



KEY CONTRIBUTORS TO HUD'S ENERGY EFFICIENCY EFFORTS

A HUD 50TH ANNIVERSARY PUBLICATION



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Energy Efficiency Efforts
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January 2016

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Introduction

In 2015, we celebrate the 50th anniversary of the U.S. Department of Housing and Urban Development (HUD). The celebration gives us an opportunity to reflect on the accomplishments of the Department during its first 50 years. The following monograph offers the reflections of five HUD energy leaders on the Department's accomplishments in its efforts to improve energy efficiency in HUD-subsidized housing and housing throughout the United States.

Five current and retired HUD employees, representing multiple HUD programs, were interviewed for this monograph, providing profiles of the different Departmental efforts at different periods of time contributing to HUD's long-time strategy to reduce the use of energy in housing.

William Freeborne (retired), David Engel (retired), and Robert Groberg (retired) all had long tenures at the Department in the Office of Policy Development and Research (PD&R) or the Office of Community Planning and Development (CPD). They each offer reflections on some of their work on the energy-efficiency issue in the mid-1970s, 1980s, and 1990s. In addition, Richard Santangelo (retired), in the Office of Public and Indian Housing (PIH), and Michael Freedberg, in PD&R and the Office of Economic Resilience (OER), have both made major contributions to HUD's energy-efficiency activities.

William Freeborne

1982–2003 Project Engineer, Office of Policy Development and Research

1975–1982 Technical Specialist, Solar Heating and Cooling Demonstration Program

What steps did HUD take after the oil crisis of the 1970s to foster energy efficiency in housing?

PD&R ran the Solar Demonstration Program from 1975 to 1982. The Solar Demonstration Program consisted of two parts: The Solar Heating and Cooling Demonstration Program and the Passive Solar Residential Design Competition.

The Solar Demonstration Program was intended to help bring the solar industry to the point that it could economically serve the housing industry with efficient and cost-effective heating and cooling equipment. During the life of the program, 943 grants were awarded and solar systems were provided hot water, space heating, or space cooling to 10,098 dwelling units.¹

The Passive Solar Residential Design Competition was a competition and award program to encourage the design, construction, and marketing of passive solar homes.²

After HUD's solar efforts were complete, the Department supported the development of American Society for Testing and Materials (ASTM) standards for solar energy equipment and installation. I was an active member on several of the ASTM committees.

This initiative was the first time that the federal government conducted activities that directly supported the promotion of a technology to the consumer. The program also helped serve as the technical foundation for energy-efficiency improvements that have been made in the residential sector.

¹ *A Descriptive Summary of HUD Cycle 2 Solar Residential Projects (1976)*—<http://www.huduser.org/portal/Publications/pdf/HUD%20-%205682.pdf>. FCC Technical Report No. 79, *Experiences of Federal Agencies with Solar Energy Systems (1985)*—<http://books.google.com/books?id=PmlrAAAYAAJ&pg=PA5&lpg=PA5&dq=HUD+solar+freeborne&source=bl&ots=PPKbOkzy7e&sig=al8YC06pjXHDvVHJYVYVjjPDhUA&hl=en&sa=X&ei=p-kqVMS5NlacyASDvY1Q&ved=0CB4Q6AEwAA#v=onepage&q=HUD%20solar%20freeborne&f=false>

² *Findings of the Passive Solar Residential Design Competition and Demonstration (1980)*—<http://www.huduser.org/Publications/pdf/HUD%20-%2050813.pdf>.

What other energy-efficiency research did PD&R conduct in the '80s and '90s?

One important effort that I worked on was the HUD Rehabilitation Energy Guidelines for One-to-Four Family Dwellings.³ This guidebook cuts through technical language to explain how owners of one-to-four family dwellings can increase the energy efficiency of residential properties. The guidelines noted that significant, cost-effective energy savings could be realized by improving the air tightness, increasing the insulation, and upgrading the HVAC (heating, ventilation, and air-conditioning) system.

The guidebook represented an update of the HUD-issued Cost-Effective Energy Conservation Standards for Rehabilitation in 1979. Since then, home construction and energy technologies have advanced—while construction costs and energy prices have increased.

The guidelines incorporated many of the recent technological changes and performance standards and applied them to particular climate zones. The guidebook explained recommended energy measures, conservation terms, and how energy conservation can be cost effective. It also included Cost-Effectiveness Worksheets and software that helped property owners and remodelers determine the savings from proposed building envelope and equipment measures.

³ <http://www.huduser.org/portal/publications/destech/single.html>.

David Engel

1990–2007 Division Director, Affordable Housing Research and Technology, Office of Policy Development & Research

What efforts has HUD made to educate the public on energy-efficiency issues?

One of the first efforts by HUD to educate the public on energy efficiency was a publication called *In the Bank or Up the Chimney?* This booklet was published in 1976 as an easy-to-understand document that told homeowners how to figure what a specific energy-saving home improvement will cost and what the estimated saving will be for their particular home, heating system, and area of the country.⁴

In 1996, the Partnership for Advancing Technology in Housing (PATH) program also provided easy-to-understand technical information on energy-saving building technologies and construction techniques. PATH helped popularize the use of technologies and techniques such as structural insulated panels, or SIPs; tankless water heaters; and solar energy systems. We were able to develop provisions that were incorporated into the model building codes that helped both builders and building code officials understand how to use these innovative products.

You noted the importance of improving energy efficiency in existing buildings. What have been some of the key initiatives you were part of while at HUD?

Not everything is a new building. Although about 1 million homes are built each year, there are more than 130 million homes in the United States. Therefore, rehabilitating older buildings often makes the most sense from an affordability standpoint. Those older buildings were often built using building codes that did not have as stringent energy standards as the building codes we use today, however. PATH focused a spotlight on the importance of reducing the energy use in existing buildings with the release of a three-volume technology roadmap to improve energy

efficiency in existing buildings between 2002 and 2004.⁵ These documents focused specifically on improving energy efficiency in existing housing. They described the challenges and outlined activities and accomplishments that will lead to the achievement of the vision. These activities include promoting new technologies, evaluating products and processes for retrofit, building capabilities among trade contractors, and identifying potential consumer incentives.

Another important set of reports was a nine-volume series called the *Rehab Guide*.⁶ These guidebooks were published between 1997 and 1999. This series of nine guidebooks was intended to inform the design and construction industry about the use of state-of-the-art materials and innovative practices in housing rehabilitation. The Rehab Guide series focused on building technologies, materials, components, and techniques for every part of home design and construction from foundations and exterior walls to windows, doors, and bathrooms.

⁴ *In the Bank Or Up the Chimney?* GPO 2300-00297. Washington, DC: U.S. Government Printing Office.

⁵ 2002 PATH Technology Roadmap: Energy Efficiency in Existing Homes—<http://www.huduser.org/portal/publications/destech/roadmap.html>. 2003 Technology Roadmap: Energy Efficiency in Existing Homes. Volume Two: Strategies Defined—http://www.huduser.org/portal/publications/destech/tech_rdEnergy.html. 2004 Technology Roadmap: Energy Efficiency in Existing Homes. Volume Three—http://www.huduser.org/portal/publications/destech/tech_roadmap_EEEH.html.

⁶ <http://www.huduser.org/portal/publications/destech/rehabgds.html>.

Robert Groberg

2009–2010 Acting Director, HUD Office of Environment and Energy

2001–2010 Co-Chair, HUD Energy Task Force

1981–2008 Energy Division Director, Office of Community Planning and Development, Office of Environment and Energy

1976–1981 Director, Section 312 Urban Renewal Rehabilitation Loans and Urban Homesteading Program, HUD Office of Community Planning and Development, Office of Rehabilitation and Relocation

Within CPD, when was the importance of energy efficiency noted?

In President Carter's 1980 Urban Policy Report, prepared by HUD, one of the five general objectives was the "encouragement of energy-efficient and environmentally sound urban development patterns." After publication of the report, HUD initiated amendments to the 1974 Housing and Community Development Act, which increased emphasis on energy efficiency and development to the Findings, Purposes and Eligible Activities of Title I and to the Urban Development Action Grant, or UDAG, program. The Assistant Secretary for CPD, Robert Embry, was designated Departmental Energy Officer, and he formed a CPD energy task force that developed energy initiatives for these programs. In 1981, CPD created the Energy Division with a staff of eight, including experts with city planning, architecture, and engineering experience, in the Office of Environment and provided funding to implement these initiatives.

What was the initial focus of the Energy Division?

Partnering with the U.S. Department of Energy (DOE), we executed an agreement for \$1.5 million to fund feasibility and design studies for community district energy systems that could provide higher efficiencies and better pollution control than central coal-fired plants or building-level boilers. The District Community Energy program provided grants to cities for some 50 feasibility studies and shared costs with local investment for two dozen followup design plans. Seven annual energy conferences were held in cooperation with DOE at U.S. Conference of Mayors winter meetings.

During the first years, the Energy Division also funded a cooperative agreement to enable the Energy Task Force of Public Technology, Inc. (PTI), to report on the experience of six local governments that used energy management to support community and economic development. Two guidebooks were published by PTI in 1987 and 1989: *The Hidden Link: Energy and Economic Development Phase I Strategic Planning*⁷ and *Phase II: Marketing and Financing Strategies for Community Energy Projects*.⁸

At the request of HUD and DOE, with Swedish, Danish, and French support, the National Academy of Sciences convened a panel that studied the prospects for district heating and cooling in the United States. HUD Secretary Pierce keynoted a June 1985 international symposium. The report, *District Heating and Cooling in the United States: Prospects and Issues*, is available online from the National Academy Press.⁹

The International District Energy Association gave its first Public Service Award to the Energy Division's deputy director, Wyndham Clarke, who was involved in developing relationships with DOE at the time of the Embry Energy Task Force and managed all the following activities under the Interagency Agreement and the international contacts.

A Municipal Community Energy Management Training Center for local government staffs was created with a board of members from the five chief local government associations. It ran for about 2 years, but funding was discontinued and it closed.

⁷ https://portal.hud.gov/hudportal/documents/huddoc?id=DOC_4325.pdf.

⁸ https://portal.hud.gov/hudportal/documents/huddoc?id=DOC_4326.pdf.

⁹ <http://www.nap.edu/catalog/263/district-heating-and-cooling-in-the-united-states-prospects-and>

Did the cooperation between HUD and DOE continue into the 1990s?

In response to congressional complaints about the lack of technology transfer from DOE laboratories to the markets, I worked with the DOE Office of Energy Efficiency and Renewable Energy's Weatherization and Intergovernmental Programs Manager, John P. Millhone, who persuaded DOE Deputy Secretary Moore to enlist HUD Secretary Kemp's cooperation to involve all HUD program and field staffs in a DOE-HUD Initiative on Energy Efficiency in Housing from 1990 to 1995. Its overall goal was to enlist DOE laboratories and field staff in improving the energy efficiency of public and other federally assisted housing. It was designed with four strategic objectives:

- Prioritize HUD housing programs to receive energy assistance.
- Develop public-private institutional linkages to focus on energy.
- Revise HUD guidelines to capture opportunities for improving energy efficiency.
- Provide technical energy information, assistance, and training to HUD staff, public and assisted housing managers, and others in the field who design and implement housing assistance programs.

The initiative initiated and carried out 27 projects with DOE support, especially with the Oak Ridge, Lawrence Berkeley, and Argonne National Laboratories and HUD support offices, local energy and housing organizations, private and public interest organizations, and the national energy laboratories. Oak Ridge National Laboratory (ORNL) helped create the PIH Guide for Energy Performance Contracting for public housing, and DOE supported the first two training sessions for public housing authorities (PHAs). By 2011, some 265 contracts had been executed, providing \$1.1 billion in energy-efficiency investments in public housing. Summaries of 14 projects can be found beginning page 45 in *The Energy Desk Book for HUD Programs*.¹⁰ The *Energy Desk Book* was used in annual training for Office of Environment and Energy field environmental staff.

The 1990 Affordable Housing Act instructed HUD to submit reports to Congress assessing activities undertaken

¹⁰<http://www.huduser.org/publications/pdf/energybook.pdf>.

to increase energy efficiency in housing as well as a 5-year Energy Efficiency Plan “for the activities to be undertaken and policies to be adopted by the Secretary to provide for, encourage, and improve energy efficiency in housing.” The Energy Division coordinated these reports from other offices, and the first plan was issued in 1992 and updated in 1994. The third version was sent to Congress in June 1999.

What was your focus as cochair of HUD's Energy Action Plan?

I wanted to assist the Department as it attempted to increase energy efficiency across all its programs. In the absence of action on the Housing and Community Development Act of 1990 mandate for adopting an energy code for new construction, we began working with the U.S. Environmental Protection Agency (EPA) to encourage use of the ENERGY STAR standards for new construction. In 2006, CPD Assistant Secretary Patenaude instructed the 40 CPD field offices to use their conferences on the HOME Investment Partnership Program to include a presentation developed by the Boston CPD Director explaining how to meet ENERGY STAR standards for new construction. The program issued a 208-page publication, *Building ENERGY STAR Qualified Homes and Incorporating Energy Efficiency and 'Green' Building Practices into HOME-funded Affordable Housing*.¹¹

I also focused on a topic covered in the early 1980s district energy studies: the use of combined heat and power (cogeneration). With help from the New York State Energy Research and Development Authority (NYSERDA), DOE and its Combined Heat and Power (CHP) Technical Assistance Partnerships (TAP) and ORNL, this effort resulted in preparation of three guides and software.

CHP Guide 1 is an update of a manual issued by New York City in June 1989. That manual was developed to assist managers, owners, and boards of multifamily buildings in determining the merits of introducing CHP into their facilities.¹²

CHP Guide 2 presents a Level 1 feasibility screening software tool to enable building owners and managers quickly to get a rough estimate of the cost, savings, and

¹¹http://portal.hud.gov/hudportal/documents/huddoc?id=19758_200809energystar.pdf.

¹²<http://portal.hud.gov/hudportal/documents/huddoc?id=chpguide1.pdf>.

payback for installing CHP. The Level 1 screening tool requires only monthly utility bills and a little information about the building and its residents.¹³ The results of the screening tool would help the building owner decide whether an opportunity exists for CHP in their building.

CHP Guide 3 introduced the Level 2 analysis for CHP in multifamily housing. The report explains how it was developed and provides links to ORNL for downloading the tool,¹⁴ its users' manual, and training material. It also provides an exercise to demonstrate how it works. The tool is complex and calls for analysis by those with advanced ability to understand building energy use and simulation.¹⁵

During this period, I attended CHP TAP meetings and industry conference calls. In cooperation with ORNL and two of the DOE regional CHP TAP directors, I prepared and delivered at the 2008 ACEEE (American Council for an Energy-Efficient Economy) Summer Study on Energy in Buildings, a paper describing the previously listed activities.¹⁶ The "major challenges" listed resulted in CPD funding work by ORNL that produced CHP Guide 3. The "lessons learned" are still relevant.

A fourth Guide was prepared after I retired in 2010. After Hurricane Sandy, EPA, DOE, and HUD prepared the *Guide to Using Combined Heat and Power for Enhancing Reliability and Resiliency in Buildings*.¹⁷ HUD invited me to work on this report, which documents how during and after Hurricane Sandy, CHP enabled a number of critical infrastructure and other facilities, including multifamily buildings, to continue their operations when the electric grid went down. Its purpose is to provide practical information on CHP, including what factors must be considered when configuring a CHP system to operate independently of the electricity grid, and what steps are involved in a typical CHP project development process.

I delivered at the 2011 PIH Conference, "Going Green: Intelligent Investments for Public Housing," a workshop on CHP in multifamily housing: "Combined Heat and Power (CHP): Cogeneration for housing and other buildings." It included a presentation by an energy service company of a case study on CHP in the New Bedford Housing Authority's Boa Vista Project.

Profiles of successful CHP installations are a key to spreading the knowledge and promoting interest in CHP for multifamily buildings. To that end, I succeeded in getting DOE to add the multifamily housing industry to its CHP Project Industry Profile Database and secured three profiles posted by the Northeast CHP TAP.¹⁸

We are exploring how to add more profiles and also to add street addresses and names of the buildings to the database so HUD and the industry can identify public and assisted multifamily buildings with CHP. A model for such lists is the NYSERDA Distributed Generation Integrated Data System that includes links a summary fact sheet, monthly reports, monitoring, and so on. It contains entries on some two dozen multifamily building installations, which I extracted and shared with DOE and HUD.¹⁹

When the Energy Division was terminated in 2008, I was reassigned as Acting Director of the Office of Environment, but CPD support for energy work had waned. I retired in 2010 but continue to advise on energy, as noted previously.

¹³ <http://portal.hud.gov/hudportal/documents/huddoc?id=chpguide2.pdf>.

¹⁴ http://eber.ed.ornl.gov/MF_CHP/.

¹⁵ <http://portal.hud.gov/hudportal/documents/huddoc?id=chpguide3.pdf>.

¹⁶ <http://aceee.org/files/proceedings/2008/start.htm>.

¹⁷ <http://portal.hud.gov/hudportal/documents/huddoc?id=CHPSept2013.pdf>.

¹⁸ http://www1.eere.energy.gov/manufacturing/distributedenergy/chp_database/.

¹⁹ <http://chp.nyserda.ny.gov/facilities/index.cfm?sort=>.

Richard Santangelo

1991–2010 EPC Program Manager, General Engineer, Office of Public and Indian Housing

PASS Division Director, General Engineer, Real Estate Assessment Center

What were the important energy milestones during your time in PIH?

Real Estate Assessment Center

I think the establishment of the Real Estate Assessment Center (REAC) in the 1990s was huge. REAC's mission is to provide and promote the effective use of accurate, timely and reliable information assessing the condition of HUD's portfolio; to provide information to help ensure safe, decent, and affordable housing; and to restore the public trust by identifying fraud, abuse, and waste of HUD resources.

REAC is improving the quality of HUD-assisted housing through the first-ever physical inspections of all HUD-assisted housing and the analysis of the financial soundness of public and multifamily assisted housing. Both the physical inspections and the collection of financial data have direct consequences to the energy performance of the units. As program manager for the processing of inspections, I led HUD's efforts to inspect subsidized housing to ensure decent, safe, and sanitary housing for more than 4 million families, 44,000 multifamily and public housing properties. We stood up the physical inspection production operations in less than 16 months, carrying out more than 86,000 inspections in less than 3 years.

In capturing the physical conditions of units and building systems, we began the development of a prototype application for estimating the cost of improving energy efficiency in public housing. By identifying the system that could be upgraded to ENERGY STAR, we could advise PHAs on improving energy efficiency by 10 to 15 percent. For example, by estimating the number of broken seals around windows and the associated energy loss, we could target improvements in efficiency. Ultimately, a list of 15 to 20 Uniform Physical Condition Standard items were identified as have energy-efficiency impacts. More work was required to develop the application, refine the calculations, and update the application to reflect improvement in energy technology.

Another important event was the negotiated rulemaking in 2005, the Final Rule on Operating Fund Program, which did two things. It established a new formula for distributing operating subsidy to PHAs and it required PHAs of 250 or more units to convert to asset management. As stated in the rule: "PHAs shall manage their properties according to an asset management model, consistent with the management norms in the broader multi-family management industry. PHAs shall also implement project-based management, project-based budgeting, and project-based accounting, which are essential components of asset management." The goal of this transition is to move the public housing program closer to the broader multifamily housing industry in terms of business practices.

Among other key improvements, the operating fund rule, which included energy incentives, was revised to provide greater flexibility. Before rulemaking, the Frozen Rolling Base incentive required that 50 percent of savings be used to address projects costs, and the remaining savings were to be spent on energy-related expenses. The rule was changed to require that the PHA must use at least 75 percent of the cost savings to pay off the debt, for example, pay off the contractor or bank loan. If at least 75 percent of the cost savings is paid to the contractor or bank, the PHA may use the full amount of the remaining cost savings for any eligible operating expense. The revised rule gave PHAs greater flexibility regarding use of energy savings and provided a service fee to PHAs with Central Office Cost Center as a way to incentivize PHAs to pursue energy conservation.

The transition to asset management allowed for the capture of utility consumption and costs data at the project level. It became readily apparent that utilities and the associated maintenance of systems accounted for more than 50 percent of what a typical PHA may spend as part of their operating expenses in a given year. Utility monitoring, tracking, and Energy Performance Contracting became priorities.

Using asset management to focus on utility costs, we could now champion HUD's efforts to reduce energy consumption in 3,200 PHAs, representing 1.2 million units of low-income housing. Utility costs of \$1.5 billion accounted for 20 percent of PHAs' \$7.5 billion annual operating expenditures (2008). Energy and water conservation and the associated maintenance costs were paramount in controlling an Asset Management Project's operational costs. Energy investment through the energy performance contracting program rose from \$170.5 million in 2002 to over \$1.1 billion in 2011.

Rental Assistance Demonstration

The Rental Assistance Demonstration (RAD) program was created in 2011. Project recapitalization through RAD enables PHAs to employ more energy-conservation measures, such as water-saving devices, low-energy lighting systems, energy-efficient appliances, ENERGY STAR-rated windows, and solar water heating.

RAD is the third wave in a 10-year transitional process to migrate PIH's rental program to a real estate platform. The establishment of REAC was the initial process that established credibility through independent assessments of physical and financial conditions. The transition to asset management, the second wave, established a project-based approach to analyzing a PHA's portfolio. RAD, the third wave, is a central part of the Department's rental housing preservation strategy, which works to preserve the nation's stock of deeply affordable rental housing, promote efficiency within and among HUD programs, and build strong, stable communities.

HUD has several approaches to promoting energy and water conservation for PHAs considering a RAD transition from the Public Housing program. Starting with a physical conditions assessment, HUD requires a detailed physical inspection of a property to determine critical repair needs, short- and long-term rehabilitation needs, market comparable improvements, energy efficiency, unmet physical accessibility requirements, and environmental concerns. PHAs with existing energy performance contracts (EPC) considering a RAD transition, can lock in its existing energy incentives from the public housing program into its new housing assistance payment under the Project-Based Rental Assistance program. In addition, to provide greater incentives to undertake energy conservation measures, HUD is permitting RAD contract rents to increase by a portion of the estimated savings in resident utility allowances.

HUD is promoting a green approach to building rehabilitation, repairs, maintenance, and property operations that is more sustainable than traditional approaches and

results in a project that is more energy efficient, costs less to operate, has better indoor air quality, and reduces its overall impact on the environment.

Benchmarking

Utility benchmarking will enable PHAs and HUD to assess each project's utility consumption without rigorous or costly evaluation of that property and can help HUD provide a sound basis for creating utility consumption reduction goals. In 2007, HUD commissioned a report documenting the 3-year development of the Benchmarking Utility Consumption and Cost System, or BUCCS, specifically for HUD's public housing.²⁰

The benchmarking models and associated benchmarking tools were created in association with ORNL and included a prototype energy benchmarking model using actual public housing utility data from HUD Regions II and III. The tool demonstrated that an accurate, easy-to-use benchmarking tool for the PHA audience was achievable. In the next phase of the project, the energy model was expanded and refined to include buildings in all 10 HUD regions and in all U.S. climate zones, and a prototype water consumption benchmarking model was developed. Both models were further refined during the final phase using additional data that was targeted to fill gaps in the previous data sets.

PIH sponsored development of this utility benchmarking system in support of revisions to 24 CFR 990 for the Public Housing Operating Subsidy. Ranking your buildings to the rest of your portfolio is the first step toward improving utility efficiency and the overall financial performance of properties. The regulation further specifies that the benchmarking tool be evaluated in 2009, for implementation by fiscal year 2011. Building utility benchmarking is a very useful starting point for PHAs to target energy- and water-savings opportunities and can help with a PHA's overall asset management strategy. Knowing where your buildings rank compared with other similar buildings is the first step toward improving utility efficiency and the overall financial performance of properties.

Awards

I was proud to be part of a larger effort that earned recognition for PIH. In 2009, HUD received the Alliance to Save Energy—Galaxy Star Award of Energy Efficiency; Environmental Protection Agency 2009 ENERGY STAR Award—Special Recognition; and the Department of Energy's 2008 Presidential Federal Energy Management Award.

²⁰ <http://www.hud.gov/offices/pih/programs/ph/phecc/finbnchrpt.doc>.

Michael Freedberg

2010–present Senior Advisor for Energy Efficiency and Climate Change, Office of Economic Resilience

2008–2010 Division Director, Affordable Housing Research and Technology, Office of Policy Development and Research

2001–2008 Co-Chair, HUD Energy Task Force

1998–2000 Senior Advisor, Office of the Secretary

As founder and co-chair of HUD's Energy Task Force, can you describe the importance of that program?

In July 2001, we established a departmentwide Energy Task Force that was directed to develop an action plan to address utility costs in HUD's portfolio of public and assisted housing. A unique feature of the Task Force was that it was made up of at least one representative from each program office, as well as a Regional Energy Coordinator for each of the 10 HUD regions, providing a real opportunity for field staff and headquarters to interact and jointly help shape departmental initiatives in this arena. In April 2002, the Task Force adopted HUD's first action plan—aimed at lowering utility costs and boosting energy efficiency within existing regulations and program requirements.²¹

Through the Energy Action Plan, HUD committed to supporting energy efficiency in four key areas:

1. Increasing energy efficiency in HUD-assisted or HUD-financed rental housing, including public housing.
2. Expanding the use of Federal Housing Administration (FHA) Energy-Efficient Mortgages, consistent with sound underwriting principles.
3. Providing technical assistance to nonprofits and faith-based organizations.
4. Continuing HUD's role in research and development into new technologies.

²¹ <http://www.hud.gov/energy/energyactionplan.pdf>.

The Energy Action Plan contained 21 actions aimed at promoting energy efficiency in public and assisted housing, as well as housing financed through a range of competitive and formula grant programs. Many of these actions were reported in a series of progress reports to Congress as part of HUD's "integrated energy strategy" mandated in the Energy Independence and Security Act of 2007.²² Congress also enacted the Energy Policy Act of 2005, which required public housing to install ENERGY STAR appliances (when cost effective) and to better integrate capital and operating fund expenditures on energy efficiency.

As a result of these activities, awareness of energy efficiency steadily increased among HUD's customers and partners. HUD extended energy performance contracts (EPCs) in public housing for up to 20 years as required by the Congress, and we saw a significant increase in EPCs in public housing. HUD also signed a Memorandum of Understanding with EPA promoting adoption of ENERGY STAR-labeled products and appliances by PHAs. HUD also established a new partnership with DOE and EPA, the Partnership for Housing Energy Efficiency, or PHEE, to collaboratively address the challenges of energy conservation in housing.

In addition, among other actions, HUD began providing incentive points for energy efficiency through several grant competitions, including HOPE VI, Section 202 Supportive Housing for the Elderly, and Section 811 Supportive Housing for Persons with Disabilities. HUD also established an Energy Conservation Clearinghouse for housing

²² <http://portal.hud.gov/hudportal/documents/huddoc?id=oshcenergyreport2012.pdf>.

authorities. The Office of Multifamily Housing Programs created HUD's first multifamily green retrofit program, through the Mark to Market Green Initiative.

What role did the American Reinvestment and Recovery Act (Recovery Act) have in improving energy efficiency of HUD assisted housing?

The Recovery Act, enacted in February 2009 at the beginning of the Obama Administration, represented a major opportunity for PHAs and other stakeholders to invest in energy efficiency or renewable energy. Congress appropriated \$13.6 billion in HUD Recovery Act funding; a portion of these funds were specifically dedicated to energy-efficient and green building, but more generally HUD encouraged grant recipients to voluntarily include energy efficiency and green measures in construction or rehabilitation projects when feasible.

- A signature initiative was the multifamily Green Retrofit Program (GRP). The GRP provided \$250 million in loans or grants for owners to invest an average of \$10,000 per unit in energy efficiency and green building. The program helped retrofit 221 properties with more than 19,000 affordable units in 37 states to be greener, healthier, and more energy efficient. Properties participating in the GRP have achieved savings in excess of 20 percent, saving more than \$5 million annually in utility costs.
- Another \$3 billion in Public Housing Capital Fund formula grants resulted in more than 412,000 energy conservation measures being installed in 244,000 public housing units. The "top 5" measures were 87,000 ENERGY STAR refrigerators, new energy-efficient windows in 43,000 units, new insulated roofs or roof insulation in 33,000 units, new energy-efficient heating systems in 23,000 units, and ENERGY STAR-qualified compact fluorescent lighting, or CFLs, in 22,000 units.
- Public Housing Capital Funds were also awarded competitively, specially for energy efficiency or green building. \$300 million was made available for new high-performing green public housing projects that met Enterprise Green Communities standards. The 36 awards made to PHAs for 2,700 new green units included 18 solar photovoltaic (PV) cell installations and 8 geothermal heating and cooling installations. The El

Paso Housing Authority built the first net zero energy public housing project in the U.S. with these funds.

- Another \$300 million was awarded via competition retrofit projects that committed to achieving 20 to 40 percent energy savings in existing public housing. HUD awarded 134 housing authorities to retrofit almost 35,000 units, some of which included PV panels (31 projects) and geothermal heating and cooling systems (13 projects).
- Additional Recovery Act funds used for green building included the competitive portion of the Native American Housing Block Grant Program, incentives for greening foreclosed properties through the second round of the Neighborhood Stabilization Program, and the Tax Credit Assistance Program.


HUD also implemented new reporting systems to better track the level of investments in energy efficiency and green building by PHAs and other HUD grant recipients. As a result, for the first time, we were able to track actual units being retrofitted.

Finally, through a multifamily weatherization partnership with the DOE, HUD was able to provide DOE with lists of public housing properties that met DOE's weatherization program income requirements, resulting in PHAs and other HUD-assisted properties being able to take advantage of DOE funds for weatherization purposes.

Can you discuss the work of the Office of Economic Resilience?

This Office grew out of the Office of Sustainable Housing and Communities, which was created in early 2009 at the start of the Obama Administration to support the Department's energy efficiency, green building, and sustainable development activities across program and field offices.

In addition to the Recovery Act's support for energy efficiency in HUD's portfolio, HUD also launched the PowerSaver pilot program to provide FHA-insured loans for homeowners to invest in home energy improvements and solar energy. At the same time, FHA awarded competitive grants through the multifamily Energy Innovation Fund to spur innovation in financing or overcoming barriers to energy efficiency in the multifamily sector.



HUD also launched two important new initiatives as part of the President's Climate Action Plan: the Better Buildings Challenge aimed at lowering utility costs by 20 percent in multifamily housing, and the installation of 100 megawatts of capacity of renewable energy on site at federally subsidized housing by 2020.

Beginning in 2010, HUD also established energy efficiency as an Agency Priority Goal (APG), with a target of 160,000 energy-efficient and healthy units every 2 years. HUD continued energy efficiency as an APG through 2014; during the 5-year 2010–2014 period, through the Recovery Act and other ongoing HUD programs, 416,000 units of energy-efficient retrofits of existing housing were completed, as were new cutting-edge green projects or healthy and safe lead hazard abatements or removals.

About one-fourth of the units that received retrofits have been lead hazard removals or healthy housing projects implemented by the Office of Lead Hazard Control and Healthy Homes, or by CPD with HOME and community development block grants. More than one-half of the units completed (52 percent) were in public housing, driven in part by the infusion of Recovery Act dollars discussed previously, but also through EPCs, the largest single contributor to energy efficiency in public housing. The Office of Multifamily Housing Programs and CPD constituted the remaining units.

Using a new energy savings model developed for HUD by McKinsey and Company, I estimate savings of approximately \$154 million so far and \$1.7 billion projected through 2025, assuming HUD keeps the APG going at current levels. HUD's projected share of these savings in dollars recouped through lower utility allowances or rent subsidies in public and assisted housing are estimated at \$318 million. Most of the savings are captured by the property owner and are reinvested into the property as a decision by the owner.

There is much work to do, but we are on our way to achieving a more energy-efficient HUD.



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January 2016