

# BOSTON'S GREEN AFFORDABLE HOUSING PROGRAM: CHALLENGES AND OPPORTUNITIES

*Patricia M. Burke,\* Galen Nelson,† Wilson Rickerson‡*

## I.

### INTRODUCTION

Green building, also known as high performance building or sustainable building, describes a comprehensive approach to designing, constructing, and renovating buildings that prioritizes human health, water and energy efficiency, environmental sustainability, and resource conservation.<sup>1</sup>

Green building has become a policy priority around the United States and there have been a series of high-profile green building incentives or requirements enacted through legislation, executive order,

---

\* LEED AP; B.A., University of Massachusetts at Amherst, 1998. Ms. Burke is a consultant to the City of Boston's Department of Neighborhood Development, where she is developing and administering the city's Green Affordable Housing Program with the co-authors. The authors wish to thank Sarah Zaphiris and Brad Swing with the City of Boston, John Feuerbach and the staff of the city's Department of Neighborhood Development, and Raphael Herz from the Massachusetts Technology Collaborative for their insights and guidance. Ms. Zaphiris, Policy Advisor, Office of the Mayor, administered the Mayor's Green Building Task Force and continues to manage the Mayor's green building program. Mr. Swing, Director of Energy Policy, City of Boston, created the strategy and secured the grant for the green affordable housing program. Mr. Feuerbach, Senior Development Officer, manages the implementation of the city's Green Affordable Housing Program. Mr. Herz manages the MTC's Green Affordable Housing Initiative. The authors would also like to thank an anonymous foundation for its support of their work under the Green Affordable Housing Program.

† B.A., Colby College, 1992. Mr. Nelson is a Boston-based consultant focusing on the green building market, education, green building strategies, and materials. He managed the construction of the \$1.2 million NEXUS green building resource center in downtown Boston.

‡ MEEP, University of Delaware, 2005; B.A., College of William & Mary, 1999. Mr. Rickerson is a Boston-based consultant focusing on sustainable energy policy and markets.

1. BUILDING DESIGN & CONSTRUCTION, WHITE PAPER ON SUSTAINABILITY: A REPORT ON THE GREEN BUILDING MOVEMENT 4 (2003), available at <http://www.usgbc.org/Docs/Resources/BDCWhitePaperR2.pdf>.

and code amendments during the past few years.<sup>2</sup> At the federal level, ten agencies require or encourage their buildings to meet the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) standard,<sup>3</sup> and a recently introduced bill would require the adoption of green building standards across still more agencies.<sup>4</sup> Around the country, twenty-five states, and at least ninety municipalities, have established green building mandates or ordinances.<sup>5</sup>

This Article explores the process by which green building goals and mandates are implemented at the departmental level. The Article uses the City of Boston's Green Affordable Housing Program (GAHP) as a case study and discusses how the adoption of green mandates by government can affect both market transformation and institutional change. Part II discusses the state and municipal regulatory structures in Boston's green housing development and how they can serve as models for other green housing development. Part III articulates the policy goals and design standards that should be considered with regard to green building in light of Boston's experience with the GAHP.

A. *Environmental and Economic Forces Have Spurred U.S. Green Building*

Rising from near obscurity only fifteen years ago, the green building industry has grown dramatically, fueled by a combination of rising energy costs, an increasingly sophisticated understanding of buildings' environmental impact, government incentives, and a slow but steady embrace by corporate America.<sup>6</sup>

---

2. See U.S. GREEN BLDG. COUNCIL, LEED INITIATIVES IN GOVERNMENTS AND SCHOOLS (2007), available at <https://www.usgbc.org/ShowFile.aspx?DocumentID=691>.

3. See *id.* LEED, a widely recognized green building rating system, rates buildings in five key areas of human and environmental health: sustainable sites, water conservation, energy efficiency, material selection, and indoor air quality. Based on their design, buildings meet one of four certification levels: Certified, Silver, Gold, or Platinum. LEED provides several rating systems tailored to meet the unique challenges and attributes of different building and renovation projects including: New Construction (NC), Existing Building (EB), Commercial Interiors (CI), Core and Shell (CS), Homes (H), and Neighborhood Development (ND). See USGBC: LEED Rating Systems, <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=222> (last visited Jan. 19, 2008).

4. See S. 506, 110th Cong. (2007) (proposing "[t]o improve efficiency in the Federal Government through the use of high-performance green buildings . . .").

5. See U.S. GREEN BLDG. COUNCIL, *supra* note 2.

6. U.S. GREEN BLDG. COUNCIL, BUILDING MOMENTUM: NATIONAL TRENDS AND PROSPECTS FOR HIGH-PERFORMANCE GREEN BUILDINGS 1 (2003), available at [http://www.usgbc.org/Docs/Resources/043003\\_hpqb\\_whitepaper.pdf](http://www.usgbc.org/Docs/Resources/043003_hpqb_whitepaper.pdf). See also BUILDING

There are compelling arguments for reducing the impact of buildings on the environment. The construction and operation of buildings accounts for 37% of all energy use and 68% of all electricity demand in the United States, over 12% of U.S. fresh water supply consumption, and more than 33% of municipal solid waste streams.<sup>7</sup> Global warming, a problem long tied to automobiles, is increasingly being linked to building operation. In fact, building operations are responsible for an estimated 30–40% of global greenhouse gas emissions.<sup>8</sup>

A focus on green building also makes sense from an economic perspective. Though the initial cost of construction—the so-called “green premium”—may be slightly higher than that of conventional buildings,<sup>9</sup> green buildings have lower operating and maintenance expenses. On average, green buildings have 20–50% lower energy bills<sup>10</sup> and significantly lower water expenses.<sup>11</sup> Strategies to achieve these long-term savings are typically identified during the integrated design process,<sup>12</sup> which is central to green building. Unlike a conventional design process, where architects, engineers, designers, builders, and owners fulfill their roles in isolation, integrated design emphasizes a team approach from the outset that involves joint performance goal setting, collaboration, and creative “outside the box” solutions.<sup>13</sup> The savings resulting from integrated design typically outweigh the initial green premium by a significant factor when subjected to cost-benefit analysis. In addition to their well-documented financial benefits, green buildings also have measurably higher levels of indoor environmental quality, which has been linked to higher worker productivity, better student performance, and lower absenteeism.<sup>14</sup>

---

DESIGN & CONSTRUCTION, *supra* note 1, at 4–7 (discussing the history of green building).

7. U.S. GREEN BLDG. COUNCIL, *supra* note 6, at 3.

8. UNITED NATIONS ENV'T PROGRAMME, BUILDINGS AND CLIMATE CHANGE: STATUS, CHALLENGES AND OPPORTUNITIES 1 (2007), available at <http://www.unep.fr/pc/sbc/publications.html>. See also Edward Mazria, *It's the Buildings, Stupid!*, NORTH-EAST SUN, Spring 2007, at 5.

9. U.S. GREEN BLDG. COUNCIL, *supra* note 6, at 1. See also WILLIAM BRADSHAW ET AL., THE COSTS & BENEFITS OF GREEN AFFORDABLE HOUSING 9–10 (2005).

10. See U.S. GREEN BLDG. COUNCIL, *supra* note 6, at 6.

11. See, e.g., BRADSHAW ET AL., *supra* note 9, at 10.

12. U.S. DEP'T OF ENERGY, BLDG. TECHS. PROGRAM, INTEGRATED BUILDING DESIGN FOR ENERGY EFFICIENCY, <http://www.eere.energy.gov/buildings/info/design/integratedbuilding/> (last visited Oct. 22, 2007).

13. *Id.*

14. See William J. Fisk, *Health and Productivity Gains From Better Indoor Environments and Their Relationship with Building Energy Efficiency*, 25 ANN. REV. ENERGY ENV'T 537, 560–61 (2000) (estimating potential annual savings and productivity gains, in 1996 dollars, at between \$40 and \$200 billion); GREG KATS ET AL., THE COSTS AND FINANCIAL BENEFITS OF GREEN BUILDINGS: A REPORT TO CALIFORNIA'S

The economic and environmental case for green building, coupled with other market forces, is driving rapid industry expansion. A recent research study estimated the value of the U.S. green building materials market at \$21.1 billion in 2005 and projected that figure would rise to \$21.9 billion in 2006 and to \$27.9 billion by 2011.<sup>15</sup> The USGBC reported over eighty million square feet of construction projects seeking LEED certification in 2002.<sup>16</sup> By 2006, that figure had jumped to 642 million square feet.<sup>17</sup>

*B. Green Building Strategies can be Effectively Integrated into Affordable Housing Developments*<sup>18</sup>

Although the business and environmental case for market rate and public sector green building has been well documented, the case for integrating green building into affordable housing development had not been clearly established until more recently.<sup>19</sup> Historically, affordable housing development has been characterized by an empha-

---

SUSTAINABLE BUILDING TASK FORCE 55–56 (2003), available at [https://www.usgbc.org/Docs/Resources/CA\\_report\\_GBbenefits.pdf](https://www.usgbc.org/Docs/Resources/CA_report_GBbenefits.pdf). For information on student performance, see GREGORY KATS, GREENING AMERICA'S SCHOOLS: COSTS AND BENEFITS 11–12 (2006), available at <http://www.usgbc.org/ShowFile.aspx?DocumentID=2908>; HMFH ARCHITECTS INC. & VT. ENERGY INV. CORP., THE INCREMENTAL COSTS AND BENEFITS OF GREEN SCHOOLS IN MASSACHUSETTS 9 (2005), available at [http://www.mtpc.org/renewableenergy/green\\_schools/HMFHstudy121905.pdf](http://www.mtpc.org/renewableenergy/green_schools/HMFHstudy121905.pdf). According to the USGBC's LEED rating system, Indoor Environmental Quality (IEQ) includes: ventilation, air quality, thermal comfort, daylight, lighting controllability, temperature controllability, and exterior views. See U.S. GREEN BLDG. COUNCIL, LEED FOR NEW CONSTRUCTION (2007), available at <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220> (follow "Version 2.2 Credit Checklist" hyperlink).

15. BCC RESEARCH, THE U.S. MARKET FOR "GREEN" BUILDING MATERIALS (2006), available at <http://www.bccresearch.com/RepTemplate.cfm?reportID=187&RepDet=HLT&cat=env&target=repdetail.cfm>.

16. Richard L. Schneider, Project Manager/Research Architect, USGBC & LEED, 2007 U.S. Army Corps of Engineers (USACE) Infrastructure Systems Conference 15 (June 27, 2007), available at [http://www.usaceisconf.org/PDF/presentations/June27/SAME6.27.07RichardA/Schneider\\_LEED.pdf](http://www.usaceisconf.org/PDF/presentations/June27/SAME6.27.07RichardA/Schneider_LEED.pdf).

17. *Id.*

18. "The generally accepted definition of affordability is for a household to pay no more than 30 percent of its annual income on housing." Dep't of Housing and Urban Dev. (HUD), Affordable Housing, <http://www.hud.gov/offices/cpd/affordablehousing/index.cfm> (last visited Oct. 22, 2007). Affordability, for all purposes, is defined by HUD because federal funds are used. Interview with John Feuerbach, Sen. Dev. Officer, City of Boston Dep't of Neighborhood Dev., in Boston, Mass. (July 2007). The guideline is that a household must earn less than 80% of the Area Median Income, based on household size—for example, a household size of 1 is \$46,300, while a household size of 4 is \$66,150. *Id.* This varies from area to area. *Id.* The household in the latter case is expected to pay no more than 30% of its income on housing. *Id.*

19. See BRADSHAW ET AL., *supra* note 9, at 9. See also Kelly Caffarelli, *Demystifying Green Building and its Cost*, RURAL VOICES, Fall 2005, at 2.

sis on low upfront capital and construction costs.<sup>20</sup> Achieving affordability by minimizing capital investment, however, has often proved to be a short-term solution that sacrifices long-term building functionality. When cheaper, lower-quality systems fail over time, building operating costs increase sharply and negatively impact both building owners and residents.<sup>21</sup>

Green building strategies, which emphasize long-term performance and sustainability, result in lower operational costs, preserve the health of building residents, and directly address many of the concerns associated with affordable housing development.<sup>22</sup> In attempting to craft green programs for affordable housing, however, several important questions for urban policy-makers include whether green strategies can be effectively integrated into multi-family affordable housing developments, what the magnitude of the green premium associated with affordable housing development is, and whether developers could afford to incur that green premium.<sup>23</sup> The issue of the green premium is particularly important within affordable housing since the challenges of funding green designs are compounded by the general decline in affordable housing funding that has taken place over the last few decades.<sup>24</sup>

A recent study demonstrates that green building strategies can be as effective for multi-family affordable housing development as they have been for the other types of buildings.<sup>25</sup> The study finds that green affordable housing development is more cost-effective than conventional affordable housing on a life-cycle basis because of the lower utility and replacement costs.<sup>26</sup> Overall, the average green premium for affordable housing developments was found to be 2.4% above conventional development costs, although several green affordable housing developments had lower upfront capital costs than did conventional designs.<sup>27</sup> Stabilizing operating expenses, such as volatile utility costs, through green measures, increases the long-term operating viability of developments.<sup>28</sup> In almost all cases, tenants

---

20. See BRADSHAW ET AL., *supra* note 9, at 23.

21. See *id.* at 23–24.

22. See discussion *supra* Part I.A.

23. See BRADSHAW ET AL., *supra* note 9, at 15–16.

24. CITIZENS' HOUS. AND PLANNING ASS'N, AFFORDABLE HOUSING GUIDEBOOK FOR LEGISLATORS 1 (2005), available at <http://www.chapa.org/pdf/Guidebook2005.pdf> (describing state budget cuts to affordable housing in Massachusetts).

25. See BRADSHAW ET AL., *supra* note 9, at 10.

26. *Id.* at 163–65.

27. *Id.* at 163.

28. Interview with John Feuerbach, *supra* note 18.

benefit economically due to lower utility bills, in addition to enjoying less tangible improvements to indoor air quality and occupant health.<sup>29</sup>

In recognition of the benefits of green building, an increasing number of states and cities are institutionalizing green strategies for both public and private sector construction and for affordable housing more specifically.<sup>30</sup>

## II.

### GREEN BUILDING FOR AFFORDABLE HOUSING REQUIRES AGENCY COORDINATION

#### A. *Energy and Environmental Trends Have Stimulated Green Building Policy in Massachusetts*

The green building industry in Massachusetts has grown in response to the same forces that have shaped green building nationally: energy prices and environmental concerns. Between 1999 and 2004, Massachusetts electricity rates increased by 102%,<sup>31</sup> and by 2005, the state's electricity rates ranked fourth in the nation.<sup>32</sup> Similarly, natural gas prices grew 45% and water rates increased 38% during that same period.<sup>33</sup> Although heating oil prices declined during the winter of 2006–2007 by 1.6%, this decline came after a 23% increase during the winter of 2005–2006.<sup>34</sup>

These economic forces, coupled with green building policy initiatives from the Governor of Massachusetts and from the Mayor of Bos-

29. BRADSHAW ET AL., *supra* note 9, at 166–67.

30. See U.S. GREEN BLDG. COUNCIL, *supra* note 2. For case studies of specific programs, see BOLDT ET AL., GLOBAL GREEN USA, MAKING AFFORDABLE HOUSING TRULY AFFORDABLE 13–15 (2005); CITY OF SEATTLE OFFICE OF HOUS., SEAGREEN: GREENING SEATTLE'S AFFORDABLE HOUSING (2002) (providing an example of a city's green affordable housing standards), available at <http://www.seattle.gov/housing/SeaGreen/SeaGreen.pdf>.

31. CITY OF BOSTON, MAYOR MENINO'S GREEN BLDG. TASK FORCE REPORT, EXECUTIVE SUMMARY 3 (2004), available at <http://www.cityofboston.gov/bra/gbtf/documents/GBTF%20Executive%20Summary.pdf> [hereinafter MAYOR MENINO'S GREEN BLDG. TASK FORCE REPORT].

32. U.S. ENERGY INFO. ADMIN., STATE ELECTRICITY PRICE, 2005 (2007), available at <http://www.eia.doe.gov/neic/rankings/stateelectricityprice.htm>.

33. MAYOR MENINO'S GREEN BLDG. TASK FORCE REPORT, *supra* note 31, at 3.

34. Compare COMMONWEALTH OF MASS. DIV. OF ENERGY RES., STATE HEATING OIL & PROPANE PROGRAM FINAL REPORT: WINTER 2006/2007 5–6 (2007), available at [http://www.mass.gov/Eoca/docs/doer/pub\\_info/shopp07.pdf](http://www.mass.gov/Eoca/docs/doer/pub_info/shopp07.pdf), with COMMONWEALTH OF MASS. DIV. OF ENERGY RES., STATE HEATING OIL & PROPANE PROGRAM FINAL REPORT: WINTER 2005/2006 5–6 (2006), available at [http://www.mass.gov/Eoca/docs/doer/pub\\_info/shopp06.pdf](http://www.mass.gov/Eoca/docs/doer/pub_info/shopp06.pdf).

ton, set the stage for cooperation between city and state governments on green building and housing affordability.

### 1. *State Policy*

At the state level, Massachusetts Governor Deval Patrick issued Executive Order (E.O.) No. 484 on April 18, 2007, creating the Leading by Example Program.<sup>35</sup> Leading by Example explicitly recognizes the impact of buildings on the environment and sets a target for reducing state government greenhouse gas emissions to 25% below 2002 levels by 2012, 40% by 2020, and 80% by 2050.<sup>36</sup>

Among the strategies to meet this target is a requirement that state buildings over 20,000 square feet meet the Massachusetts LEED Plus standard.<sup>37</sup> The Governor's E.O. 484 complements earlier efforts by the state that mandate environmentally preferable purchasing standards and reductions in toxic building materials.<sup>38</sup>

Much of the green building portion of E.O. 484 draws explicitly from the recommendations of the Massachusetts Sustainable Design Roundtable, a voluntary, public/private partnership of more than seventy design and construction professionals. The group's recommendations were published in a 2006 report.<sup>39</sup>

### 2. *Municipal Policy*

The state's green building policies parallel those that had already been enacted in Boston, the Commonwealth's capital and largest city. Boston Mayor Thomas Menino convened a Green Building Task Force, similar to the state Roundtable, which completed its recommendations in 2004.<sup>40</sup>

---

35. Mass. Exec. Order No. 484 (Apr. 18, 2007), *available at* <http://www.mass.gov/Agov3/docs/Executive%20Orders/Leading%20by%20Example%20EO.pdf>.

36. *Id.* at 1, 4.

37. *Id.* at 9. LEED Plus requires developers to meet LEED, to exceed the energy performance standard in the Massachusetts Energy Code by 20%, to have a third party conduct building commissioning, and to meet one of four Smart Growth criteria. *Id.* See also EXECUTIVE OFFICE OF ADMIN. AND FIN., COMMONWEALTH OF MASS., A&F BULLETIN 12 – ESTABLISHMENT OF MINIMUM STANDARDS FOR SUSTAINABLE DESIGN AND CONSTRUCTION OF NEW BUILDINGS AND MAJOR RENOVATIONS BY EXECUTIVE AGENCIES 2 (2006), *available at* <http://www.mass.gov/Eeoaf/docs/administrative/bulletin12.doc>.

38. Mass. Exec. Order No. 484, *supra* note 35, at 2.

39. MASS. SUSTAINABLE DESIGN ROUNDTABLE, LEADING BY EXAMPLE: AN ACTION PLAN FOR GREEN BUILDINGS IN MASSACHUSETTS STATE CONSTRUCTION PROJECTS (2006), *available at* [http://www.mass.gov/cam/dlforms/Sustainable\\_Design\\_RoundtableRpt\\_2006.pdf](http://www.mass.gov/cam/dlforms/Sustainable_Design_RoundtableRpt_2006.pdf).

40. See MAYOR MENINO'S GREEN BLDG. TASK FORCE REPORT, *supra* note 31, at 1.

The Task Force recommended integrating green building requirements into Article 80 of the city's zoning code, which governs private sector development.<sup>41</sup> The changes, adopted in January 2007, require projects over 50,000 square feet to meet the LEED Certified standard under the appropriate LEED rating system.<sup>42</sup> An important distinction in the city's LEED standard is that buildings must be LEED "certifiable," meaning that they must satisfy the requirements of the LEED system, but do not have to seek formal certification from the USGBC.<sup>43</sup> In adopting the standards, Boston became the first major city in the United States to require LEED compliance for private developments.<sup>44</sup>

After the changes to the zoning code, Mayor Menino also signed An Executive Order Relative to Climate Action on April 13, 2007, that mandates a 7% reduction in greenhouse gas emissions from 1990 levels by 2012 and an 80% reduction by 2050.<sup>45</sup> The Executive Order requires that all new construction or major renovation of city-owned buildings attain LEED Silver certification from the USGBC.<sup>46</sup>

### 3. *The Green Affordable Housing Initiative*

During the period of time that both Boston and the Commonwealth were formulating their green building policies, the Massachusetts Technology Collaborative (MTC), a quasi-public state agency charged with administering the Massachusetts Renewable Energy Trust, announced the launch of the Green Affordable Housing Initia-

---

41. *Id.* at 15.

42. Boston Zoning Code, art. 37 § 37-4 (2007), available at <https://www.cityofboston.gov/bra/pdf/ZoningCode/Article37.pdf>; Boston Zoning Code, art. 80 §§ 80B-2 (2007), available at <https://www.cityofboston.gov/bra/pdf/ZoningCode/Article80.pdf>.

43. Boston Zoning Code, art. 37 §§ 37-2(4), 37-4 (2007), available at <https://www.cityofboston.gov/bra/pdf/ZoningCode/Article37.pdf>. The Zoning Code identifies four additional "Boston Green Building Credits" that may be earned and applied toward the appropriate LEED rating system to satisfy the Zoning requirements. The credits include: modern grid (for buildings that generate their own energy), historic preservation (for projects involving restoration of registered historic buildings), groundwater recharge (for projects capturing storm water 50% above existing requirements), and modern mobility (for projects that promote the use of public transit, reduce parking, create incentives for alternative vehicle use, etc.). See *id.* at app. A.

44. Brooks Rainwater, *Boston, D.C., Adopt Green Building Rules for Private Development*, 14 AIARCHITECT (2007), [http://www.aia.org/aiarchitect/thisweek07/0202/0202p\\_bostondc.cfm](http://www.aia.org/aiarchitect/thisweek07/0202/0202p_bostondc.cfm).

45. Exec. Order, Thomas M. Menino, Mayor, An Order Relative to Climate Action in Boston, ¶ 1 (Apr. 13, 2007), available at [http://www.cityofboston.gov/environmentalenergy/pdfs/clim\\_action\\_exec\\_or.pdf](http://www.cityofboston.gov/environmentalenergy/pdfs/clim_action_exec_or.pdf) [hereinafter Mayor Menino Exec. Order].

46. *Id.* ¶ 7. For information on Boston's Climate Action Plan, see also CITY OF BOSTON CLIMATE ACTION PLAN SUMMARY (2007), available at [http://www.cityofboston.gov/environmentalenergy/pdfs/Boston\\_Climate\\_Change\\_SummaryReport.pdf](http://www.cityofboston.gov/environmentalenergy/pdfs/Boston_Climate_Change_SummaryReport.pdf).

tive.<sup>47</sup> Under the Initiative, public and private sector organizations could bid for \$24.5 million in funding to encourage the integration of renewable electricity into affordable housing.<sup>48</sup> The Initiative was funded through proceeds from the state's system benefit charge, which is a \$0.0005 per kilowatt-hour (that is, 0.5 mill/kWh) charge on retail electricity sold within the state.<sup>49</sup> Many of the MTC's system benefit charge-funded renewable energy grants require some form of matching funds. Under the Small Renewable Incentive program, for example, solar electric incentives are capped at \$2.00–5.50 per watt,<sup>50</sup> while such systems typically cost \$8.00–10.00 per watt to install in Boston.<sup>51</sup> The gap in financing between the rebate level under programs like the MTC's Small Renewables Initiative and the final installed cost is too large for most affordable housing developers to bridge, so renewable energy has infrequently been integrated into Massachusetts affordable housing to date.<sup>52</sup> Part of the Initiative's intent is to distribute system benefit charge funds to affordable housing residents who might not otherwise be able to access the programs their electric bills helped support.<sup>53</sup>

On July 29, 2006, the MTC established eight partnerships with public and private sector organizations under the Green Affordable Housing Initiative, including the City of Boston's Department of Neighborhood Development (DND).<sup>54</sup> Boston received a \$2 million grant to incorporate renewable energy, energy efficiency, green de-

---

47. RENEWABLE ENERGY TRUST, MASS. TECH. COLLABORATIVE (MTC), GREEN AFFORDABLE HOUSING INITIATIVE: GRANT FUNDING OPPORTUNITY, SOLICITATION NO. 2006-GAH-01, at 1 (2006).

48. Renewable Energy Trust, MTC, Green Affordable Housing Initiative, [http://www.mtpc.org/renewableenergy/afford\\_housing.htm](http://www.mtpc.org/renewableenergy/afford_housing.htm) (last visited Nov. 2, 2007).

49. MASS. GEN. LAWS ANN ch. 25, §§ 20(a)(1), (c) (West 2002).

50. RENEWABLE ENERGY TRUST, MTC, COMMONWEALTH SOLAR: SOLAR PV REBATES: RESIDENTIAL REBATE: APPLICATION FORMS AND INSTRUCTIONS 5 (2008), available at [http://www.mtpc.org/solar/Attachment\\_A1.doc](http://www.mtpc.org/solar/Attachment_A1.doc).

51. Installed cost data drawn from a spreadsheet compiled by the Massachusetts Technology Collaborative (MTC) at the request of the City of Boston's Department of Neighborhood Development, Jon Abe & Tyler Leeds, MTC, Oct. 22, 2007, (unpublished, on file with the *New York University Journal of Legislation and Public Policy*) (providing a data set of 662 projects funded by MTC in Boston).

52. Interview with Raphael Herz, Manager, Green Affordable Hous. Initiative, MTC, in Westborough, Mass. (Aug. 2007).

53. *Id.*

54. City of Boston, Green Affordable Housing Program Summary (July 29, 2006) (unpublished, on file with *New York University Journal of Legislation and Public Policy*).

sign, and healthy homes techniques into the city's affordable housing developments.<sup>55</sup>

*B. Affordable Housing Development in Boston Requires Compliance with many Agency Regulations*

Affordable housing development is a multi-year, highly complex process, and a comprehensive overview of affordable housing in Boston is beyond the scope of this article. This section provides a general overview of the affordable housing process in order to provide context for the city's efforts to integrate green strategies into affordable housing development.

Affordable housing is a critical issue in Massachusetts because the Commonwealth has been among the three states in the country with the highest housing costs relative to resident incomes for the past several decades.<sup>56</sup> One of the primary reasons for this has been that housing supply has historically lagged behind housing demand.<sup>57</sup> This problem is compounded in urban areas such as Boston by high development costs and a lack of vacant land.<sup>58</sup> According to the National Low Income Housing Coalition, Massachusetts has the third most expensive housing in the country.<sup>59</sup> The most recent Greater Boston Housing Report Card concluded that Boston has some of the highest home prices in the nation.<sup>60</sup> High home prices have blocked

---

55. Renewable Energy Trust, MTC, Green Affordable Housing Initiative, *supra* note 48.

56. CITIZENS' HOUS. AND PLANNING ASS'N, *supra* note 24, at 1.

57. *Id.*

58. *Id.*

59. DANILO PELLETIERE ET AL., NATIONAL LOW INCOME HOUS. COALITION, OUT OF REACH 2006 (2006), available at <http://www.nlihc.org/oor/oor2006/>. For each state, the Coalition's report calculates the amount of money a household must earn in order to afford a rental unit at a range of sizes (0, 1, 2, 3, and 4 bedrooms) at the area's Fair Market Rent (FMR), based on the generally accepted affordability standard of paying no more than 30% of income for housing costs. From these calculations, the hourly wage a worker must earn in Massachusetts to afford the fair market rent for a two-bedroom home was determined to be \$22.65, the third highest among the states. *See id.* (click "Most Expensive Jurisdictions").

60. BONNIE HEUDORFER & BARRY BLUESTONE, THE CENTER FOR URBAN AND REGIONAL POLICY, NORTHEASTERN UNIVERSITY, THE GREATER BOSTON HOUSING REPORT CARD 2005–2006: AN ASSESSMENT OF PROGRESS ON HOUSING IN THE GREATER BOSTON AREA 5 (2006), available at <http://www.curp.neu.edu/pdfs/HRC%202005-2006.pdf>. The Report Card is "a diagnostic tool that provides an objective assessment of the region's annual progress toward providing housing opportunities for all of its citizens." *Id.* at 3.

ownership for prospective homebuyers and increased demand for rental units, which has contributed to high rents in Boston as well.<sup>61</sup>

Both private sector developers and non-profit community development corporations actively develop affordable housing in Boston. This process begins when developers seek funds from the DND's Neighborhood Housing Division (NHD) for projects that are at the schematic stage.<sup>62</sup> NHD's mission is to develop and preserve large multi-family affordable housing projects within Boston, and its primary tool for influencing development within the city is funding. NHD typically releases one to two requests for proposals (RFPs) for affordable housing funds each year.<sup>63</sup>

NHD administers federal allocations of both HOME Investment Partnerships Program funds and Community Development Block Grants, which can be used to develop or rehabilitate affordable housing projects for homeownership and rental.<sup>64</sup> NHD also administers part of Boston's *Leading the Way II* funds, which are targeted to preserve existing affordable housing and accelerate the rate of new affordable housing construction.<sup>65</sup>

Developers typically pursue a city building permit and city affordable housing funds in parallel.<sup>66</sup> The permitting and funding processes are complicated, and projects typically take between three to five years to complete.<sup>67</sup> In order to secure a building permit, developers must demonstrate that they control the land they are proposing to build on through a fully executed instrument, such as an option agreement, a purchase and sale agreement, or a deed.<sup>68</sup> They must also comply with the Massachusetts Building Code and Boston's Zoning Code.<sup>69</sup> If the building is over fifteen units in size, or over 20,000

---

61. See KEVIN MCCOLL, CITY OF BOSTON, LEADING THE WAY II: A REPORT ON BOSTON'S HOUSING STRATEGY FY2004–FY2007, at 21 (2004), available at [http://www.cityofboston.gov/dnd/pdfs/LTW\\_II.pdf](http://www.cityofboston.gov/dnd/pdfs/LTW_II.pdf).

62. Interview with Ben Johnson, Dev. Officer, City of Boston Dep't of Neighborhood Dev., in Boston, Mass. (July 19, 2007).

63. Interview with John Feuerbach, *supra* note 18.

64. ROGER E. CLARK, CLEAN ENERGY STATES ALLIANCE, FINANCING AFFORDABLE HOUSING: A PRIMER FOR THE STATE CLEAN ENERGY FUNDS 13, 15 (2005), available at [http://www.cleanenergystates.org/CaseStudies/Primer\\_on\\_Financing\\_Affordable\\_Housing.pdf](http://www.cleanenergystates.org/CaseStudies/Primer_on_Financing_Affordable_Housing.pdf).

65. Interview with John Feuerbach, *supra* note 18; Interview with Ben Johnson, *supra* note 62.

66. Interview with Ben Johnson, *supra* note 62.

67. *Id.*

68. Dep't of Neighborhood Dev., Hous. Policy – Section 8: Site Control Policy, [http://www.cityofboston.gov/dnd/D\\_8\\_Site\\_Control.asp](http://www.cityofboston.gov/dnd/D_8_Site_Control.asp) (last visited Nov. 11, 2007).

69. Inspectional Servs. Dep't, Obtaining a Building Permit, <http://www.cityofboston.gov/isd/building/boa/bldgdefault.asp> (last visited Oct. 22, 2007).

square feet of gross floor area, it must go through the Article 80 Small Project Review zoning process, managed by the Boston Redevelopment Authority (BRA).<sup>70</sup> Small Project Review provides procedures for reviewing site and design plans.<sup>71</sup> As discussed above, Article 80 also requires buildings over 50,000 square feet to go through the Large Project Review process, which requires that buildings meet the requirements of the LEED Certified level standard; however, buildings do not have to pursue certification from the USGBC.<sup>72</sup> Large Project Review considers a wide array of design issues including traffic impact, environmental protection, and historic preservation.<sup>73</sup> Developers must also submit their building designs to the BRA. The BRA must then consult the Boston Water and Sewer Commission, the Public Works Department, and other agencies as necessary (e.g., Parks & Recreation Department, Landmarks Commission, etc.).<sup>74</sup> Once the necessary approvals have been acquired, developers can receive a building permit from the city's Inspectional Services Division, the final step prior to construction.<sup>75</sup>

NHD's RFPs are scheduled to be released in advance of the state's affordable housing funding process in order to allow developers who are on track to get approval at the City's Zoning Board of Appeals, or have demonstrated that the development could be built "as of right" and will get a building permit at a later date, to also apply for state affordable housing funds.<sup>76</sup> Among the most significant state funds that developers can apply for are additional state-administered HOME funds, the competitive 9% federal Low Income Housing Tax Credits from the Massachusetts Department of Housing and Community Development, and the 4% federal Low Income Housing Tax Credits, which are available from MassHousing on a rolling basis.<sup>77</sup> Developers who submit proposals for state-administered funds do not

---

70. BOSTON REDEVELOPMENT AUTH., A CITIZEN'S GUIDE TO DEVELOPMENT REVIEW UNDER ARTICLE 80 OF THE BOSTON ZONING CODE 10 (2004), available at <http://www.cityofboston.gov/bra/PDF/Documents/A%20Citizens%20Guide%20to%20Article%2080.pdf>.

71. *Id.*

72. *See supra* notes 41–44 and accompanying text.

73. BOSTON REDEVELOPMENT AUTH., *supra* note 70, at 7.

74. *Id.* at 24–26.

75. *Id.* at 9, 24.

76. Interview with John Feuerbach, Senior Dev. Officer, City of Boston Dep't of Neighborhood Dev., in Boston, Mass. (Oct. 24, 2007).

77. *See* CITIZENS' HOUS. AND PLANNING ASS'N, *supra* note 24, at 46–48. *See also* MASSHOUSING, RENTAL DEVELOPMENT PROGRAM: 9 RULES OF TAX-EXEMPT BOND FINANCING 3, available at [http://www.masshousing.com/portal/server.pt/gateway/PTARGS\\_0\\_2\\_422\\_0\\_0\\_18/RD\\_9RulesTxExemptBondFin.pdf](http://www.masshousing.com/portal/server.pt/gateway/PTARGS_0_2_422_0_0_18/RD_9RulesTxExemptBondFin.pdf).

have a chance to alter their proposals after submission: they are either accepted or rejected.<sup>78</sup> In order to ensure that Boston affordable housing projects are successful in their bids for state funds, NHD works closely with developers to review the technical and economic feasibility of housing proposals as part of the city's funding award process. This flexible review process, and NHD's role as an affordable housing fund administrator, made NHD a natural choice to coordinate the integration of green strategies into the city's affordable housing developments. Upon creation of the Green Affordable Housing Program, NHD was charged with administering the new green mandate and funds.<sup>79</sup>

*C. Boston's Green Affordable Housing Program Provides a Model for Integrating Green Building into Pre-existing Regulatory Structures*

DND used the MTC funds to create the City of Boston's Green Affordable Housing Program (GAHP) in 2007.<sup>80</sup> The creation of the GAHP occurred during the same period of time as the Article 80 amendments and Mayor Menino's Executive Order, and its creation reinforced the momentum toward green building at both the city and state levels. It is important to note, however, that the intents of the three city green building initiatives are distinct. The Mayor's Executive Order requires that new or substantially renovated public buildings achieve LEED Silver certification,<sup>81</sup> while the Article 80 zoning changes require that all new private buildings over 50,000 square feet be "certifiable" at the LEED Certified level.<sup>82</sup> Finally, the green standards created under the GAHP require affordable housing to build to the LEED Silver level;<sup>83</sup> however, buildings do not have to pursue certification from the USGBC.

The City of Boston stated that the intent of the GAHP is to "make the inclusion of [renewable energy/energy efficiency/green/healthy home] building practices commonplace in the city's affordable hous-

---

78. Interview with John Feuerbach, *supra* note 18.

79. See Renewable Energy Trust, MTC, Green Affordable Housing Initiative, *supra* note 48.

80. See *infra* note 169; Renewable Energy Trust, MTC, Background to Green Affordable Housing Program, [http://www.mtpc.org/renewableenergy/green\\_buildings/afford/afford\\_housing\\_backgrnd.html](http://www.mtpc.org/renewableenergy/green_buildings/afford/afford_housing_backgrnd.html) (last visited Nov. 29, 2007).

81. See Mayor Menino Exec. Order, *supra* note 45, ¶ 7.

82. See *supra* note 42 and accompanying text.

83. CITY OF BOSTON, GREEN AFFORDABLE HOUSING AT DND, [http://www.cityofboston.gov/dnd/D\\_Green\\_Housing.asp#Leed](http://www.cityofboston.gov/dnd/D_Green_Housing.asp#Leed) (last visited Feb. 2, 2008).

ing program.”<sup>84</sup> By encouraging the development of green standards for affordable housing, the city created an opportunity to develop green standards for buildings not covered by the Executive Order or Article 80, namely new private buildings below 50,000 square feet and existing buildings. Boston also extended its consideration of “green building” beyond LEED and established additional benchmarks and performance standards for renewable energy, energy efficiency, and healthy homes for the full range of building types reviewed by DND.<sup>85</sup> The city also stipulated that GAHP funds be coordinated with those of other funding organizations, including foundations and the local electricity and gas utilities.<sup>86</sup>

In order to translate DND’s stated intent into programmatic reality, the Department set four primary goals for the GAHP. First, GAHP would disburse the funds to directly support the installation of solar energy panels with 130–160 kW installed capacity on approximately 200 housing units.<sup>87</sup> Second, it would educate the development community about green building through a series of training programs.<sup>88</sup> Third, it would coordinate funding between DND, the utilities, foundations, and other MTC Green Affordable Housing Initiative partner organizations.<sup>89</sup> Fourth, it had to establish new baseline green standards for affordable housing for the DND.<sup>90</sup>

It is significant that DND did not simply disburse the GAHP funds on MTC’s behalf. Instead, as the goals imply, DND used the GAHP funding award as an opportunity for a broader realignment of its programs around green strategies and to engage the housing development community in a larger dialogue about green building. DND

84. SOLAR BOSTON, PROPOSAL IN RESPONSE TO U.S. DEPARTMENT OF ENERGY FINANCIAL ASSISTANCE FUNDING OPPORTUNITY ANNOUNCEMENT 9 (2007), available at [http://www.masstech.org/renewableenergy/public\\_policy/DG/resources/2007-01-Solar-Boston-Project.pdf](http://www.masstech.org/renewableenergy/public_policy/DG/resources/2007-01-Solar-Boston-Project.pdf).

85. See NAOMI MERMIN ET AL., NAT’L CTR. FOR HEALTHY HOUS., COMPARING GREEN BUILDING GUIDELINES AND HEALTHY HOMES PRINCIPLES: A PRELIMINARY INVESTIGATION 3, 16–18 (2006), available at [http://www.centerforhealthyhousing.org/Green\\_Analysis.pdf](http://www.centerforhealthyhousing.org/Green_Analysis.pdf) (defining healthy homes as dry, clean, well-ventilated, safe, pest-free, free from contaminants, and well-maintained). See Section III, *infra* (discussing DND’s standard adoption process).

86. See SOLAR BOSTON, *supra* note 84, at 19 (proposing to maximize integration of GAHP with other municipal agencies).

87. CITY OF BOSTON, *supra* note 54.

88. *Id.*

89. *Id.*

90. Department of Neighborhood Development, Green Affordable Housing Program Project Manager Position Request for Proposals 4 (Jan. 2007) (unpublished memorandum, on file with the *New York University Journal of Legislation and Public Policy*).

developed a mandatory training program for developers applying for its funds, and engaged funding and standards organizations to ensure that the GAHP was coordinated with other national and regional programs.

1. *Boston's GAHP Illustrates the Importance of Training and Outreach in Program Success*

Although many affordable housing developers in Boston already had demonstrated commitment to green building, DND organized a series of training workshops on green affordable housing.<sup>91</sup> These included workshops focusing on integrated design, renewable energy and energy efficiency, and indoor air quality. The training sessions were mandatory for developers applying for GAHP funds but were also open to other affordable housing stakeholders. The goal of the training sessions was to provide participants with practical information about DND's revised Design Standards and DND's expectations for proposals.

The training sessions were a valuable addition to the GAHP program. In addition to providing developers with useful information, the trainings further broadcasted DND's commitment to green development and provided a forum for developer concerns that doubled as an informal mid-course review of program development. The success of the training programs has highlighted the value of additional workshops targeting both the development community and City employees. DND is evaluating a series of additional events and training programs focusing on green building beginning with a series of sessions aimed to build capacity within the agency.<sup>92</sup>

2. *Boston's GAHP Illustrates the Necessity of Resource Coordination in Program Success*

For much of the twentieth century, affordable housing developers could rely on large-scale state or federal subsidy programs to finance

---

91. Three workshops were held: June 26, 2007, July 25, 2007, and August 22, 2007. See City of Boston, Green Affordable Housing at DND, [http://www.cityofboston.gov/dnd/D\\_green\\_housing.asp](http://www.cityofboston.gov/dnd/D_green_housing.asp) (last visited Jan. 21, 2008).

92. One workshop has been held: Sept. 28, 2007. City of Boston, Dep't of Neighborhood Dev., Boston's Green Affordable Housing Program (Sept. 28, 2007) (unpublished PowerPoint presentation, on file with the *New York University Journal of Legislation and Public Policy*). Subsequent affordable housing trainings are currently being planned for Spring 2008 in partnership with MTC. Interview with Raphael Herz, Manager, MTC, Green Affordable Hous. Initiative, in Westborough, Mass. (Dec. 2007).

housing projects.<sup>93</sup> During the past twenty years, however, large-scale “deep subsidy” programs have been replaced with a greater number of “shallow subsidy” programs.<sup>94</sup> As a result, affordable housing developers in high-cost development areas, or developers desiring a greater degree of affordability have had to seek funding from a broad range of different sources. In Massachusetts, the average affordable housing project now makes use of seven different subsidy programs.<sup>95</sup> In order to reduce the transaction costs associated with securing affordable housing financing, Massachusetts has developed a one-stop application for funds from five different state and municipal agencies.<sup>96</sup>

A similar challenge has emerged under the GAHP in that there is a broad range of funding sources available to green projects. In addition to the MTC, both the electrical and gas utilities have energy efficiency funding that can be directed to multi-family affordable housing.<sup>97</sup> Furthermore, several foundations (including Enterprise Community Partners and the Home Depot Foundation) make funding available on a competitive basis for Massachusetts green affordable housing developers.<sup>98</sup> There is a need to coordinate these funding sources to ensure that green strategies are not being “double funded,” and that the standards required to access these funds are fairly similar. Under the GAHP, DND worked closely with other funding organizations to coordinate resources. This effort is ongoing, and several fund-

---

93. U.S. DEP'T OF HOUS. AND DEV., AFFORDABLE HOUSING (2007), *available at* <http://www.hud.gov/offices/cpd/affordablehousing/index/cfm>.

94. CITIZENS' HOUS. AND PLANNING ASS'N, *supra* note 24, at 3.

95. *Id.*

96. *See* OneStop Application, <http://www.mhic.com/OneStop2000.xls> (last visited Jan. 22, 2008); *see also* DHCD, <http://mass.gov/dhcd> (last visited Jan. 22, 2008) (contributing agency); MassHousing, <http://www.masshousing.com> (last visited Jan. 22, 2008) (same); Massachusetts Housing Partnership Fund, <http://www.mhp.net> (last visited Jan. 22, 2008) (same); Massachusetts Housing Investment Corporation, <http://www.mhic.com> (last visited Jan. 22, 2008) (same); DND, <http://www.cityofboston.gov/dnd> (last visited Jan. 22, 2008) (same). Other agencies use the OneStop application. *See also* Neighborhood Housing Trust, <http://www.cityofboston.gov/dnd/pdfs/NHT.pdf> (last visited Jan. 22, 2008); BRA, <http://www.cityofboston.gov/bra> (last visited Jan. 22, 2008).

97. *See* MASS. GEN. LAWS ANN. ch. 25, § 19 (West 2002). This legislation created a charge on each kilowatt-hour sold in the state to support energy efficiency programs, and these funds are disbursed and managed by state utilities. *Id.*

98. *See* HOME DEPOT FOUND., AFFORDABLE HOUSING BUILT RESPONSIBLY, [http://www.homedepotfoundation.org/support\\_housing.html](http://www.homedepotfoundation.org/support_housing.html) (last visited Dec. 3, 2007); ENTER., GREEN COMMUNITIES, <http://www.greencommunitiesonline.org/tools/funding/index.asp> (last visited Dec. 3, 2007).

ing organizations have agreed to work with DND to explore a one-stop application for green affordable housing funds.<sup>99</sup>

A related issue is that DND's funding from MTC is limited and funds were exhausted after the first RFP for funds in 2007.<sup>100</sup> In order to sustain current market transformation efforts, DND will either have to identify additional sources of green funds to support Boston developments or work with the network of state, utility, and foundation funders to ensure that their mix of funds adequately supports the requirements of DND's revised Design Standards.

### III.

#### GREEN BUILDING FOR AFFORDABLE HOUSING IN BOSTON REQUIRES ESTABLISHING STANDARDS

In revising Design Standards for the GAHP, DND attempted to reference national standards to the maximum extent possible.<sup>101</sup> This section details the standards that DND selected and provides an overview of the additional requirements that were adopted in order to more fully reflect the city's policy priorities. DND harmonized its requirements with city policies as much as it could. Where necessary, DND adopted standards above and beyond the city's LEED requirements to provide a framework for making energy efficiency, renewable energy, and healthy homes commonplace.

##### A. *Selecting a Green Building Standard*

The most fundamental design decision that DND had to make when establishing its standards was which green standard to choose. Rather than simply adopting LEED, DND surveyed green building and affordable housing standards from around the country.<sup>102</sup> The three options that DND ultimately reviewed in detail were: developing a custom set of city-specific standards, adopting the LEED system, and adopting the Enterprise Community Partners Green Communities Criteria.<sup>103</sup>

As a first step, DND reviewed standards and guidance documents developed by other cities, such as Seattle's SeaGreen Affordable

---

99. Memorandum from the City of Boston Dep't of Neighborhood Dev. 2-3 (2007) (on file with the *New York University Journal of Legislation and Public Policy*).

100. Interview with John Feuerbach, *supra* note 76.

101. These standards include LEED and ENERGY STAR. See Section III, *infra*.

102. The authors of this Article surveyed these standards for DND.

103. See *supra* note 3 (defining LEED standards); see generally ENTER. CMTY. PARTNERS, GREEN COMMUNITIES CRITERIA, available at [http://www.gmhf.com/programs/green\\_communities/GreenCriteria.pdf](http://www.gmhf.com/programs/green_communities/GreenCriteria.pdf) (last visited Jan. 3, 2008) (defining Green Communities Criteria).

Housing Guide.<sup>104</sup> Despite the advantages inherent in customizing standards to meet local infrastructure, geography, climate, and policy priorities, DND did not opt to pursue a new green standard. DND staff and consultants were working on a tight schedule and lacked the resources necessary to research, develop, brand, and launch a Boston-specific standard. DND also preferred to build off of a nationally validated and recognized brand rather than create a new, unknown standard from scratch.<sup>105</sup> Furthermore, DND's adoption of the LEED standard was consistent with the BRA's Article 80.

The decision to adopt the LEED standard or the Green Communities Criteria was less clear cut. Enterprise Community Partners, Inc. is a national non-profit that, through their Green Communities™ program, provides financial assistance to low-income housing projects. In order to be eligible for Enterprise funds, developments must meet the Green Communities Criteria, a rating system developed by Enterprise which consists of both mandatory and optional green strategies. Similar to LEED, the Criteria are separated into several categories and assigned points. The categories include: integrated design process, location and neighborhood fabric, site improvements, water conservation, energy efficiency, materials beneficial to the environment, healthy living environment, and operations and management.<sup>106</sup> Unlike the LEED-Homes and LEED-New Construction programs, which target new homes under three stories and large buildings respectively, Enterprise developed the Green Communities Criteria specifically to target affordable housing.<sup>107</sup> On the one hand, harmonization with City policy argued for adoption of LEED. On the other hand, the fact that Green Communities was tailored for affordable housing and

---

104. See *infra* note 169; CITY OF SEATTLE OFFICE OF HOUS., SEA GREEN: GREENING SEATTLE'S AFFORDABLE HOUSING (2002), available at <http://www.seattle.gov/housing/SeaGreen/SeaGreen.pdf>. See also generally Meredith Laitner, Adam Stella & Madeline Zamoyski, Note, *Green Building City Survey*, 11 N.Y.U. J. LEGIS. & PUB. POL'Y 81, 99–103 (2008).

105. In its final report, Mayor Menino's Task Force made a similar argument for its decision to recommend LEED. MAYOR MENINO'S GREEN BLDG. TASK FORCE, *supra* note 33, at 9 (“Although still evolving and not a perfect system, [LEED] . . . would allow Boston to be in the mainstream of green policies and programs.”).

106. See ENTER. CMTY. PARTNERS, *supra* note 103, at 7–11.

107. Compare U.S. GREEN BLDG. COUNCIL, LEED FOR NEW CONSTRUCTION (2006), <http://www.usgbc.org/DisplayPage.aspx?CMSPageID=220> (describing the types of development for which LEED-NC was designed), with U.S. GREEN BLDG. COUNCIL, LEED FOR HOMES PROGRAM PILOT RATING SYSTEM 6 (2007), available at <http://www.usgbc.org/ShowFile.aspx?DocumentID=2267> (describing size requirement for LEED-Homes); ENTER. GREEN CMTYS., ABOUT GREEN COMMUNITIES (2007), available at <http://www.greencommunitiesonline.org/about> (“Enterprise believes ‘green’ and ‘affordable’ are one in the same.”).

opened the door to additional funds for developers was a compelling argument in favor of the Criteria.

To make its design decision, DND conducted a side-by-side comparison of the two standards. Both LEED and Enterprise recognize the importance of integrated design and site selection.<sup>108</sup> Additionally, both emphasize water conservation and efficiency and use of materials that support indoor air quality. Both standards also require homeowner/tenant manuals and building walkthroughs with residents to review green systems. DND concluded that the standards were not dramatically different enough to be mutually exclusive, although they place different emphases on different strategies.<sup>109</sup>

DND chose the LEED standards in order to harmonize with both the Mayor's Executive Order and the BRA's Article 80 process.<sup>110</sup> DND also required, following the BRA's lead, that buildings be LEED "certifiable" rather than requiring official certification from the USGBC. DND went a step further than the BRA and matched the Mayor's standard for public buildings, however, in requiring that buildings achieve a Silver level rather than the most basic LEED Certified level.<sup>111</sup> Although LEED was chosen over Green Communities, DND recommended, during training sessions and in published outreach materials, that developers take the incremental steps necessary to also meet the Criteria and therefore gain access to Enterprise funds.<sup>112</sup>

The LEED-Homes standard only applies to buildings three stories and below.<sup>113</sup> For larger buildings, DND again follows BRA's

---

108. Green building begins with an integrated design process. Unlike a conventional design process, where architects, engineers, designers, builders, and owners fulfill their roles in isolation from one another, integrated design emphasizes a team approach that involves joint performance goal setting, collaboration, and creative "outside the box" solutions. This type of approach maximizes the potential for energy and material efficiency as well as opportunities to reduce building costs. *See* ENTER. CMTY. PARTNERS, *supra* note 103, at 5.

109. DND staff conducted an internal analysis in which the LEED and Enterprise studies were compared side-by-side. The lead analysts on this project were Galen Nelson and Patricia Burke.

110. CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR NEW CONSTRUCTION 1 (2007) ("DND will use LEED – Homes Silver as a standard. Certification is not required but buildings must be certifiable and all LEED Homes prerequisites must be met.").

111. *See id.*

112. *See* CITY OF BOSTON DND, GUIDE TO GREEN AFFORDABLE HOUSING PROGRAM DESIGN REQUIREMENTS AND RELATED FUNDING OPPORTUNITIES 3–4 (2007) (explaining opportunities for funding by compliance with Criteria standards).

113. *See* U.S. GREEN BLDG. COUNCIL, LEED FOR HOMES PROGRAM PILOT RATING SYSTEM 6 (2007), available at <http://www.usgbc.org/ShowFile.aspx?DocumentID=2267> (describing size requirement for LEED-Homes).

lead under Article 80 and expects developers to meet the LEED-New Construction standard.<sup>114</sup> An as yet unresolved challenge for DND, and for Boston's affordable housing community, is how to set appropriate standards for existing buildings that are seeking funding but will not be undertaking major renovation.<sup>115</sup> The lack of national standards for existing buildings is also an issue when attempting to establish an energy efficiency standard.<sup>116</sup>

An important challenge for Boston in adopting its green building guidelines is the green building movement's emphasis on integrated design. As a result of DND's adoption of the LEED standards, affordable housing developers will have to assemble their development teams at the conceptual stage of project planning. Practically speaking, it also means that projects will have to consult with DND at an earlier stage than has occurred in the past. The concept of integrated design has resonance outside of the developer teams, however. The early formation of development teams will also require closer and earlier coordination among prospective green funders. For example, the outcome of an integrated design charrette may call for the creation of an energy model or reveal the need for a solar feasibility study, for which utility companies, foundations, or other organizations may offer overlapping funding.<sup>117</sup>

Perhaps more significantly for city policy, a broad-based switch to integrated design may also require a more coordinated response from city agencies. It is likely, for example, that DND's revised Design Standards, the Article 80 amendments, and the Mayor's Executive Order will necessitate a rethinking of inter-agency coordination in order to accommodate early-stage, integrated design, particularly for large scale, campus-style projects.

For example, some developers may decide to use ground source heat pumps that might require drilling a deep well beneath a public right of way, requiring approval from the city's Public Improvement Commission. Others might propose the use of innovative storm water management strategies that require cooperation and coordination with

---

114. See *infra* note 169; U.S. GREEN BLDG. COUNCIL, GREEN BUILDING RATING SYSTEM FOR NEW CONSTRUCTION & MAJOR RENOVATIONS (2005), available at <https://www.usgbc.org/ShowFile.aspx?DocumentID=1095>.

115. An appropriate standard for existing affordable housing buildings is still under discussion because gut rehab or invasive renovations are not always technically, economically, or environmentally feasible.

116. See *infra* Section III.B.

117. See GUIDE TO GREEN AFFORDABLE HOUSING, *supra* note 112 (describing funding source for solar energy), at 10; Tina Halfpenny, Solar Boston, KeySpan Presentation: Solar Thermal Solutions in Boston and the Northeast 7 (Jan. 10, 2008) (same).

the local water authority. At this early stage of the standards it is not clear exactly how this inter-agency cooperation will proceed. It is clear, however, that the interaction of integrated design, funding needs, and agency approval will compel inter-agency action down the road.

### B. *Selecting an Energy Program*

Adopting an energy efficiency standard for the GAHP proved challenging, not because there were competing national standards, but because there are no national standards for certain affordable housing building types.

The most widely recognized residential energy performance standard is Energy Star for Qualified Homes. Energy Star is an energy standard that was developed by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy to encourage buildings to be more energy efficient than required by building codes.<sup>118</sup> In Boston, the standard requires that buildings perform 15% better than the 2003 International Energy Conservation Code.<sup>119</sup> The verification system for Energy Star is based on the Home Energy Rating System (HERS); Energy Star buildings in Massachusetts must attain a score of eighty-five on the HERS index.<sup>120</sup> During the Energy Star process, developers work with HERS contractors to model and verify building energy use.<sup>121</sup>

There are two different and interchangeable Energy Star requirements that developers can choose to conform to: the *National Performance Path* and the *National Builder Option Package*.<sup>122</sup> Both

---

118. See 42 U.S.C.A. § 6294a(a) (West 2007).

119. U.S. EPA, ENERGY STAR HOMES, FEATURES OF ENERGY STAR QUALIFIED NEW HOMES, [http://www.energystar.gov/index.cfm?c=new\\_homes.nh\\_features](http://www.energystar.gov/index.cfm?c=new_homes.nh_features) (last visited Nov. 10, 2007) [hereinafter FEATURES OF ENERGY STAR].

120. U.S. EPA, ENERGY STAR, QUALIFIED HOMES NATIONAL PERFORMANCE PATH REQUIREMENTS 1, [http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/PerfPathTRK\\_0602](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/PerfPathTRK_0602) (last visited Nov. 10, 2007) [hereinafter NATIONAL PERFORMANCE PATH REQUIREMENTS]. The HERS score is an indicator of the relative energy efficiency of a building. U.S. EPA, ENERGY STAR, WHAT IS THE HERS INDEX?, [http://www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.nh\\_HERS](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_HERS) (last visited Jan. 21, 2007). A HERS score of zero means that the building uses no energy. *Id.*

121. U.S. EPA, ENERGY STAR, INDEPENDENT INSPECTION AND TESTING, [http://www.energystar.gov/ia/new\\_homes/features/HERSrater\\_062906.pdf](http://www.energystar.gov/ia/new_homes/features/HERSrater_062906.pdf) (last visited Nov. 10, 2007).

122. Compare NATIONAL PERFORMANCE PATH REQUIREMENTS, *supra* note 120, with U.S. EPA, ENERGY STAR QUALIFIED HOMES, BUILDER OPTION PACKAGE NOTES, [https://www.energystar.gov/ia/partners/downloads/BOP\\_054.pdf](https://www.energystar.gov/ia/partners/downloads/BOP_054.pdf) (last visited Nov. 10, 2007).

sets of requirements focus on heating and cooling equipment, windows, lighting, and efficient appliances.<sup>123</sup> Both options also require the use of the Energy Star Thermal Bypass Checklist, which details requirements for insulating and sealing a house to control heat flows and air leakage.<sup>124</sup> The Performance Path involves HERS modeling on a case-by-case basis, while the Builder Option Package is a more prescriptive set of requirements designed for home manufacturers and production builders.<sup>125</sup>

The Energy Star process is well-established in Massachusetts. Boston developers can participate in the *Massachusetts New Homes with Energy Star* program and receive a \$750 per unit rebate and free compact fluorescent lights from NSTAR, the local electricity distribution utility.<sup>126</sup> Developers also receive an official Energy Star certification label with which they can market their building's efficiency credentials upon completion of the program.<sup>127</sup> In order to meet the baseline energy requirements and pursue incentives supporting energy efficiency, DND expects that all developers will enroll in the Energy Star program. Energy Star is only applicable, however, to new buildings that are three stories in height and below.<sup>128</sup>

For buildings with four or more residential floors, and for developers seeking to renovate existing buildings, establishing an energy standard equivalent to Energy Star is more difficult. There are currently no national Energy Star standards for new multi-family buildings four stories and taller because the energy dynamics of high-rise buildings are dramatically different than low- to mid-rise buildings.<sup>129</sup>

---

123. Compare NATIONAL PERFORMANCE PATH REQUIREMENTS, *supra* note 120, with U.S. EPA, ENERGY STAR QUALIFIED HOMES, BUILDER OPTION PACKAGE NOTES, [https://www.energystar.gov/ia/partners/downloads/BOP\\_054.pdf](https://www.energystar.gov/ia/partners/downloads/BOP_054.pdf) (last visited Nov. 10, 2007).

124. See U.S. EPA, ENERGY STAR QUALIFIED HOMES THERMAL BYPASS CHECKLIST GUIDE 83 (June 2007), available at [http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/TBC\\_Guide\\_062507.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/TBC_Guide_062507.pdf).

125. U.S. EPA, ENERGY STAR HOMES, GETTING STARTED, [http://www.energystarhomes.com/ESHController.aspx?building\\_getting\\_started.pdf](http://www.energystarhomes.com/ESHController.aspx?building_getting_started.pdf) (last visited Nov. 10, 2007).

126. U.S. EPA, ENERGY STAR HOMES, PROGRAM INCENTIVES, [http://www.energystarhomes.com/ESHController.aspx?command=link&building\\_incentives.xml](http://www.energystarhomes.com/ESHController.aspx?command=link&building_incentives.xml) (last visited Nov. 10, 2007).

127. See U.S. EPA, ENERGY STAR HOMES, USING THE ENERGY STAR IDENTITY TO MAINTAIN AND BUILD VALUE 4.0, <https://www.energystar.gov/ia/partners/logos/downloads/BrandBook508r.pdf> (last visited Nov. 10, 2007).

128. FEATURES OF ENERGY STAR, *supra* note 119.

129. F. L. Andrew Padian, Presentation at the Energy Efficient Multifamily Buildings Workshop (May 9, 2007).

There is also no national standard for existing multi-family residential buildings of any size.

In order to address the need for energy standards for these types of buildings, DND worked with state and federal stakeholders to identify and adopt national best practices. For buildings above four stories, the EPA has launched an Energy Star Multi-Family High Rise pilot program for new construction.<sup>130</sup> The pilot program requires buildings to exceed the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 90.1-2004 energy standard by 20%.<sup>131</sup> The pilot was launched in 2005 in New York, Oregon, and Washington.<sup>132</sup> In order to achieve this target, developers must model the building's baseline energy performance as though it were complying with ASHRAE 90.1-2004 standard's Appendix G. A second model is then built under which the design must improve energy performance by 20% over the baseline.<sup>133</sup> Although Massachusetts has not joined the multi-family pilot, DND has adopted the pilot's requirements.<sup>134</sup>

DND acknowledges that the standard is new to Boston, and that developers may face challenges to benchmark and then exceed ASHRAE 90.1-2004 by 20%. DND anticipates a dialog with developers about their efforts to meet this requirement and expects that developers will work towards the goal of 20% above ASHRAE 90.1-2004. DND is evaluating whether to consider projects that fall short of the 20% target after construction, but that have made a demonstrated effort to meet the standard, "Energy Star equivalent."<sup>135</sup>

---

130. See U.S. EPA, ENERGY STAR, FREQUENTLY ASKED QUESTIONS: ENERGY STAR QUALIFIED HOMES, [http://www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.pt\\_bldr\\_fa](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.pt_bldr_fa) (last visited Nov. 10, 2007); David Hepinstall & Richard Faesy, Energy Star High Rise Multifamily Building Program, Presentation at Hostos Community College "Moving Toward Sustainable Energy: The Bronx is Going Green" Seminar (Sept. 23, 2005), available at <http://www.getenergysmart.org/Files/Hostos/HostosMFES.pdf>.

131. Michael Guerard, Senior Project Manager, Conservation Servs. Group, Presentation on Mid/High-Rise New Construction at the Renewable Energy and Energy Efficiency Training Workshop 3 (July 25, 2007), available at [http://www.mtpc.org/renewableenergy/green\\_buildings/afford/5MichaelGuerardCSG.pdf](http://www.mtpc.org/renewableenergy/green_buildings/afford/5MichaelGuerardCSG.pdf).

132. U.S. EPA, ENERGY STAR, CAN MULTI-FAMILY BUILDINGS QUALIFY FOR THE ENERGY STAR? (Nov. 1, 2007), [http://energystar.custhelp.com/cgi-bin/energystar.cfm/php/enduser/std\\_adp.php?p\\_faqid=3093](http://energystar.custhelp.com/cgi-bin/energystar.cfm/php/enduser/std_adp.php?p_faqid=3093).

133. See *infra* note 169.

134. See *infra* note 169; AM. SOC'Y OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENG'RS, STANDARD 90.1-2004: ENERGY STANDARD FOR BUILDINGS EXCEPT LOW-RISE RESIDENTIAL BUILDINGS (2004), available at <http://www.realread.com/prst/pageview/browse.cgi?book=1931862664>.

135. Interview with John Feuerbach, Sen. Dev. Officer, City of Boston Dep't of Neighborhood Dev., in Boston, Mass. (Jan. 2008).

For existing buildings, DND identified the New York State Energy Research and Development Authority's New York Energy Smart Multifamily Performance Program as an appropriate model to follow.<sup>136</sup> In EPA's Energy Star program for existing commercial buildings, an Energy Star label is awarded once an existing building has demonstrated that it is within the seventy-fifth percentile of energy performance when benchmarked against a national database of similar existing commercial buildings.<sup>137</sup> The Energy Star program does not yet have such a database for existing multi-family buildings. As part of a pilot program for New York State, however, the New York State Research and Development Authority (NYSERDA) developed a multi-family affordable housing benchmarking tool for New York's existing multi-family building energy efficiency program.<sup>138</sup> This tool draws data from a U.S. Department of Housing and Urban Development database of multi-family buildings.<sup>139</sup> In conversations with EPA and Oak Ridge National Laboratory, DND confirmed that the tool's dataset is sufficiently robust for use in the Boston area.<sup>140</sup>

Developers applying to DND to renovate existing buildings must use the benchmarking tool to determine the current energy performance of their building, and then improve their energy performance by an amount to be agreed upon in consultation with DND.<sup>141</sup> DND is

---

136. See N.Y. State Energy Research and Dev. Auth., *Make Your Building Work for You*, <http://www.getenergysmart.org/buildingowners/existingmultifamily/overview.asp> (last visited Nov. 10, 2007).

137. U.S. EPA, *THE ENERGY STAR FOR BUILDINGS & MANUFACTURING PLANTS*, [http://www.energystar.gov/index.cfm?c=business.bus\\_bldgs](http://www.energystar.gov/index.cfm?c=business.bus_bldgs) (last visited Jan. 22, 2008) ("The energy performance of commercial and industrial facilities is scored on a 1-100 scale and those facilities that achieve a score of 75 or higher are eligible for the ENERGY STAR, indicating that they are among the top 25% of facilities in the country for energy performance.").

138. N.Y. State Energy Research & Dev. Auth., *Multifamily Performance Benchmarking Tool & Energy Reduction Plan Tables Workbook*, <http://getenergysmart.org/Files/BuildingPerformance/Tools/SampleBenchmarkingTool.xls> (last visited Nov. 10, 2007).

139. NYSERDA *Multi-Family Building Performance Benchmarking Tool – Ver. 1*, <http://www.getenergysmart.org/Files/BuildingPerformance/ProgramUpdates/BenchmarkingTool.xls> (click "benchmarking tool" tab) (last visited Jan. 24, 2008) ("The NYSERDA Multi-Family Building Energy Use Benchmarking Tool quantifies the projected performance of a user-defined building relative to all HUD 5-plus unit multi-family residential buildings nationwide.").

140. Telephone Interview with Ted Leopkey, Program Analyst, U.S. EPA, in Boston, Mass. (July 2007); Telephone Interview with Terry Sharp, Dev. Eng'r, Oak Ridge Nat'l Lab., in Boston, Mass. (July 2007).

141. See CITY OF BOSTON, DEP'T OF NEIGHBORHOOD DEV., *GREEN AFFORDABLE HOUSING AT DND*, [http://cityofboston.gov/dnd/D\\_Green\\_housing.asp#Energy\\_star](http://cityofboston.gov/dnd/D_Green_housing.asp#Energy_star) (last visited Jan. 22, 2008) ("Energy performance review for developments proposing to renovate existing buildings will be handled on a case-by-case basis.").

currently considering using the standard set by NYSERDA under which existing buildings must improve their energy performance by 20% over their benchmarked baseline.<sup>142</sup> Unlike new construction buildings, which can be built to standard specifications, existing building stock varies widely in terms of its energy performance and it may be difficult to set a target that all buildings can achieve.<sup>143</sup> A near-term policy challenge is therefore to decide what minimum performance improvement threshold should be required for existing buildings.

### C. *Establishing Renewable Energy Requirements*

Unlike the green building and energy efficiency standard development process, the process for adopting renewable energy standards for the GAHP program was fairly straightforward because renewable energy standards in the state are well established through legislation and MTC programs.

Under Massachusetts state law, renewable electricity technologies include solar photovoltaic, solar thermal electric, wind energy, ocean thermal energy, wave energy, tidal energy, fuel cells utilizing renewable fuels, landfill gas, hydroelectricity, and low-emission biomass technologies.<sup>144</sup> Although all of these technologies are eligible for funding under the Green Affordable Housing Program, most are unsuitable for customer-sited applications in the Boston area. Boston is home to an affordable housing development that employs a biodiesel combined heat-and-power system,<sup>145</sup> and a 100-kilowatt wind turbine sited at the International Brotherhood of Electrical Workers Local 103.<sup>146</sup> These projects have thus far proved unique, however, and photovoltaic is by far the most prevalent of the renewable energy systems currently installed within the city.<sup>147</sup> If this trend continues, DND expects that most of the renewable energy systems that it funds

---

142. Memorandum from the City of Boston Dep't of Neighborhood Dev. 2 (2007) (on file with the *New York University Journal of Legislation and Public Policy*) (discussing the evaluation of whether to adopt the NYSERDA requirement that buildings improve by 20% over their benchmarked baseline).

143. F. L. Andrew Padian, *Energy Usage: How Efficient are Your Buildings? (or the 7 to 1 solution)*, AIM, Sept. 2006, at 31 (finding that heating usage can range as high as seven times the lowest usage amount per unit of area).

144. MASS. GEN. LAWS ANN. ch. 25A, § 11F (West 2007).

145. ALYSSA FLANNERY ET AL., GREEN BUILDING CASE STUDIES: BRIAN J. HONAN APARTMENTS 2 (2007).

146. Lyn Corum, *A Price Controller for Business and Home*, DISTRIBUTED ENERGY (2006), available at [http://www.foresterpress.com/de\\_0609\\_price.html](http://www.foresterpress.com/de_0609_price.html).

147. Interview with Jon Abe, Senior Project Manager, Mass. Tech. Collaborative, in Boston, Mass. (Aug. 2007). There were twenty-eight photovoltaic systems installed in Boston as of the end of 2007. *Id.*

will be solar electric (photovoltaic or PV) systems because they can be readily mounted on building rooftops or integrated into façades.<sup>148</sup>

In crafting its renewable energy requirements, DND directly referenced the MTC's Small Renewables Initiative technical requirements for wind energy and solar energy systems, and referenced the definition of eligible biomass put forth in the state's Renewable Portfolio Standard regulations.<sup>149</sup> The Small Renewables Initiative technical requirements help ensure that system components meet national standards and that they are installed correctly, while the biomass definition requires that the biomass-fueled system have low emissions and use 100% renewable fuels.

In addition to the technical standards, MTC worked with DND to include a requirement in the DND RFP that installed costs for photovoltaic systems funded under the GAHP be capped at \$10 per watt.<sup>150</sup> Installed costs for photovoltaics vary widely around the country. While some markets like Long Island and New Jersey have average installed costs close to \$7.00 per watt, Boston's average installed cost is \$9.21 per watt.<sup>151</sup> Although this is high compared to most regions of the country, Boston's average installed cost is comparable to those of other large Northeastern urban centers like New York City.<sup>152</sup>

For the GAHP program, MTC requires that developers install a data acquisition system to monitor renewable energy system output and that the data be fed into the MTC's Production Tracking System.<sup>153</sup> The MTC also requires that generators transfer the rights to renewable energy credits (REC) generated by systems funded under

---

148. See CITY OF BOSTON, DEP'T OF NEIGHBORHOOD DEV., HOMEOWNERSHIP, RENTAL AND COOPERATIVE HOUSING PRODUCTION REQUEST FOR PROPOSALS 7 (2007) ("DND expects that solar photovoltaics will be the most commonly deployed renewable electricity technology. . . .") [hereinafter 2007 RFP].

149. See RENEWABLE ENERGY TRUST, MTC, MINIMUM TECHNICAL REQUIREMENTS FOR RENEWABLE ENERGY INSTALLATIONS FUNDED BY THE SMALL RENEWABLES INITIATIVE, available at [http://www.masstech.org/Grants\\_and\\_Awards/SRI/Attachment\\_A-Minimum\\_Technical\\_Requirements\\_021207.pdf](http://www.masstech.org/Grants_and_Awards/SRI/Attachment_A-Minimum_Technical_Requirements_021207.pdf) (last visited Nov. 8, 2007); see also 225 CMR 14.00, available at <http://www.mass.gov/doer/rps/225cmr.pdf> (last visited Nov. 8, 2007) (defining eligible biomass fuels).

150. 2007 RFP, *supra* note 148.

151. These numbers were drawn from MTC program data by the authors. See *supra* note 51.

152. See WILSON RICKERSON ET AL., NEW YORK CITY'S SOLAR ENERGY FUTURE: SOLAR ENERGY POLICIES AND BARRIERS IN NEW YORK CITY 15 (2006), available at [http://www.bcc.cuny.edu/institutionalDevelopment/cse/CUNYPV\\_%20PolicyAndBarriersStudy.pdf](http://www.bcc.cuny.edu/institutionalDevelopment/cse/CUNYPV_%20PolicyAndBarriersStudy.pdf).

153. See City of Boston DND, *supra* note 112, at 19 (explaining GAHP requirements).

the GAHP to the MTC.<sup>154</sup> By retaining REC rights, MTC plans to replenish its program funds through the aggregation and sale of RECs from GAHP systems.<sup>155</sup> MTC argues that the REC rights transfer is justified since MTC is paying for the entire cost of the renewable energy systems, rather than only a portion.<sup>156</sup>

In addition to the MTC requirements, DND also requires that all affordable housing developments, whether they are applying for GAHP funds or not, must be built “solar ready”<sup>157</sup> as defined by the Enterprise Green Communities standards<sup>158</sup> and as recommended by a recent report on integrating solar power into affordable housing development.<sup>159</sup> Buildings must be oriented to permit access to sunlight, the design must include south-facing architectural elements, unobstructed roof area must be reserved for panels, and wiring must be run from the potential solar system location to the electrical panel.<sup>160</sup>

---

154. RENEWABLE ENERGY TRUST, MTC, GREEN AFFORDABLE HOUSING INITIATIVE PROGRAM AGREEMENT 7 (2007) [hereinafter PROGRAM AGREEMENT]. RECs are essentially certificates demonstrating that a given energy system’s generation is renewable. Every kilowatt-hour or megawatt-hour generated by a renewable energy system also generates an REC. RECs have emerged as a commodity within both the voluntary green power markets and the renewable portfolio standard compliance markets nationwide. Organizations and individuals that want to procure a percentage of their electricity from “green” sources typically purchase RECs, and utilities seeking to demonstrate compliance with the Massachusetts renewable portfolio standard targets (i.e., 4% of retail sales within the state must be derived from renewable electricity by 2009) must also purchase RECs on the regional market. Unless a renewable energy system is directly connected to a facility, the delivery of “green” electricity from a generator to an end user cannot be guaranteed since electricity from one source fed into the electricity grid is indistinguishable from that of any other source. As a result, RECs are a contractual recognition of green power purchase, rather than evidence of physical delivery. See LORI BIRD & BLAIR SWEZEY, NREL/TP-620-38994, GREEN POWER MARKETING IN THE UNITED STATES: A STATUS REPORT 1–2 (2005) (describing the ability for consumers in the U.S. electricity market to purchase RECs).

155. Memorandum from Raphael Herz, Manager, Green Affordable Hous. Initiative, MTC 1 (Sept. 27, 2007) (on file with the *New York University Journal of Legislation and Public Policy*) (espousing desire that electricity generated does not go “unharvested”).

156. Interview with Raphael Herz, Manager, Green Affordable Hous. Initiative, MTC, in Westborough, Mass. (Aug. 2007).

157. See City of Boston DND, *supra* note 112, at 19 (explaining GAHP requirements).

158. See ENTER. CMTY. PARTNERS, *supra* note 98, at 28 (detailing Green Communities Criteria).

159. PEREGRINE ENERGY GROUP, INC. & CLEAN ENERGY GROUP, STRATEGIES TO FOSTER SOLAR ENERGY & ADVANCED EFFICIENCY IN AFFORDABLE MULTI-FAMILY HOUSING 6 (2006).

160. ENTER. CMTY. PARTNERS, *supra* note 98, at 28.

#### D. Identifying Healthy Homes Strategies

A “healthy home” can be defined as a building that minimizes occupant health risks such as asthma and respiratory disease, unintentional injury, and exposure to toxic substances.<sup>161</sup> Although there is no national healthy homes standard, many existing green building standards include sections that address healthy homes criteria. The National Center for Healthy Housing (NCHH) recently completed a report comparing the occupant health criteria embedded in five national green building standards, including LEED and Enterprise.<sup>162</sup> The report found that none of the five standards comprehensively addressed the NCHH’s healthy homes principles that residential buildings be “dry, clean, well ventilated, pest-free, free from contaminants, safe, and well-maintained.”<sup>163</sup>

According to the NCHH analysis, the LEED-Homes standard completely satisfies the “well-maintained” criterion, and satisfies 75% of the “dry” and “ventilated” criteria, but falls short of the rest.<sup>164</sup> The EPA Energy Star Indoor Air Package (IAP) completely satisfies the ventilation, contaminant, pest control, and maintenance criteria, and could potentially make up for some of LEED’s healthy homes shortcomings.<sup>165</sup> The Energy Star IAP is an optional addition to the Energy Star for Qualified Homes program focusing on moisture control, radon control, pest barriers, heating, ventilation, and air conditioning systems, combustion systems, building materials, and home commissioning.<sup>166</sup>

DND considered requiring the IAP for several reasons. First, the IAP is a natural extension of the GAHP Energy Star requirement. Second, the IAP meets many of the LEED standard’s healthy homes gaps identified by the NCHH. Third, implementing the IAP may enable or allow projects to earn points under the LEED-Homes rating system.<sup>167</sup> To date, however, Massachusetts utilities have declined to include the IAP in the existing Massachusetts Energy Star programs

---

161. NAOMI MERMIN ET AL., *supra* note 85, at 3.

162. MERMIN ET AL., *supra* note 85, at 5–7.

163. *See id.* at 3 (noting that “the results showed that there is a significant variation in the degree to which national green guidelines consider occupant health.”).

164. *Id.* at 16 tbl.3.

165. *Id.*

166. U.S. EPA, ENERGY STAR INDOOR AIR PACKAGE SPECIFICATIONS, VERSION 2 (2007), available at [http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/IAP\\_Specification\\_041907.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/IAP_Specification_041907.pdf).

167. *See* U.S. GREEN BLDG. COUNCIL, LEED FOR HOMES PROGRAM PILOT RATING SYSTEM 28 (2007), available at <http://www.usgbc.org/ShowFile.aspx?DocumentID=2267>.

because the IAP benefits are health-related, not energy-related.<sup>168</sup> Although DND encourages developers to pursue the IAP, the IAP was not selected as a requirement because the infrastructure to support and certify IAP compliance is not yet in place in the state. A secondary concern is that, as with Energy Star for Qualified Homes, there is no standard for buildings over three stories tall. There are probably fewer technical barriers to extending the IAP standard to buildings over four stories than there are to extending the energy standard. However, no formal technical guidelines for IAP in high-rise multi-family buildings exists, and this lack of standards presents a barrier to agencies that would like to reference national standards for both low- and high-rise buildings in their programs.

In order to reflect the healthy homes goals of the city, the DND solicited comments from national and regional healthy homes stakeholders and incorporated prescriptive standards related to pest control and moisture directly into the Design Standards language rather than referencing a formal standard.<sup>169</sup>

#### *E. GAHP Provides a Model for Standards Integration*

Under Boston's GAHP, MTC agreed that up to 30% of each award could be used to support energy efficiency, green building, or healthy homes strategies.<sup>170</sup> DND specified that the maximum award for any given project would be \$500,000, which equates to a maximum of \$150,000 for non-renewable strategies for each project.<sup>171</sup> During the funding award process, DND and MTC agreed the non-renewable funds could be used to support green building and energy efficiency improvements that represented incremental gains above DND's baseline standards.<sup>172</sup> Although MTC's funds were critical to the success of the initial GAHP effort, and to Boston's affordable housing market transformation efforts, their impact is less far-reaching than DND's efforts under the GAHP to establish mandatory green standards.

Before the establishment of GAHP, DND had updated its Residential Design Standards for both rehabilitation projects and for new construction to incorporate strategies regarding storm water manage-

---

168. Interview with Brian Smith, ICF Int'l, in Boston, Mass. (Sept. 2007).

169. The knowledge in this Article is based on direct work by the authors with Boston's DND and their efforts to help DND select standards that would aid DND's efforts to create healthy homes.

170. RENEWABLE ENERGY TRUST, MTC, GREEN AFFORDABLE HOUSING INITIATIVE PROGRAM AGREEMENT 9 (2007).

171. 2007 RFP, *supra* note 148, at 4.

172. PROGRAM AGREEMENT, *supra* note 170, at 9.

ment, the heat island effect, water efficiency, and indoor air quality.<sup>173</sup> Additionally, the 2006 Design Standards required the national Energy Star standard for new construction that was three stories or less.<sup>174</sup> After the creation of the GAHP, however, DND conducted a thorough review of its Design Standards to ensure that they reflected the City's energy efficiency, healthy housing, green building, and renewable energy goals.<sup>175</sup>

NHD released a request for GAHP proposals in April 2007, simultaneously with its RFP for HOME, Community Development Block Grants, and Leading the Way II funds.<sup>176</sup> NHD created three tracks for respondents: Category 1 for projects seeking both conventional financing sources and GAHP funds, Category 2 for projects that had previously been awarded NHD funds and were only seeking GAHP funds, and Category 3 for projects that were seeking affordable housing financing, but not GAHP funds.<sup>177</sup> Rather than requiring only Category 1 and Category 2 projects to meet green standards, DND revised its Design Standards so that all current and future projects must include green design, regardless of whether they seek green funds or not.<sup>178</sup> Thus, the GAHP funds provided DND an opportunity to create a new set of mandatory green standards for affordable housing development that will exist beyond the funds' expenditure. Not only did the new green standards raise the bar for the definition of "incremental" green improvements, but they also signaled a permanent shift towards green building for affordable housing development in Boston.

The standards revision process was valuable for both DND and for the broader green building efforts at the city and state levels. By

---

173. CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR REHABILITATION PROJECTS 9–10, 12, 16–18 (2006), available at [http://www.cityofboston.gov/dnd/PDFs/D\\_14\\_2\\_Rehab\\_Design\\_Standards.pdf](http://www.cityofboston.gov/dnd/PDFs/D_14_2_Rehab_Design_Standards.pdf); CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR NEW CONSTRUCTION 14, 17–18, 22–25 (2006), available at [http://www.cityofboston.gov/dnd/PDFs/D\\_14\\_1\\_New\\_Construction.pdf](http://www.cityofboston.gov/dnd/PDFs/D_14_1_New_Construction.pdf).

174. CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR NEW CONSTRUCTION, *supra* note 170, at 2.

175. The authors of this Article discussed the goals with DND and reviewed the design standards piece by piece, proposed incorporation of additional strategies, and then updated the design standards with these strategies.

176. 2007 RFP, *supra* note 148, at 1.

177. *Id.* at 4.

178. See CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR REHABILITATION PROJECTS, *supra* note 173, at 1–2 (noting that all projects should “promote cost effective, environmentally responsible, quality design.”); CITY OF BOSTON DND, RESIDENTIAL DESIGN STANDARDS FOR NEW CONSTRUCTION, *supra* note 110, at 1 (noting that all projects should “promote cost effective, environmentally responsible, quality design”).

targeting affordable housing, the MTC and the city extended green mandates to sets of buildings not targeted under the city and Commonwealth's existing policies. As a result, DND had to develop standards for specific building sets (for example, existing buildings and high-rise new construction), and in response to specific policy priorities unique to Boston. DND's approach to these issues has created a model for other city and state programs to reference, and identified policy challenges demanding further research. These include: developing energy standards for buildings four stories and over, developing energy standards for existing buildings, and developing and enacting mandatory standards for green building.<sup>179</sup>

The network of federal, state, local, private sector, and non-profit stakeholders that DND consulted to develop the standards will also be a valuable resource as Boston's green mandates continue to evolve.<sup>180</sup>

#### IV.

#### CONCLUSION

Boston's Green Affordable Housing Program is an interesting case study in green building policy implementation and program development. The DND experience with structuring the GAHP highlights both the challenges and opportunities inherent in integrating green building strategies into the affordable housing sector.

The most significant impact of the GAHP is arguably not the \$2 million in funds, but rather the opportunity the funds created to reorient Boston's affordable housing market. Partnerships between state clean energy fund administrators and housing development agencies have been advocated as a pathway to deploy renewable energy tech-

---

179. The GAHP consultants also identified a host of possible future research and programmatic goals including: exploring third party photovoltaic ownership models for affordable housing developments, identifying inexpensive renewable energy performance monitoring protocols and technology, exploring the creation of green building material purchasing cooperatives for affordable housing developers, developing standards that are specifically tailored to local climates and environmental challenges, developing a standard certification process that maintains high standards of quality while minimizing developer paperwork and overhead, and identifying new and consolidating existing green affordable housing funding sources. See *supra* note 169.

180. DND consulted the following entities: U.S. Environmental Protection Agency, U.S. Department of Housing and Urban Development, Oak Ridge National Laboratory, U.S. Green Building Council, RESNET, Massachusetts Technology Collaborative, ICF International, Conservation Services Group, The Green Roundtable, Green Healthy Buildings Network, Boston Urban Asthma Coalition, National Center for Healthy Homes, Steven Winter Associates, New Ecology, Inc., NSTAR, KeySpan, National Grid, Boston Public Health Commission, Boston Housing Authority, local architects, and both non-profit and for-profit green housing developers.

nologies in otherwise underserved communities.<sup>181</sup> As demonstrated by the GAHP, however, such partnerships can also create opportunities for broader institutional change and market transformation. Instead of simply acting as a grant administrator on behalf of MTC, DND organized mandatory training programs for developers, reached out to other state and national funding organizations in an effort to coordinate resources, and revised its Design Standards to incorporate green criteria. These standards revisions fundamentally shifted the city's affordable housing market towards green development. Ultimately, they are expected to result in the production of over 230 affordable housing units that will provide healthier homes for urban families while reducing energy related expenses and environmental impact.

---

181. *See, e.g.*, PEREGRINE ENERGY GROUP, INC. & CLEAN ENERGY GROUP, CLEAN ENERGY STATE PROGRAM GUIDE, STRATEGIES TO FOSTER SOLAR ENERGY & ADVANCED EFFICIENCY IN AFFORDABLE MULTI-FAMILY HOUSING 1 (2006), available at [http://www.cleanenergyfunds.org/CaseStudies/CEG\\_Peregrine\\_PV\\_Multifamily\\_2006.pdf](http://www.cleanenergyfunds.org/CaseStudies/CEG_Peregrine_PV_Multifamily_2006.pdf).