection, such as high-performance glazing, above-standard  
750 insulation, energy-efficient lighting, motion- and daylight-responsive lighting controls, or  
751 BAS/BMS. Competent appraisers can be expected to know what to look for and what  
752 questions to ask to avoid missing relevant features.

753 If the market places a greater emphasis on green characteristics such as energy efficiency, or  
754 the air quality of the interior environment, the potential impact on the existing, conventional  
755 buildings is obsolescence – the brown discount. Green features such as solar panels, low-  
756 flow water fixtures, and energy-efficient lighting are also found in older buildings which  
757 have been renovated or retrofitted. Unless appraisers have a fundamental understanding of  
758 green building concepts and practices, and study market behavior relating to these features,  
759 appraisers risk missing or misapplying important adjustments to the comparables. As is the  
760 case in any appraisal, applying random or unsupported percentage or dollar adjustments to  
761 the comparable properties may not yield credible results.

762 • *Utilizing unsupported or inappropriate adjustments.* As with any other building feature,  
763 adjustments for green building features, labels and certifications require market support.  
764 These adjustments may be derived from conventional paired-sales/rent analysis, or from  
765 other sources including market interviews and/or applicable secondary data sources such as  
766 studies and third-party research. However, appraisers applying an across-the-board  
767 adjustment to the comparable properties based on a dollar amount that is not market-derived,  
768 or random/unsupported percentage adjustments for green features and characteristics, face  
769 the same competency risk as do appraisers who apply unsupported or inappropriate  
770 adjustments for other, more conventional features.

771 When considering adjustments to the comparables in the valuation process, appraisers must  
772 subject green feature adjustments to the same rigor of analysis as any other adjustment.  
773 Adjustments must remain consistent with appraisal theory, and must be supportable by  
774 observations of market behavior including, but not limited to, sale and lease comparable data. In  
775 cases where there is a lack of appropriate transaction data, sufficient interviews with  
776 knowledgeable local market participants are needed to reach reasonable adjustments. The  
777 following are examples of unsupported or inappropriate adjustments:

- 778 • Using a multiplier for energy-efficiency savings without adequate market research and  
779 support;
- 780 • Applying a fixed percentage premium for green certification, based solely on the industry-  
781 reported cost premium over a code-built structure. This should not be done without  
782 independently investigating if the cost premium is accurate and relevant to the specific  
783 market, and whether or not market participants are using this as a basis of  
784 comparison/adjustment;

- 785 • Assuming the market reaction, if any, to green or energy-efficiency features is the same for  
786 different geographic areas (such as Northeast vs. West Coast, Central California vs. Coastal  
787 California, urban vs. suburban). This also applies to different market segments (such as  
788 commercial vs. residential, high-end residential vs. entry level, Class A office vs. Class B  
789 office);
- 790 • Using methods and/or analytical approaches that are inconsistent with established appraisal  
791 theory and practice, and therefore raise competency concerns, just as they would if applied to  
792 conventional features;
- 793 • Using an inappropriate assumption of superadequacy when the appraiser encounters a new  
794 technology or improvement that he/she is not familiar with; and
- 795 • Assuming that the market will react the same way it did the last time the appraiser worked in  
796 that market. Market reactions to green building can evolve more rapidly than some  
797 appraisers may be accustomed to, and competent valuation requires the appraiser to stay  
798 informed and aware of all relevant market trends.

### 799 **INFLUENCE OF BIAS**

800 Good ethical business practice and an appraiser’s professional reputation are centered on the  
801 assumption of objectivity – that the appraiser will render an objective value opinion free of bias.  
802 Further, performing an assignment with bias is a clear violation of the USPAP ETHICS RULE,<sup>8</sup>  
803 which states, in part:

804 “An appraiser must not perform an assignment with bias.” USPAP defines bias as: “a  
805 preference or inclination that precludes an appraiser’s impartiality, independence, or  
806 objectivity in an assignment.”<sup>9</sup>

807 Some level of skepticism and resistance to new concepts and market influences is normal and a  
808 healthy part of the valuation process when dealing with new property types and market  
809 influences. However, when resistance to new ideas or approaches persists in spite of changing  
810 market norms, the appraiser’s objectivity may become compromised. Bias may result when  
811 objectivity is compromised. Examples of bias include:

- 812 • *Assuming the market doesn’t care, so why should the appraiser?* Appraisers may misjudge or  
813 intentionally refuse to conduct the necessary market research to render an appropriate  
814 judgment on the degree to which the market has incorporated sustainability into its market  
815 value decision matrix. As a result, they miss the value the market may assign to green  
816 labels, energy-efficiency ratings, green features and sustainable building practices. Given  
817 that appraisers need to properly identify all relevant physical characteristics of a property,  
818 they may not simply “ignore” a green certification or green features just because the  
819 borrower or property owner does not volunteer such information. Appraisers are required to  
820 perform a level of due diligence that is necessary to produce credible assignment results.

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<sup>8</sup> Uniform Standards of Professional Appraisal Practice (USPAP) – 2014-15 edition, (Washington, D.C.: The Appraisal Foundation, 2014), U-7.

<sup>9</sup> Ibid, U-2.

821 • *Assuming that all green building benefits accrue only to the public or environment.* Green  
822 buildings and green features often cause non-economic impacts. Such impacts may create  
823 positive or negative influence on market value. Energy savings, water savings, and the  
824 potential for higher rents are examples of direct impacts that may positively impact the  
825 economic bottom line. Indirect impacts might include improvement to the interior  
826 environment (air quality and daylight) that can improve productivity and tenant satisfaction –  
827 leading to improved tenant retention and lower turnover costs. Green-certified buildings are  
828 often subjected to added inspections and performance testing, with greater attention to  
829 durability.

830 • *Assuming that green characteristics and/or certifications always add value.* Appraisers  
831 should not assume that all green building certifications and green building features add value,  
832 without adequately analyzing the full spectrum of value impacts or conducting adequate  
833 market research to support that contention.

#### 834 **EXPECTATIONS FOR APPRAISERS/THRESHOLDS FOR COMPETENCE**

835 Determining the minimum threshold for core competency will depend to some degree on  
836 property type, geography, time, and the intended use of the appraisal opinions and conclusions.  
837 However, while the level of rigor expected of an appraiser may vary, the basic criteria to judge  
838 competency for a green property follows the same steps that apply to any appraisal assignment:  
839 problem definition and identification, research and analysis, and development and reporting of  
840 the value.

841 ***For example, in an assignment to appraise a residential or commercial green***  
842 ***building, an energy-efficient property, or a conventional property with***  
843 ***green/energy-efficient features, the appraiser’s competency for the particular***  
844 ***assignment may be determined based on the appraiser’s ability to accurately:***

845 • ***identify the subject property’s characteristics that would cause it to be***  
846 ***classified as green or energy efficient (applies to both green buildings and***  
847 ***conventional buildings with green features);***

848 • ***verify these characteristics through documentation and information available***  
849 ***for the type of characteristic with an emphasis on third-party verification;***

850 • ***analyze the market to determine if these characteristics contribute to market***  
851 ***value; and***

852 • ***develop and report a credible opinion of value for the subject property.***

853 The following bullet points provide specific examples of possible factors to consider for both  
854 residential and commercial appraisers when valuing green buildings, energy-efficient buildings,  
855 conventional buildings with green or energy-efficient features and conventional buildings in  
856 predominantly green markets:

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- 857 • Determine an appropriate scope of work to address the green, energy efficient, or sustainable  
858 features in the subject property, in the context of the market attitudes, client requirements,  
859 intended use of the assignment results, and the intended user(s) of the report.
- 860 • Collect, verify, and analyze relevant green and energy-efficient characteristics from data  
861 services (such as MLS, CoStar, Loopnet) related to the subject property and comparable sales  
862 while recognizing that such data services may not specifically note green features,  
863 certifications, labels, and energy scores. Appraisers may be required to move beyond  
864 traditional data sources like MLS for information on certifications, labels, third-party  
865 verifications, and specific green/energy-efficient features.
- 866 • Understand the difference between an energy-efficiency score (ENERGY STAR for  
867 commercial buildings or HERS for homes) and a sustainability-based green building  
868 certification/label (such as LEED or NGBS), and the implications for valuation.
- 869 • Understand the dominant green building rating system for the market and property type being  
870 appraised. Be aware of the differences between the various green building rating systems in  
871 terms of metrics (what it measures), rigor (how it measures), whether it is self- or third-party  
872 certified, and whether it is performance/operations-based (such as LEED EBOM) or  
873 design/asset based (LEED Core & Shell, LEED New Construction, etc.).
- 874 • Recognize that green building certifications and energy scores are time sensitive, and the  
875 relevance/reliability of a rating or certification may diminish as time passes. Properties may  
876 need to be re-certified or re-rated due to changes in: 1) the rating system, 2) the structure,  
877 and/or 3) the occupancy or manner in which it is used or operated.
- 878 • Summarize or state (based on the reporting option utilized) the relevance, if any, to market  
879 value of any green labels/certifications and/or energy-efficiency scores/labels as well as  
880 energy efficient or green building features in the appraisal report.
- 881 • Appropriately analyze in the development process, and disclose in the report, the degree of  
882 value impact, if any, of the label, certification or green and energy-efficient characteristics of  
883 the property (includes green or energy-efficient features in conventional buildings).
- 884 • Read, analyze and appropriately consider in the valuation the impact, if any, of any building  
885 performance assessments, audits, or energy-efficiency reports available for the property.
- 886 • Gain access to and appropriately employ the “green section” of popular building costs  
887 estimator services. Understand that in areas with green building codes, the marginal costs of  
888 green and energy-efficient buildings may or may not be included in costs from manuals or  
889 other sources. The appraiser should verify if these costs are included before use.
- 890 • Be aware of the cost/value implications of integrated design and integrated systems.  
891 Integrated design and systems integration (synergies) can result in cost savings that may  
892 offset added costs of green features. These cost interactions may not be reflected in the  
893 recognized cost manuals.
- 894 • Possess baseline knowledge of energy efficiency, green building and sustainability concepts,  
895 technologies, and building features sufficient to differentiate between properties that are  
896 considered green, and/or energy efficient and those that are not.

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- 897 • Be aware of, and monitor, market behaviors and attitudes relating to sustainability, green  
898 building and energy efficiency, which may include primary research (observation,  
899 interviews, surveys) as well as secondary research (publications, studies, published research.)
- 900 • Conduct an appropriate level of market research and analysis to support the market’s  
901 willingness to pay for energy efficiency and other green building features.
- 902 • Appropriately analyze, discuss and report the degree of value impact and capitalization, if  
903 any, of on-site generating assets and attributable revenue (for instance, renewable energy  
904 credits).
- 905 • Explain, describe and cite the relevance, if any, to market value of any transferable obligation  
906 which encumbers the property (i.e., leased solar panel system).
- 907 • In addition, residential appraisers may be expected to:
- 908 ○ Understand the HERS Index Rating or similar energy-efficiency scoring metric that is  
909 predominant in the market and know where to obtain this data for the subject and  
910 comparable properties.
- 911 ○ Report energy efficient or green features and the methods used to analyze value in that  
912 particular market within the appraisal report.
- 913 ○ Appropriately consider potential operating cost savings which may result from energy-  
914 efficiency upgrades in the valuation process. Conduct adequate market research to  
915 support applicable market-derived adjustments to a gross rent multiplier, discounted cash  
916 flow analysis, or similar income-based valuation techniques.
- 917 In order to meet the above criteria, appraisers who work in markets where green and/or high  
918 performance building features are prevalent may need to more fully understand the meaning and  
919 implications of selected key terms and concepts. Many of these terms are included in the  
920 following section titled “Glossary of Key Terms and Acronyms.”

## Section IV: Glossary of Key Terms and Acronyms

921 NOTE: If a link provided in the “Glossary of Key Terms” or in the “Addendum: Selected  
922 Resources” doesn’t work, please paste the web address into your browser or Google link.

### 923 GLOSSARY OF KEY TERMS

924 **American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)**  
925 - A building technology society focused on building systems, energy efficiency, indoor air  
926 quality, refrigeration and sustainability within the industry. (Derived from  
927 <https://www.ashrae.org>)

928 **Appraisal Management Company (AMC)** - An entity that serves as an intermediary  
929 between appraisers and lenders and provides appraisal management services. (Derived from  
930 <http://www.federalreserve.gov>)

931 **Brown Discount** - The concept that properties which do not meet market expectations for  
932 energy efficiency and sustainability may sell, rent or lease at a lower price. (Derived from  
933 <http://gislab.wharton.upenn.edu>; <http://www.architectsjournal.co.uk>)

934 **Building Automation System (BAS)** - A computer-based control system installed in  
935 buildings that controls and monitors its mechanical and electrical equipment such as  
936 ventilation, lighting, power systems, fire systems, and security systems. (Derived from  
937 <http://www.gsa.gov>)

938 **Building Commissioning** – An intensive quality assurance process that begins during  
939 building design and continues through construction, occupancy, and operations. (Derived  
940 from <http://www.cacx.org>)

941  
942 **Building Energy Asset Score** - A national standardized tool for assessing the physical and  
943 structural energy efficiency of commercial and multifamily residential buildings on a 10-  
944 point scale. The Asset Score generates a simple energy-efficiency rating that enables  
945 comparison among buildings and identifies opportunities to invest in energy-efficiency  
946 upgrades. (Derived from: <http://energy.gov/eere/buildings/building-energy-asset-score>)

947  
948 **Building Envelope or Building Enclosure** - The building’s thermal barrier isolating the  
949 interior conditioned space from the exterior environment, consisting of roof, walls, exterior  
950 doors, windows, foundation and other sealing barriers. (Derived from  
951 <http://www.greenresourcecouncil.org/green-resources/green-building-glossary>)

952 **Building Management System (BMS)** - See Building Automation System.

953 **Building Performance Assessment (BPA)** - An energy audit that provides objective and  
954 quantified measurements of a building's performance including energy, lighting, thermal  
955 comfort and maintenance. (Derived from <http://www.gsa.gov>)

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956 **Energy Audit** - An assessment of how much energy a building consumes and what steps can  
957 be taken to improve its energy efficiency. (Derived from <http://energy.gov>)

958 **Energy Efficiency Mortgages (EEM)** - A mortgage that credits a home's energy efficiency  
959 in the mortgage itself. EEMs give borrowers the opportunity to finance cost-effective,  
960 energy-saving measures as part of a single mortgage. (Derived from <http://hud.gov>)

961 **Energy Modeling** - A computer program to model energy flows within and throughout a  
962 structure. It uses computer-based tools to simulate a building's energy use throughout an  
963 entire year of operation. (Derived from <http://www.buildinggreen.com>)

964 **ENERGY STAR** - A standard for energy-efficient consumer products originated in the  
965 United States. It is also a benchmarking process that reveals how a building's energy  
966 consumption compares to that of similar buildings of the same space type – based on a  
967 national average. (Derived from <http://www.energystar.gov>)

968 **Energy Use Intensity (EUI)** - A benchmark expressing a building's energy use. Energy per  
969 square foot per year; calculated by dividing the total energy consumed by the building in one  
970 year by the total gross floor area of the building. (Derived from <http://www.energystar.gov>)

971 **Energy-Efficiency Rating Systems** - A rating system designed to evaluate buildings solely  
972 on energy efficiency. These are different than green building rating systems which rate a  
973 building across multiple aspects of sustainability-related criteria. (Derived from  
974 <http://www.epa.gov>)

975 **Green Building** – (verb) - The practice of creating structures and using processes that are  
976 environmentally responsible and resource-efficient throughout a building's life cycle from  
977 siting to design, construction, operation, maintenance, renovation and deconstruction. (noun)  
978 - A structure with sustainability related features. (Derived from <http://www.epa.gov>)

979 **Green Globes** - An online green building rating and certification tool that is used primarily  
980 in the United States and Canada. (Derived from <http://www.thegbi.org>)

981 **Green Lease** - Real property leases that include language addressing sustainability and green  
982 building criteria, primarily relating to the operation of a green building. A green lease aligns  
983 the financial and energy incentives of building owners and tenants to save money, conserve  
984 resources, and ensure the efficient operation of buildings. (Derived from  
985 <http://www.greenleaselibrary.com>)

986 **Greenhouse Gas Emissions (GHGs)** - Emitted gases that trap heat from the sun and warm  
987 the planet's surface. The majority are related to energy consumption, and most of those are  
988 comprised primarily of carbon dioxide. (Derived from <http://www.epa.gov>)

- 989 **High Performance Building** - A building that integrates and optimizes on a life cycle basis  
990 all major high performance attributes, including energy [and water] conservation,  
991 environment, safety, security, durability, accessibility, cost-benefit, productivity,  
992 sustainability, functionality, and operational considerations. (Derived from  
993 <http://www.gpo.gov>; Energy Independence and Security Act 2007 401 PL 110-140)
- 994 **Home Energy Rating System (HERS)** - A nationally-recognized scoring system that  
995 measures a home's energy performance. Based on the results, an energy-rated home will  
996 receive a HERS Index Score. (Derived from <http://www.resnet.us>)
- 997 **Home Energy Scoring Tool** – A national standardized rating system that places a home on a  
998 10-point scale. It reflects the level of energy efficiency of a home's fixed assets (e.g.,  
999 envelope and major equipment), while controlling in occupant-varying influences. (Derived  
1000 from <http://homeenergyscore.gov>)
- 1001 **HUD PowerSaver** - A special loan program that allows homeowners to make energy-saving  
1002 changes, including the installation of insulation, water heaters, new windows, and solar  
1003 panels. (Derived from <http://www.energy.gov>; <http://www.fha.com>)
- 1004 **Indoor Environmental Quality/Indoor Air Quality (IEQ/IAQ)** - The conditions inside a  
1005 building – air quality, lighting, thermal conditions, ergonomics – and their effects on its  
1006 occupants or residents. (Derived from <http://www.usgbc.org>)
- 1007 **Integrated Design Process (IDP)** - Involves multiple areas of a project working together  
1008 from the start towards one major goal. In regards to green building, this approach is  
1009 commonly taken to allow a building to achieve maximum efficiency, lower costs, and  
1010 increase overall performance. (Derived from <https://www.go-gba.org>)
- 1011 **Leadership in Energy and Environmental Design (LEED)** - Rating systems for the design,  
1012 construction, operation, and maintenance of green buildings, homes and neighborhoods.  
1013 (Derived from <http://www.usgbc.org>)
- 1014 **LEED Certification** - A certification for a building that satisfies the prerequisites of the  
1015 LEED rating system for the design, construction, operation and maintenance, and energy  
1016 efficiency. (Derived from <http://www.usgbc.org>)
- 1017 **LEED Existing Buildings Operation and Maintenance (EBOM)** - A third-party (LEED)  
1018 rating and certification system for existing buildings. Buildings are evaluated for  
1019 sustainability, energy efficiency, indoor air quality, etc. (Derived from  
1020 <http://www.usgbc.org>)
- 1021 **Light-Emitting Diode (LED)** - A semiconductor diode that emits light when a voltage is  
1022 applied to it and that is used especially in electronic devices. It is significantly more efficient  
1023 than incandescent lighting. (Derived from <http://www.businessdictionary.com>)



- 1024 **Living Building Challenge** - A performance-based green building certification program  
1025 sponsored by the International Living Future Institute. (Derived from [http://living-  
future.org](http://living-<br/>1026 future.org))
- 1027 **National Green Building Standard (NGBS)** – ANSI-approved residential green rating  
1028 system developed by the National Association of Home Builders and the International Code  
1029 Council. NGBS Green certification is issued by Home Innovation Research Labs. (Derived  
1030 from [www.homeinnovation.com/Green](http://www.homeinnovation.com/Green))
- 1031 **National Renewable Energy Laboratory (NREL)** - The U.S. Department of Energy's  
1032 primary national laboratory for renewable energy and energy-efficiency research and  
1033 development. (Derived from <http://www.nrel.gov>)
- 1034 **Net Zero Energy (NZE)** - A building where the total amount of energy used by the building  
1035 on an annual basis is roughly equal to the amount of energy created on the site. (Derived  
1036 from <http://www.nrel.gov>)
- 1037 **Passive House Institute US** - A program that certifies buildings based on specific  
1038 performance criteria including ultra-low energy use and airtight building envelope integrity.  
1039 (Derived from <http://www.nrel.gov>)
- 1040 **Passive Housing** - A comprehensive system working with natural resources (instead of  
1041 relying predominantly on ‘active’ systems) to reduce energy consumption. (Derived from  
1042 <http://www.phius.org>; <http://www.passipedia.org>)
- 1043 **Portfolio Manager Tool** - An online tool from the EPA used to measure and track energy  
1044 and water consumption, as well as greenhouse gas emissions. (Derived from  
1045 <http://www.energystar.gov>)
- 1046 **Property Assessed Clean Energy (PACE)** - A program to finance energy efficiency and  
1047 renewable energy upgrades to buildings. It is typically repaid as a property tax assessment  
1048 for up to 20 years. (Derived from <http://pacenow.org>)
- 1049 **Residential Energy Services Network (RESNET)** - An independent, non-profit  
1050 organization to help homeowners reduce the cost of their utility bills by making their homes  
1051 more energy efficient. (Derived from <http://www.resnet.us>)
- 1052 **Sandia Lab PV Value** - Online calculators to determine present value of solar PV. (Derived  
1053 from <http://www.pvvalue.com>)
- 1054 **Solar Photovoltaic Systems (Solar PV)** - A system designed to supply power utilizing solar  
1055 panels to absorb and directly convert sunlight into electricity. (Derived from  
1056 <http://www.nrel.gov>)

- 1057 **Solar Thermal Systems (STE)** - A technology for harnessing solar energy for thermal  
1058 energy (heat). (Derived from <http://energy.gov>)
- 1059 **Sustainability** - Sustainability is based on a simple principle: Everything needed for survival  
1060 and well-being depends, either directly or indirectly, on the natural environment.  
1061 Sustainability creates and maintains the conditions under which humans and nature can exist  
1062 in productive harmony, that permit fulfilling the social, economic and other requirements of  
1063 present and future generations. (Derived from <http://www.epa.gov>)
- 1064 **Sustainable Building** - A structure that is environmentally responsible and resource efficient  
1065 throughout a building's life cycle: from siting to design, construction, operation,  
1066 maintenance, renovation, and demolition. Also known as "high performance" or "green  
1067 building." (Derived from <http://www.gsa.gov>; <http://www.epa.gov>; <http://www.wbdg.org>)
- 1068 **Triple Bottom Line** - An accounting framework with three parts: social, environmental (or  
1069 ecological), and financial. These three divisions are also called the three Ps: People, Planet  
1070 and Profit, or the "three pillars of sustainability". (Derived from  
1071 <http://www.ibrc.indiana.edu>; <http://www.investopedia.com>)
- 1072 **U.S. General Services Administration (GSA)** - A U.S. Agency that provides workplaces by  
1073 constructing, managing, and preserving government buildings and by leasing and managing  
1074 commercial real estate. (Derived from <http://www.gsa.gov>)
- 1075 **WaterSense program** - An EPA program that seeks to protect the future of the nation's  
1076 water supply by offering people a simple way to measure the water efficiency of products  
1077 and homes. (Derived from <http://www.epa.gov>)

## ACRONYMS

- 1078      **ASHRAE** - American Society of Heating, Refrigeration and Air Conditioning Engineers
- 1079      **AMC** - Appraisal Management Company
- 1080      **BAS** - Building Automation System
- 1081      **BMS** - Building Management System
- 1082      **BPA** - Building Performance Assessment
- 1083      **EEM** - Energy Efficiency Mortgages
- 1084      **EUI** - Energy Use Intensity
- 1085      **EBOM** - Existing Buildings Operation and Maintenance
- 1086      **GHGs** - Greenhouse Gas Emissions
- 1087      **GSA** - U.S. General Services Administration
- 1088      **HERS** - Home Energy Rating System
- 1089      **IEQ/IAQ** - Indoor Environmental Quality/Indoor Air Quality
- 1090      **IDP** - Integrated Design Process
- 1091      **kBTU** - Kilo British Thermal Unit
- 1092      **kWh** - Kilowatt Hour
- 1093      **LEED** - Leadership in Energy and Environmental Design
- 1094      **LED** - Light-Emitting Diode
- 1095      **NGBS** – National Green Building Standard
- 1096      **NREL** - National Renewable Energy Laboratory
- 1097      **PACE** - Property Assessed Clean Energy
- 1098      **RESNET** - Residential Energy Services Network
- 1099      **Solar PV** - Solar Photovoltaic Systems

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## Section V: Addendum: Selected Resources

NOTE: It is acknowledged that the lists below are incomplete, but are provided as a starting point to discover the expanding universe of information related to green/high performance property. Additional links are also provided in the Glossary section. These links were operational at the time of publication, but they may have been changed or removed over time. If this has occurred, please search for current operational links.

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### INTERNET RESOURCES

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#### **Energy Efficiency Rating Systems, Scores and Certifications**

1102

- Appraisal Institute Residential Green and Energy Efficient Addendum (form 820.04): <http://www.appraisalinstitute.org/assets/1/7/Interactive820.04ResidentialGreenandEnergyEfficientAddendum.pdf>

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- Appraisal Institute Commercial Green and Energy Efficient Addendum: [http://www.appraisalinstitute.org/assets/1/29/AI\\_821\\_Green\\_Commercial\\_Interactive.pdf](http://www.appraisalinstitute.org/assets/1/29/AI_821_Green_Commercial_Interactive.pdf)

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- EPA ENERGY STAR (ENERGY STAR for Homes and EPA Portfolio Manager for Commercial): <http://www.energystar.gov/>

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- Energy Information Administration (EIA): <http://www.eia.gov/consumption/commercial/>

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- The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy: <http://www.eere.energy.gov/>

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1112

- Institute for Market Transformation energy use disclosure law summary website: <http://www.imt.org/resources/detail/guide-to-state-and-local-energy-performance-regulations-version-3.0>

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- The U.S. Department of Energy's Building Performance Database: <http://energy.gov/eere/buildings/building-performance-database>

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1117

- Lawrence Berkeley National Laboratory's Energy IQ web-based tool: <http://EnergyIQ.lbl.gov>

1118

1119

- The U.S. Department of Energy's Building Energy Asset Score for commercial buildings: <http://energy.gov/eere/buildings/building-energy-asset-score>

1120

1121

- Standardization Roadmap, Energy Efficiency in the Built Environment, June 2014: <http://www.ansi.org>

1122

1123

- Energy Efficiency Standardization Coordination Collective, American National Standards Institute: [http://www.ansi.org/standards\\_activities/standards\\_boards\\_panels/eesc/overview.aspx?menuid=3](http://www.ansi.org/standards_activities/standards_boards_panels/eesc/overview.aspx?menuid=3)

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1125

1126

- Sustainable SITES Initiative: <http://www.sustainablesites.org/>

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- 1127 • The Database of State Incentives for Renewables & Efficiency: <http://www.dsireusa.org>
- 1128 • Sandia National Laboratories PV Value Tool: <http://www.pvvalue.com> or
- 1129 [www.energy.sandia.gov](http://www.energy.sandia.gov)

1130 **Residential Rating Systems, Scores and Certifications**

- 1131 • NGBS Certification Activity: <http://www.homeinnovation.com/ngbsgreenstats>
- 1132 • National Green Building Standard (NGBS): <http://www.homeinnovation.com/green>
- 1133 • RESNET/Home Energy Rating System (HERS): <http://resnet.us/> and
- 1134 <http://www.energy.ca.gov/HERS/>
- 1135 • Home Energy Score: <http://www1.eere.energy.gov/buildings/residential/hesindex.html>
- 1136 • Build it Green (GreenPoint Rated): <http://www.greenpointrated.com>
- 1137 • Fannie Mae Green Initiative (especially Green Initiatives Resources):
- 1138 <https://www.fanniemae.com/multifamily/green-initiative>
- 1139 • American Society of Heating, Refrigeration & Air Conditioning Engineers (ASHRAE):
- 1140 [www.ashrae.org/greenstandard](http://www.ashrae.org/greenstandard)
- 1141 • Living Building Challenge and International Living Future Institute (ILFI): [http://living-](http://living-future.org/lbc)
- 1142 [future.org/lbc](http://living-future.org/lbc)
- 1143 • National Association of Realtors Green Multiple Listing Service Implementation Guide, v
- 1144 1.0, May 2014: <http://www.greenthemls.org>
- 1145 • ENERGY STAR: <http://www.energystar.gov>

1146 **Commercial Rating Systems, Scores and Certifications**

- 1147 • The U.S. Department of Energy’s Building Energy Asset Score for commercial buildings:
- 1148 <http://energy.gov/eere/buildings/building-energy-asset-score>
- 1149 • U.S. Green Building Council (LEED): <http://usgbc.org> (especially Resources), also
- 1150 <http://gbig.org>
- 1151 • Green Building Initiative (Green Globes): <http://www.thegbi.org> (In the United States)
- 1152 • New Buildings Institute: <http://newbuildings.org/>
- 1153 • Passive House Institute US:
- 1154 <http://www.passivehouse.us/passiveHouse/PassiveHouseInfo.html>
- 1155 • Passivhaus Institut: <http://passiv.de/en/>
- 1156 • LEED: <http://www.usgbc.org>
- 1157 • Green Globes: <http://www.greenglobes.com> (Green Globes in Canada)
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1159 **Building Codes**

- 1160 • International Green Construction Code (IgCC):  
1161 <http://www.iccsafe.org/cs/igcc/pages/default.aspx>
- 1162 • ASHRAE Green Standard 189.1 (Standard for the Design of High-Performance, Green  
1163 Buildings): <https://www.ashrae.org/resources--publications/bookstore/standard-189-1>

1164 **PUBLICATIONS**

1165 Below are suggested sources; individual articles may be found on the subject from these various  
1166 publications:

- 1167 • Colorado Energy Office, An Early Look at Energy Efficiency and Contributory Value,  
1168 February 2015 [www.colorado.gov](http://www.colorado.gov)
- 1169 • An Introduction to Green Homes, Appraisal Institute, 2010
- 1170 • Residential Green Valuation Tools, Appraisal Institute, 2014
- 1171 • Colorado Energy Office, The Impact of Photovoltaic Systems on Market Value and  
1172 Marketability, May 2013 [www.colorado.gov](http://www.colorado.gov)
- 1173 • Green Builder magazine (residential) <http://www.greenbuildermedia.com/magazine>
- 1174 • Journal of Sustainable Real Estate (JOSRE) [www.josre.org](http://www.josre.org)
- 1175 • Journal of Green Building <http://www.collegepublishing.us/journal.htm>
- 1176 • Hoen, B., R. Wiser, P. Cappers and Mark Thayer, An Analysis of the Effects of Residential  
1177 Photovoltaic Energy Systems on Home Sales Prices in California, Lawrence Berkeley  
1178 National Laboratory Environmental Energy Technologies Division, April 2011  
1179 <http://emp.lbl.gov/sites/all/files/lbnl-4476e.pdf>
- 1180 • Muldavin, Scott, Value Beyond Cost Savings, Green Building Finance Consortium:  
1181 <http://www.greenbuildingfc.com/>
- 1182 • Pivo, G. and J. Fisher. Investment Returns from Responsible Property Investments: Energy  
1183 Efficient, Transit-oriented and Urban Regeneration Office Properties in the U.S. from 1998–  
1184 2008. Working Paper, Responsible Property Investing Center, Boston College, University of  
1185 Arizona Benecki Center for Real Estate Studies, Indiana University, October 11, 2008,  
1186 revised March 3, 2009 <http://kelley.iu.edu/bcres/files/research/PivoFisher10-10-08.pdf>
- 1187 • Runde, Timothy and Thoyre, Stacey, Integrating Sustainability and Green Building into the  
1188 Appraisal Process, Journal of Sustainable Real Estate (JOSRE) Vol 2, No. 1, 2010.  
1189 [http://www.josre.org/wp-content/uploads/2012/09/Sustainability\\_and\\_Green\\_Building\\_Into  
1190 Appraisal\\_Process-JOSRE\\_v2-11.pdf](http://www.josre.org/wp-content/uploads/2012/09/Sustainability_and_Green_Building_Into_Appraisal_Process-JOSRE_v2-11.pdf)
- 1191 • Chappell, Theddi Wright and Corps, Chris. High Performance Green Building: What's it  
1192 Worth? Cascadia Region Green Building Council, May 2009.  
1193 [http://living-future.org/sites/default/files/HighPerfGB\\_ValuationStudy.pdf](http://living-future.org/sites/default/files/HighPerfGB_ValuationStudy.pdf)

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1194

## **EDUCATIONAL RESOURCES**

- 1195 • Appraisal Institute Courses: <http://www.appraisalinstitute.org/education/green/>
- 1196 ○ Introduction to Green Buildings: Principles & Concepts
- 1197 ○ Case Studies in Appraising Green Residential Buildings
- 1198 ○ Case Studies in Appraising Green Commercial Buildings
- 1199 ○ Residential and Commercial Valuation of Solar
- 1200 • Appraisal Institute's Valuation of Sustainable Buildings Professional Development Program:  
1201 <http://www.appraisalinstitute.org/education/green/downloads/green-faqs.pdf>
- 1202 • Earth Advantage Courses: <http://www.earthadvantage.org/education/>
- 1203 ○ Appraising Green Homes: Construction Methods & Trends
- 1204 ○ Appraising Green Homes: Valuation Techniques
- 1205 ○ Appraising Green Homes: Advanced Application
- 1206 • Earth Advantage's Accredited Green Appraiser (AGA) program:  
1207 ○ <http://www.earthadvantage.org/education/accredited-green-appraiser-aga>
- 1208 • SEEC, LLC Courses: <http://www.seecsolutions.com>
- 1209 ○ Appraising Energy Efficiency in New Homes and Retrofits (Webinar)
- 1210 ○ Green Home Trends and Appraisal Methodologies (Live Class)
- 1211 ○ Green Building – The Marketing Advantage (Live Class)
- 1212 ○ Energy Performance Scores – Valuing Energy Improvements (Live Class)
- 1213 ○ Navigating Green Fields Within the MLS Form (Live Class)
- 1214 ○ Getting the Most Out of a Green Appraisal (Live Class)
- 1215 ○ Indoor Air Quality for Real Estate Professionals (Live Class)
- 1216 ○ Green Building – An Emerging Sector in Residential Appraisal (Live Class)
- 1217 ○ Comparing High Performance Heating Choices for Home Upgrades (Live Class)
- 1218 ○ Water Conservation for Real Estate Professionals (1 and 2) (Live Class)
- 1219 ○ Introduction to Residential Green Building – Background and Competency (Live Class)

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