

A Strategy to Increase Energy Efficiency Investment in Public Housing

Prepared for:
Environmental Defense Fund
New York, NY

April 2012

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List of Acronyms

CDFI – Community Development Financial Institution

CLPHA – Coalition of Large Public Housing Authorities

ECM – Energy Conservation Measure

EDF – Environmental Defense Fund

EPA – U.S. Environmental Protection Agency

EPC – Energy Performance Contract

ESCO – Energy Services Company

GHG – Greenhouse Gas

HUD – U.S. Department of Housing and Urban Development

HVAC – Heating, Ventilation, and Air Conditioning

IPA – Intergovernmental Personnel Act

M&V – Measurement and Verification

NYCHA – New York City Housing Authority

PHA – Public Housing Authority/Agency

EXECUTIVE SUMMARY

Introduction

This document proposes a strategy for Environmental Defense Fund to increase energy efficiency investment in public housing. Improving the energy efficiency of public housing buildings represents a tremendous opportunity to decrease energy consumption nationwide. In 2010, PHA-paid energy expenditures totaled more than \$1 billion, a similar magnitude to the \$3.6 billion the U.S. Department of Defense spends on energy consumption in its facilities.

Reduced energy use results in cost savings for public housing authorities (PHAs) and the federal government, and reduced greenhouse gas emissions. The U.S. Department of Housing and Urban Development (HUD) provides utility subsidies to PHAs and oversees their work. Working with HUD, many housing authorities have used energy performance contracts to perform energy efficiency retrofits. These contracts will continue to be an important tool to enable housing authorities to invest in energy efficiency.

As a leading environmental nonprofit, Environmental Defense Fund (EDF) has a significant role to play in helping PHAs across the country to invest in energy efficiency.

Strategy to Increase Energy Efficiency Investment

EDF should consider the following criteria when determining a strategy to increase energy efficiency investment:

- Align with EDF's expertise and mission;
- Help multiple public housing authorities;
- Build upon successes of HUD and partner organizations; and
- Minimize the impact on HUD's budget.

Accounting for these criteria, EDF should follow a strategy that consists of two main components:

1. Using a top-down approach, work directly with HUD to increase the ease with which PHAs work with HUD and receive HUD's approval for energy efficiency projects. Working with HUD first requires that EDF understand HUD's policies and programs. EDF can help HUD enhance its current policies to improve HUD's energy performance contracting review process and develop solutions for small PHAs who have typically been underserved by energy performance contractors. In addition, EDF can provide personnel assistance to HUD to collect data on current energy consumption in public housing and share the successes of energy efficiency programs.
2. Using a bottom-up approach, form partnerships with PHAs and other organizations to help PHAs determine which energy efficiency projects to select and how to fund them. EDF should begin by partnering with nonprofit organizations that already have been supporting PHAs' sustainability work. Through EDF's Climate Corps program, it should

place fellows at PHAs across the country to build a network of housing authorities focused on energy efficiency. EDF can also provide information and technical assistance to PHAs, specifically on the funding models that are most appropriate for a PHA's specific retrofit project.

Conclusions

Some housing authorities have already performed energy efficiency retrofits; many others have not yet become involved in programs to reduce energy use. EDF can work with housing authorities of varying levels of experience to help increase investment in energy efficiency nationwide. If EDF is successful in its strategy, it should expect to see housing authorities of all sizes using locally- or context-appropriate funding models to invest in energy efficiency.

Working with public housing authorities, HUD, and partner organizations, EDF has the ability to help decrease our nation's energy consumption and reduce greenhouse gas emissions associated with energy use. These efforts can increase national awareness of the importance of making the country's affordable housing stock more energy efficient. Implementing the strategy outlined here will help EDF improve the climate, preserve affordable housing for those who need it most, and demonstrate the significance of public housing.

HOW CAN ENVIRONMENTAL DEFENSE FUND INCREASE ENERGY EFFICIENCY INVESTMENT IN PUBLIC HOUSING?

1. INTRODUCTION

This document proposes a strategy for Environmental Defense Fund to increase energy efficiency investment in public housing. The introduction provides background information, establishes the importance of energy efficiency investment in public housing, and describes current efforts by the federal government and local housing authorities. Appendices A through D, referenced throughout the introduction, provide supplemental background information.

1.1 MOTIVATION FOR ADDRESSING POLICY QUESTION

Environmental Defense Fund (EDF) is a nonprofit organization focused on environmental protection. EDF's mission is to use science and economics to preserve natural systems.¹ It commonly forms partnerships with public- and private-sector organizations to address environmental challenges at a global scale. It is known for developing market-based solutions to environmental problems.

In 2011, EDF began working with the New York City Housing Authority (NYCHA) to help reduce energy consumption and greenhouse gas emissions in public housing. Building off of the success of this partnership, EDF intends to work with other public housing authorities across the country that are interested in taking action to improve energy efficiency.

Public housing authorities/agencies (PHAs) are entities that oversee local public housing. The U.S. Department of Housing and Urban Development (HUD) supports approximately 3,300 PHAs that in total house approximately 1.2 million households,² slightly greater than one percent of total U.S. households. Public housing is important because it provides affordable housing to low- and moderate-income families across the country. Approximately 41 percent of public housing properties are in cities, while 36 percent are in rural areas.³

¹ Environmental Defense Fund (2012)

² U.S. Department of Housing and Urban Development (2011)

³ U.S. Department of Housing and Urban Development (2010b)

Energy is a significant expense for housing authorities. Nationally, utility costs account for 24 percent of total PHA operating expenses.⁴ About two-thirds of the utility cost is spent on energy and the remaining third is spent on water, sewer, and miscellaneous charges. In 2010, PHA-paid energy expenditures totaled more than \$1 billion. To give a sense of scale, this is of a similar magnitude to the \$3.6 billion the U.S. Department of Defense spends on energy consumption in its facilities.⁵

About half of the PHA-paid energy expenses were for electricity (Table 1). Examining this data on a per-unit basis shows that the average monthly energy cost per housing unit was \$80.⁶

Table 1. PHA-Paid Energy Expenses, 2010		
	Total Energy Cost (\$ million)	Cost per unit- month (\$)
Electricity	\$532	\$40.73
Natural Gas	\$302	\$23.15
Fuel Oil	\$221	\$16.88
Total	\$1,055	\$80.76

Source: HUD’s Financial Assessment Subsystem-Public Housing (FASS-PH) financial data for Cycle 11 (2010).

This large magnitude of energy consumption means the potential for reductions in energy use is significant. If all housing authorities across the country reduce energy consumption by 25 percent, they would save a combined \$250 million annually, based on 2010 reported energy costs in Table 1. A conservative estimate equates this to an annual savings of 880,000 MWh of electricity, 750,000 tcf natural gas, and 18 million gallons of oil. (See Appendix A for an explanation of these calculations.) This savings corresponds to an avoided 827,000 metric tons of CO₂e emissions, the equivalent of taking more than 160,000 passenger vehicles off the road.⁷

Public housing buildings, especially older ones, represent a large opportunity for energy efficiency improvements. The average age of housing projects is 27 years,⁸ representing a great opportunity for efficiency retrofits.

Each housing authority has its own set of unique challenges in reducing energy consumption. In some locations, tenants are responsible for directly paying their utility bills, and in others the utility cost is included in the rent. Some projects have large high-rise buildings, while others

⁴ U.S. Department of Housing and Urban Development (2012h)

⁵ U.S. Department of Defense (2010)

⁶ As a comparison, the U.S. Energy Information Administration reports that the average U.S. residential bill for electricity alone is \$110.55 per month (U.S. Department of Energy 2012a). Given that about 50 percent of public housing units are in attached structures, which generally consume less energy, this statistic suggests that PHA residents consume an equal or smaller amount of energy compared to other residential customers.

⁷ EPA’s Greenhouse Gas Equivalencies Calculator uses total energy use to estimate the associated CO₂e emissions. (U.S. Environmental Protection Agency 2011).

⁸ U.S. Department of Housing and Urban Development (2010b)

have small townhomes. Almost half of all PHAs manage fewer than 100 units, while one – NYCHA – manages more than 150,000 units.⁹ Each housing authority must use the appropriate methods for choosing and financing energy efficiency improvements based on its unique set of circumstances.

Overall, improving the energy efficiency of existing public housing buildings helps to reduce costs for PHAs and HUD. It also contributes to reducing energy use and associated greenhouse gas emissions, an important goal for EDF and the federal government. Additional background information about energy efficiency is provided in Appendix B.

1.2 FEDERAL GOVERNMENT SUPPORT

To operate their programs, housing authorities must work very closely with the federal government. Housing authorities receive financial support and technical assistance from the government.

1.2.1 U.S. Department of Housing and Urban Development Involvement

To supplement tenant rent, federal funding is the main revenue source for PHAs. Through its office of Public and Indian Housing, HUD provides aid to authorities across all 50 states, Washington, D.C., and Puerto Rico.¹⁰ The aid comes in the form of capital and operating subsidies.

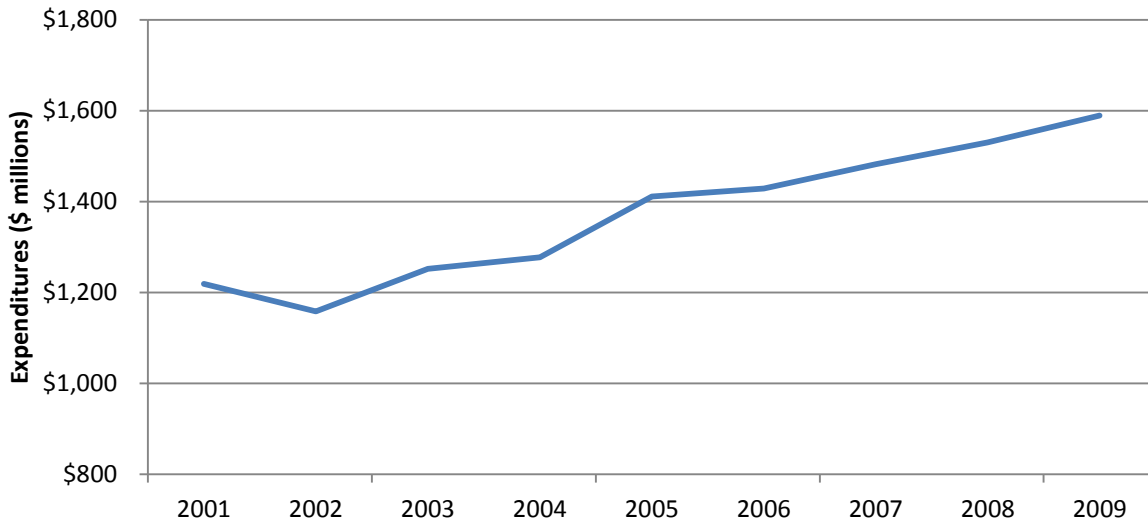
HUD spends a large amount in operating subsidies to cover utility expenses. In 2010, HUD allocated \$1.6 billion for utility payments (including energy, water, sewer, etc.) to public housing authorities.¹¹ Shown in Figure 1 below, utility expenditures have been steadily increasing over the past decade. The increase in utility expenses is a concern for PHAs because as costs continue to increase, HUD's authorized budget cannot cover eligible utilities expenses, and PHAs do not receive a sufficient level of subsidy to cover their costs.

⁹ U.S. Department of Housing and Urban Development (2010b)

¹⁰ U.S. Department of Housing and Urban Development (2012b)

¹¹ U.S. Department of Housing and Urban Development (2010a)

**Figure 1. PHA-Paid Utility Expenditures,
2001-2009**



Source: Financial Assessment Subsystem (FASS-PH) financial data. The following line items were used in totaling the data for utilities: water, electricity, gas, fuel, and other utility expenses (“Other” includes sewer and miscellaneous utility costs). 2009 PHA-paid utilities are from financial statements for the Cycle 11 reporting period, covering fiscal years ending 9/30/09 and subsequent quarters through 6/30/10).

Increasing utility expenditures are also a concern for HUD. Like all federal agencies, HUD faces budget constraints now and in future years. HUD wants to provide subsidies to PHAs, but must do so within its appropriated funding levels. Decreases in PHAs’ utility consumption would benefit the federal government by decreasing the utility subsidy HUD provides to PHAs.

One of HUD’s four goals for 2012 and 2013 is to build more sustainable communities that “increase the number of cost-effective energy and green retrofits...”¹² This goal helps HUD to achieve its mission:

...to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes: utilize housing as a platform for improving quality of life; build inclusive and sustainable communities free from discrimination; and transform the way HUD does business.¹³

¹² U.S. Department of Housing and Urban Development (2012c)

¹³ U.S. Department of Housing and Urban Development (2012g)

1.2.2 HUD's Incentives to Reduce Energy Consumption in Public Housing

HUD states that it has two main incentives to encourage energy efficiency and conservation: (1) the Rolling Base Consumption Level and (2) the use of an energy performance contract (EPC).¹⁴ Using the Rolling Base Consumption Level, a PHA's level of utility subsidy is based on the level of consumption during a three year period prior to the current funding period. If a PHA decreases its energy consumption over time, it can benefit from this formula by receiving a subsidy greater than its current utility costs. Conversely, if a PHA increases its energy consumption, its subsidy may not cover its new, higher utility costs. HUD considers this an incentive to reduce energy consumption because housing authorities that reduce consumption over time will receive subsidies equal to or greater than their actual utility costs.

The rolling base formula does not necessarily encourage energy savings as much as it discourages increases in energy costs. In fact, it might encourage housing authorities to maintain the status quo rather than more aggressively pursuing conservation measures. When a PHA considers implementing an energy conservation measure, it quantifies the initial expenditure on installing the efficiency measure and the energy cost savings over time. To recoup the upfront investment, an organization will need to receive energy savings for a certain period of time. The rolling base formula may prevent housing authorities from capturing enough of the energy savings, because their energy consumption, and thus their subsidy level, will gradually decrease over time. Thus, in conducting a financial analysis of an energy conservation measure, the rolling base formula might make the project cost prohibitive. In this case, PHAs might actually avoid undertaking energy efficiency projects to avoid decreases in utility subsidy levels.

The second type of incentive is an EPC, also referred to as an energy savings performance contract. An EPC is a financing arrangement that uses future utility cost savings to pay back the cost of energy efficiency improvements. The main benefit of an EPC is that a PHA does not have to pay the entire upfront cost of the retrofit from its capital budget. To capture enough savings to recover initial capital outlays, EPCs typically last 10 to 20 years.

Often times a third-party, such as an Energy Services Company (ESCO), will make the capital improvements, and the organization benefitting from the improvements will share the utility cost savings with the ESCO. As part of the contract, the ESCO will also guarantee that the project generates enough cost savings to repay the cost of the investment over the term of the contract, minimizing risk for the PHA.

Executing a HUD-approved EPC avoids the disincentives of the rolling base formula mentioned above by allowing housing authorities to "lock in" their current utility subsidy level for the duration of the EPC (i.e., the subsidy level is frozen). When future utility expenses decrease, subsidy levels will remain constant and PHAs can use this difference to pay back the cost of the initial energy efficiency improvement.

EPCs have been widely used in the municipality, university, school, and hospital markets (often referred to as the MUSH markets). The federal government has also begun using EPCs more widely. In December of 2011, President Obama released a presidential memorandum directing

¹⁴ U.S. Department of Housing and Urban Development (14 March 2011)

all federal agencies to implement energy conservation measures using direct appropriations and energy savings performance contracts.¹⁵

To date, 213 PHAs have initiated or completed 240 EPCs with \$885 million in leveraged investment.¹⁶ PHAs must receive approval from HUD before implementing any energy conservation measure, such as an EPC, that is financed by an entity other than HUD. Some housing authorities have had difficulty getting HUD approval of their EPC. The HUD review process (see Appendix C) can be difficult to understand, as there are many layers of approval, and each EPC that is submitted does not necessarily follow the same path to approval.

Proposed EPCs are initially submitted to a local HUD Field Office. (There is at least one field office in each state.)¹⁷ If the Field Office decides that it does not have the technical expertise to review the EPC, the proposed EPC will be directed to HUD's Energy Center for review. Upon passing further review by a panel of Energy Center experts and the EPC's main reviewer, and receiving approval from the Field Office Director, the EPC can be approved. HUD aims to complete the EPC review within three months; however there is no official time limit or process in place to track the duration of each review.

The EPC procedure is outlined in HUD regulations and further clarified in HUD guidance documents. Appendix D provides an analysis of current laws and regulations that govern this process. The regulations stipulate that HUD will approve an EPC if it determines that projected energy cost savings will be sufficient to cover the repayments under the contract. If HUD determines that it cannot approve an EPC proposal, it will provide guidance to the PHA on necessary proposal modifications.

1.2.3 HUD's Assistance in Sustainability

HUD has provided assistance to PHAs to support their general sustainability efforts. It maintains the Public Housing Environmental and Conservation Clearinghouse, which provides links to best practices in energy efficiency and conservation.¹⁸ The Clearinghouse also provides access to the Utility Benchmarking Tool that PHAs can use for internal planning and analysis. The Benchmarking Tool allows PHAs to enter their energy and water use into a spreadsheet to track current consumption levels and compare this with other PHAs.

In addition to materials available via web, HUD hosted a Going Green Conference in 2011 to bring together public housing staff along with green building and energy efficiency experts to talk about the best ways to make public housing more sustainable.

¹⁵ The White House (2011)

¹⁶ Paradise (2012)

¹⁷ U.S. Department of Housing and Urban Development (2012d)

¹⁸ U.S. Department of Housing and Urban Development (2012h)

2. STRATEGY TO INCREASE ENERGY EFFICIENCY INVESTMENT

Internally, EDF should rank energy efficiency in public housing among its priority issues and determine the resources necessary (e.g., staff, out-of-pocket costs) to implement selected programs.

When selecting an implementation strategy for improving energy efficiency in public housing, EDF should consider options that meet the following criteria:

- **Align with EDF's expertise and mission.** EDF solves problems by forming partnerships and providing scientific, economic, and policy research. EDF's current energy program focuses on smart grid, energy efficiency, and natural gas.
- **Help multiple public housing authorities** across the country. Although EDF has begun this work with NYCHA, these efforts can be leveraged to create broader national impact.
- **Build upon successes of HUD and partner organizations.** If HUD and other organizations across the country have initiatives that have successfully promoted energy efficiency investment, any new EDF work should keep these programs intact and supplement them rather than replacing them. Conversely, if programs have not been successful, EDF might wish to suggest ways to change or replace them.
- **Minimize the impact on HUD's budget.** Given our nation's current fiscal situation, any suggested policies should not require HUD to have a larger budget. Current caps on discretionary funding limit any increases in agency budgets.

EDF should examine several options when determining how best to improve energy efficiency in public housing:

1. Using a top-down approach, work directly with HUD to increase the ease with which PHAs work with HUD and receive HUD approval for energy efficiency projects.
2. Using a bottom-up approach, form partnerships with PHAs and other organizations to help PHAs determine which energy efficiency projects to select, and how to fund them.
3. Develop a political strategy to change HUD regulations or procedures to allow housing authorities to more easily invest in energy efficiency.

The following subsections describe each of the three options, and demonstrate how options one and two will be the best strategy for EDF to pursue.

2.1 OPTION ONE – WORK DIRECTLY WITH HUD

Option one is a top-down strategy that helps HUD more effectively implement its energy efficiency work. EDF should work with HUD, as the entities have a mutual interest in improving the energy efficiency of public housing. EDF should not represent any specific housing authorities, but should serve as a technical expert on the financial and policy aspects of energy efficiency initiatives. The top-down strategy is important because making changes at HUD can have a large impact on many housing authorities at once.

This approach is comprised of four steps:

1. Understand HUD's current policies
2. Provide personnel assistance to HUD
3. Assist HUD with data collection and information sharing
4. Analyze and support policy

2.1.1 Understand HUD's Current Policies

To assist HUD, EDF must first thoroughly understand the details of HUD's energy efficiency initiatives. Understanding the details of daily operations will help EDF understand how programs currently work, and where improvements are needed. Examining current programs can also help EDF to identify any gaps in knowledge or data within HUD.

Understanding policies requires forming good relationships with both HUD employees that are involved in this work and HUD leadership that can make decisions about the direction of programs or policies. To form these relationships, EDF must show HUD why energy efficiency is a pressing national issue, and how EDF is uniquely positioned to help HUD. EDF has already reached out to employees at HUD Headquarters specifically related to its work with NYCHA. EDF can use these initial conversations to identify others in Headquarters or Field Offices that are interested in working together.

To maintain its objectivity, EDF should not position itself as an advocate for PHAs; PHA trade associations effectively fill this niche. EDF should instead focus on opportunities that benefit PHAs and the greater government/society, while meeting its goal of improved energy efficiency and reduced greenhouse gas emissions. Likewise, EDF should not promote policies that only benefit a small number of PHAs.

2.1.2 Provide Personnel Assistance to HUD

Once EDF has begun to understand HUD's current policies and internal needs, EDF can help address any issues by placing people within HUD to assist with data and policy needs.

To improve data collection and analysis, and information sharing with the public, EDF can use its successful Climate Corps Program to place fellows at HUD. Traditionally, Climate Corps fellows are placed in an organization to develop a customized plan for that organization to reduce its energy consumption. Fellows typically identify new systems or technologies that can be implemented in the host organization's facilities.

At HUD, the fellows can focus on energy use and efficiency across all PHAs. Specifically, they can help with HUD's efforts to analyze data on the success of EPCs and other energy conservation efforts in public housing.

To focus on more substantive policy issues at HUD, EDF can help place an energy efficiency expert within HUD through the Intergovernmental Personnel Act (IPA) Mobility Program. HUD can enter into an IPA agreement to assign a federal or non-federal employee to its office.¹⁹ An IPA is a good solution for a federal agency because it does not require approval by the U.S. Office of Personnel Management; it simply requires a written contract. The IPA agreement can cover a period of up to two years. Additionally, HUD would develop a cost sharing agreement stipulating how much, if any, of the costs of the assignment the agency will pay. Depending upon cost sharing negotiations, this can be a low- or no-cost solution for HUD.

This expert placed at HUD could be a current federal employee (e.g., from one of the Department of Energy's national laboratories) or work for a nonprofit organization (e.g., EDF, Resources for the Future, or the American Council for an Energy-Efficient Economy). The assigned individual should understand strategies to finance energy efficiency, and effective energy conservation measures for various types and sizes of buildings.

2.1.3 Assist HUD with Data Collection and Information Sharing

One apparent need is for HUD to better collect, analyze, and disseminate information about energy use and energy savings in public housing. To build successful programs, HUD must measure and report the status of energy use and progress toward reducing energy consumption in public housing.

Sharing information on its website and quantitatively reporting the successes of energy efficiency programs will benefit HUD by documenting successes that show Congress that it is using its budget effectively. Furthermore, the Obama Administration's Open Government Initiative emphasizes a transparent government that encourages public participation and collaboration.²⁰ Sharing information with the public will help HUD comply with this initiative.

¹⁹ U.S. Office of Personnel Management (2012)

²⁰ The White House (2012)

EDF's Climate Corps Program

EDF Climate Corps is an innovative summer fellowship program that places graduate students in companies, cities and universities to build the business case for energy efficiency.

Fellows spend 10-weeks working across organization departments to:

- Understand the host organization's energy use;
- Model the financial gains from energy efficiency upgrades;
- Facilitate collaboration among multiple energy efficiency stakeholders;
- Identify and help dismantle organizational barriers; and
- Map out a clear strategy for energy efficiency investments and present recommendations to management.

<http://edfclimatecorps.org/hire-fellow>

HUD should collect and analyze data to show the success of its energy programs. When PHAs apply for their utility subsidies, they report their utility consumption. Aggregating this data across all PHAs would provide baseline energy consumption. Having a good baseline is crucial for measuring future success. Quantifying the magnitude of PHAs' energy and sharing it with the public can show how important it is to incentivize reductions in energy use.

It is important to measure and analyze the success of EPCs in public housing. The reporting should give some indication of how well PHAs have been able to implement the EPCs, and if the actual cost savings have been significant.

Although it has overseen the EPC process for many years, HUD had not systematically collected data on EPC progress. A few years ago, HUD began requiring all PHAs working on an EPC to submit their measurement and verification reports on an annual basis.²¹ There is currently no database that holds EPC-related information, and HUD relies on field officers to report data. This process likely leads to inconsistent and incomplete data.

Similarly, HUD requires PHAs to conduct energy audits every five years. The audits identify energy conservation measures (ECMs) that could be implemented in a PHA's buildings. Each audit shows a financial analysis of potential ECMs to help PHAs target measures that reduce energy use and costs. HUD has not analyzed these energy audits. Aggregating these data could give an estimate of the potential national reduction in energy use from implementing energy efficiency retrofits in PHAs. Analysis could help HUD monitor which PHAs have successfully used the energy audits as a tool to identify which retrofits to choose, and which PHAs have not been as successful.

Aside from its lack of data, HUD has not provided an adequate level of information to the public. The main HUD website for EPC information does not appear to have been updated within the past few years.²² The links to successful EPCs are outdated and provide little information about the types of energy conservation measures EPCs contained or the results of the EPCs. This website does not serve as a good source of information on best practices, nor does it give any indication of how successful the EPCs have been. The most recent comprehensive guidance on the EPC process, a handbook that explains how EPCs should be conducted in accordance with HUD regulations, was published in 1992.²³ As the EPC market is evolving, this handbook can be updated to reflect recent best practices.

In addition to the apparent data needs outlined above, EDF might identify additional opportunities to assist HUD with its data management and analysis. These opportunities would likely be identified as EDF gains a better understanding of HUD policies and procedures (as described in Section 2.1.1).

²¹ Paradise (2012)

²² U.S. Department of Housing and Urban Development (2012a)

²³ U.S. Department of Housing and Urban Development (1992)

2.1.4 Analyze and Support Policy

Beyond meeting data needs that support current programs, EDF can also support HUD by recommending policy improvements. Once EDF has formed a good relationship with HUD, it is important to start working on ways to spark energy efficiency investment. EDF may investigate policies that improve the EPC review process, and other policies specifically focused on the needs of smaller PHAs.

Improve HUD's Energy Performance Contract Review Process

EDF should focus on improving the EPC approval process to assist housing authorities that take advantage of this financing mechanism. Although EPCs have been very popular, HUD's approval process can make them difficult for some PHAs to execute. EDF should examine some ways to streamline HUD's EPC approval process. (See Appendix C for a flow chart of the current process.)

1. Develop several versions of a model EPC agreement and make them available to PHAs. On its website, HUD provides a sample request for proposals for an EPC.²⁴ This is a good boilerplate template that a PHA can customize to meet its specific needs. If HUD can similarly provide generic examples of EPCs and the energy conservation measures that are part of EPCs, this can help PHAs to better understand expectations. It can also speed up the review process because a PHA (and its ESCO or consultant) will use standard language or procedures that are acceptable to HUD.
2. Set a firm time limit on HUD's EPC review. If HUD set a strict 90-day time limit on its review process, it would signal to PHAs that it is serious about making the approval process more manageable. As the EPC review process involves multiple reviewers, HUD should internally set a recommended period of time for each of the major milestones in the process: the Field Office determining whether it is able to review the proposal in house, the Field Office or Energy Center completing its review of the proposal, and the panel review of the proposal. One main HUD contact should alert the PHA as its proposal reaches each major phase of the review process. In addition to stating on the website that HUD has set a 90-day time limit, it should post the average number of days it has taken to review each EPC proposal.
3. Make it clear to PHAs whether their respective HUD Field Office will review proposals or if the Energy Center will review them. If a Field Office always defers review to the Energy Center, PHAs should know this so they can work out any issues with the Energy Center before submitting the proposal.
4. Upon receipt of the EPC proposal, first check to see if all forms and documentation have been submitted. Do not begin the review process until the PHA has submitted all information. This will prevent delays further along in the review process.
5. Ensure consistency in procedures across HUD Field Offices. In the review process, HUD Field Offices are the first to receive an EPC proposal. As there are more than 70 Field Offices, there is likely variation in this review process. A more centralized approach can make the process more fair and equitable. This can be accomplished by giving the Energy Center or 10 Regional Offices more control over the review process. In this case, the best role for the Field Offices might be to accompany the EPC proposal with a letter of

²⁴ U.S. Department of Housing and Urban Development (2012a)

support to the Regional Office or Energy Center. Alternatively, the Energy Center could train all of the Field Offices to make the review process more consistent, rather than providing training on an ad hoc basis as requested by a Field Office. Improving consistency across HUD Field Offices can also ensure that the technical assistance PHAs receive throughout the proposal process is consistent. Implementing these changes requires an adequate number of staff in the Energy Center and might require some staffing reorganization.

Develop Solutions for Small PHAs

EDF should focus on solutions that help small PHAs become more energy efficient. Although EPCs are very effective financing mechanisms, smaller housing authorities have not been able to develop EPCs as readily because they lack the size necessary to attract ESCO interest; the high administrative costs relative to the energy cost savings make small PHAs unprofitable ventures. For this analysis, a small PHA is one with 250 units or fewer. There are approximately 2,300 PHAs across the country that fall into this category, managing a total of 17 percent of total public housing units.²⁵

In March 2012, HUD awarded the University of Illinois-Champaign a grant to assess the needs of small and medium-sized PHAs. The University cites the inability to attract financing and the lack of technical capacity as the main barriers to energy efficiency for these PHAs. Working with four small PHAs in Illinois, the University will develop solutions to help the PHAs make energy efficiency investments.²⁶

Based on the results of the University of Illinois-Champaign's work, and interviews with small PHAs, EDF and HUD should develop more flexible options for small PHAs. Some examples of solutions are provided below.

1. Make the EPC development process easier. HUD has considered developing a list of ECMs that are typically applicable to small PHAs. PHAs can then choose from these ECMs based on their particular needs. This will minimize the time staff members in small PHAs need to spend on this process.
2. Facilitate development of EPC coalitions for small PHAs that are geographically close to one another. Small PHAs often do not have the capacity to complete their own retrofits and would benefit greatly by the expertise of an ESCO. If a single PHA is not an attractive investment for an ESCO, a group of PHAs bundled together may make the profits more enticing.
3. Decrease the administrative burden for EPC development. Encourage collaboration with state energy offices that have developed programs to provide technical assistance with EPC development. In Washington State, for example, client organizations pay the state a fee to receive support in project development. This fee is incorporated into the EPC so that the EPC cost savings covers this initial fee and the organization does not need to pay anything upfront.²⁷

²⁵ U.S. Department of Housing and Urban Development (2010b)

²⁶ U.S. Department of Housing and Urban Development (2012e)

²⁷ (Energy Services Coalition)

4. Work with community development financial institutions (CDFIs)²⁸ – small organizations that provide loans and grants to communities that are underserved by traditional financial institutions.²⁹ CDFIs know communities well, so they can make loans to higher risk organizations that traditional financial institutions could not serve. One benefit of working with CDFIs is that they can be flexible in the services they offer because they are not regulated; CDFIs can tailor lending or grant funding to meet the needs of specific organizations. Already, CDFIs such as Seedco Financial Services provide low interest loans for multifamily building retrofits.³⁰ This expertise can be leveraged to support energy efficiency in public housing.
5. Make connections to sources of private financing. HUD’s webpage of incentives to reduce energy costs provides links to other sources of funding.³¹ These include utility rebates, participation in demand response, and foundation grants.
6. Identify other federal assistance programs. Other HUD programs or other federal agencies have funding available for energy conservation in affordable housing. For example, the Department of Energy’s Weatherization Assistance Program provides energy efficiency installations free of charge in low-income multi-family and residential housing.³² HUD can be more proactive in finding the appropriate funding for different types of energy efficiency work.

Some of the recommendations here suggest that PHAs may benefit from using funding sources other than an EPC. One issue housing authorities must consider when using other funding for energy efficiency work is the effect on utility subsidies. A benefit of executing an EPC is that a utility subsidy level is frozen once the EPC work begins to help the PHA realize the cost savings of the energy efficiency investment.

According to HUD guidance, no other energy efficiency project can freeze the utility subsidy level. A PHA can expect to see its utility costs decrease after implementing an energy conservation measure; accordingly, the level of its utility subsidy will decrease. EDF should help PHAs to understand the budget implications of various funding mechanisms.

2.1.5 Analysis of Option One

It would be beneficial for EDF to work alongside HUD and make recommendations that will improve the EPC review process. EDF has a history of working with organizations from a variety of sectors, some of which are not necessarily perceived as pro-environment organizations. That EDF and HUD are both working toward the same goal makes them even more likely partners. EDF can use its policy and economic expertise to make further recommendations on how HUD can promote energy efficiency investment.

²⁸ CDFIs are located in all 50 states, find one here: http://www.opportunityfinance.net/industry/industry_locator.asp (Opportunity Finance Network 2012).

²⁹ U.S. Department of the Treasury (2010)

³⁰ Seedco Financial Services (2012)

³¹ U.S. Department of Housing and Urban Development (2012f)

³² U.S. Department of Energy (2010)

As HUD provides assistance to all PHAs across the country, HUD's policies have a large impact nationwide. EDF should focus on helping HUD to improve programs to better align with its larger energy goals. EDF should move forward with option one.

2.2 OPTION TWO – FORM PARTNERSHIPS WITH PHAS AND OTHER ORGANIZATIONS

Option two is a bottom-up strategy that focuses on helping PHAs to lead the way in developing innovative solutions to improve energy efficiency. It consists of three components:

1. Partner with other organizations
2. Assist PHAs
3. Promote best practices and access to funding

2.2.1 Partner with Other Organizations

EDF should build off of the current initiatives of other organizations that have been involved with sustainability in public or affordable housing. The PHA Sustainability Network and the Coalition of Large Public Housing Authorities will be important partners.

PHA Sustainability Network

Enterprise Community Partners and the U.S. Green Building Council formed the PHA Sustainability Network. The Network is dedicated to bringing housing authority staff together to make public housing healthier and more affordable by improving sustainability.

The PHA Sustainability Network has bi-monthly conference calls where participants can share best practices or discuss common issues. EDF should consider having one staff member become a regular participant on these calls to get another perspective on the issues PHAs face in implementing energy efficiency projects.

Enterprise Community Partners has focused on creating affordable housing in thriving and sustainable communities. Enterprise has invested billions of dollars to help finance 300,000 affordable homes across the country.³³

The U.S. Green Building Council, most widely known for developing LEED standards, has been a national leader in green building. Its Affordable Housing Initiative aims to develop tools, education, and technical assistance to help the affordable housing sector make buildings more sustainable and energy efficient.

Coalition of Large Public Housing Authorities

The Coalition of Large Public Housing Authorities (CLPHA) is a trade association that represents the interests of its 70 member housing authorities across the country (see Appendix E for a list of members). CLPHA has also become involved with the PHA Sustainability Network. CLPHA has worked closely with HUD over the years on a variety of issues, recently supporting HUD's 2011 Going Green Conference.

³³ Enterprise (2012)

In assisting its member PHAs, CLPHA develops and maintains the Public Housing Green Database. Housing authorities can share their best practices on this site, and members of the general public can search the database. Although only five housing authorities have contributed to this database, it is a great first step in encouraging the widespread adoption of sustainability practices.

Additional Partners

Tables 2 and 3 below give a brief description of potential partner organizations and mention any relevant work each has done on energy efficiency in public housing. These organizations have focused on one or more of the following areas: public housing, energy efficiency and sustainability, community economic development and affordable housing, and financing.

Table 2 provides information on organizations that have already been working on energy efficiency in affordable housing. EDF can form partnerships with these organizations and benefit from their successes so far.

Once EDF has begun work with the organizations in Table 2, it should then consider the organizations listed in Table 3. These groups have experience in either affordable housing or energy efficiency. As EDF expands its energy efficiency efforts, it can begin engaging these groups in additional energy efficiency work.

Table 2. Potential Partner Organizations Currently Involved with Energy Efficiency in Affordable Housing					
Organization	Description	Area of Expertise			
		Public Housing	Energy Efficiency	Affordable Housing	Finance
Clinton Climate Initiative	One focus area is retrofitting existing buildings in cities. Previously worked with NYCHA to implement energy efficiency measures, such as more efficient lighting.	X	X		
Coalition of Large Public Housing Authorities	<i>See text above</i>	X	X		
Emerald Cities	Focuses on energy efficiency and sustainable development in cities throughout the U.S. Developed toolkits to guide communities through various processes necessary to enhance sustainability.	X	X	X	
Natural Resources Defense Council	Worked with Enterprise Community Partners on a Green Communities Initiative to ensure that new construction is built in a way that reduces energy use.		X	X	
PHA Sustainability Network (with Enterprise Community Partners & U.S. Green Building Council)	<i>See text above</i>	X	X	X	X
Public Housing Authorities Directors Association	Trade association that works with HUD to represent housing authorities of all sizes. Energy work includes a policy brief recommending changes to HUD's current regulations so a PHA can freeze its subsidy levels for 20 years without an EPC.	X	X		
Rocky Mountain Institute	Leads the Residential Energy Efficiency Leaders Working Group comprised of 10 public housing authorities focused on sustainability and energy efficiency.	X	X		

Table 3. Potential Partners for Partnership Expansion					
Organization	Description	Area of Expertise			
		Public Housing	Energy Efficiency	Affordable Housing	Finance
American Council for an Energy-Efficient Economy	Conducts research and issues reports and policy guidance on many facets of energy efficiency.		X		
Building Owners and Managers Association International	Represents local associations of commercial property owners. Developed guides for green and sustainable buildings.		X		
Consortium for Energy Efficiency	Consortium of energy efficiency program managers. Promotes programs that encourage the use of energy-efficient products and services.		X		
Habitat for Humanity	Builds affordable housing worldwide. As energy efficient homes are more affordable for families, Habitat has focused on ensuring the homes it builds are efficient. Developed a checklist for energy efficient construction.			X	
National Association of Energy Service Companies	Represents ESCOs and promotes energy efficiency. Developed a database (accessible to its members) that tracks cost, savings, and location of 2,600 projects.		X		X
National Association of Housing and Redevelopment Officials	Has more than 23,000 members that are affiliated with housing and community development agencies.	X		X	
National Association of Local Housing Finance Agencies	Represents Local Housing Finance Agencies that provide financing for affordable housing.	X			X
National Council of State Housing Agencies	Represents State Housing Finance Agencies that provide affordable housing.	X			X
National Multi Housing Council	Represents large apartment firms across the country. Worked on energy and climate change issues that help to decrease energy use in apartment buildings.		X		
NeighborWorks	Provides assistance and access to financing through its network of 235 community-based nonprofit organizations.			X	X
Opportunity Finance Network	National network of Community Development Financial Institutions.		X	X	X
State Economic Development Agencies	Many state economic development agencies have focused on energy efficiency as a strategy to promote economic development and competitiveness.		X	X	X

2.2.2 Assist PHAs

EDF should work directly with PHAs. EDF's Climate Corps Program is one good way to initiate partnerships with housing authorities. EDF and NYCHA began working together in 2011, when EDF placed two of its Climate Corps fellows in NYCHA's Energy Department. The fellows were graduate students charged with analyzing utility consumption and making recommendations for cost-effective energy efficiency improvements. In recommending energy efficiency improvements to NYCHA, the fellows noted that one of the main barriers to implementation was finding the appropriate funding to complete the work. EDF has continued to work with NYCHA to address this barrier.

In the summer of 2012, EDF will place fellows in the housing authorities of New York City, Boulder, and El Paso and possibly Philadelphia and Chicago. If fellows in these PHAs identify similar or new barriers, EDF can continue working with these PHAs to ensure long-term success of implementing the recommended energy efficiency improvements.

EDF should continue to identify housing authorities that are interested in becoming Climate Corps host organizations. To identify new partners, EDF should work with CLPHA. CLPHA is very familiar with the initiatives of particular housing authorities and is helpful in forming relationships with PHAs. See Appendix E for CLPHA's member list. Outside of the Climate Corps program, EDF can work with PHAs that have been committed to energy efficiency, but also those who have not yet done this type of work.

To show potential host organizations the benefits of partnering with EDF, EDF should provide marketing materials about its successful partnerships to date. A marketing flyer that EDF can modify and format is found in Appendix F.

2.2.3 Promote best practices and access to funding

To encourage new investment in energy efficiency, EDF should share best practices among PHAs and with the public. EDF can dedicate a portion of its energy web page to its "Energy Efficiency in Public Housing Initiative."

EDF's website should promote and consolidate information that partners have developed. As described in Tables 2 and 3, several organizations have already developed websites, conference calls, and databases to help PHAs share energy efficiency or environmental sustainability information. Rather than duplicating these efforts, EDF should focus on providing information about financing energy efficiency retrofits. It can provide information about the variety of strategies PHAs have employed to reduce energy use, given their particular needs and structures. Three short examples from Boston,³⁴ Boulder, and New York City are provided below.

³⁴ Boston Housing Authority (2010)

ESCO EPC
Boston

The Boston Housing Authority has executed the largest EPC of any housing authority at \$63 million. It has been working with Ameresco, an ESCO, for several years to develop its EPC.

Its contract with Ameresco has many energy conservation measures – including low-flow water fixtures, upgraded lighting, and a solar photovoltaic system – that will be completed in three phases.

Self-directed EPC
Boulder

Boulder Housing Partners completed its first EPC with an ESCO, resulting in significant energy savings at eight of its sites. To build off of that success, it is considering developing a self-directed EPC to implement additional energy conservation measures across its portfolio.

While ESCO-directed EPCs are effective solutions, a PHA can recoup costs more quickly if it does not have to pay for an ESCO, provided that it has the internal capacity to execute an EPC and finance the initial retrofit costs. The PHA can also have more control over project management without an ESCO's involvement. Boulder Housing Partners may consider using qualified energy conservation bonds to finance a self-directed EPC in the future.

Utility Incentives
New York City

NYCHA has implemented many programs and technologies to improve energy efficiency. To continue making energy efficiency upgrades, it has tried to access a variety of funding sources.

NYCHA's utility provider, ConEd, agreed to pay for most of the cost of lighting upgrades in several of its projects. ConEd was willing to work with NYCHA because it is a big customer, and has projects in locations where ConEd needs to reduce electricity demand. The utility was willing to be flexible and work with NYCHA, because NYCHA's reduction in energy use will help the utility to meet its demand-side management goals.

2.2.4 Analysis of Option Two

Partnering with a variety of organizations aligns very well with EDF's current work. Working not only with individual PHAs, but with other organizations committed to energy efficiency and affordable housing will help to reach a large number of PHAs with diverse needs.

As EDF is new to the public housing arena, it can benefit by working with other groups that have a history of supporting public or low-income housing. EDF should identify leaders in this area

and build off of their existing efforts. Working with these other organizations can advance its energy efficiency mission without requiring additional work or funding from HUD. EDF should move forward with option two.

2.3 OPTION THREE – EMPLOY A POLITICAL STRATEGY

EDF might consider developing a political strategy to improve the ease with which PHAs can invest in energy efficiency. There is a broad range of activities EDF can consider, from working with Congress to developing a campaign to increase public awareness and HUD awareness of the issue.

2.3.1 Potential Political Strategy

If EDF is concerned that HUD’s current policies limit PHAs’ investments in energy efficiency, it might consider working with Congress to put top-down pressure on HUD to better execute its programs. To do this, EDF could identify members of Congress from areas of the country that have a high density of public housing and are also members of a relevant House or Senate Committee, such as:

- The Senate Committee on Banking, Housing, and Urban Affairs;
- The Subcommittee on Insurance, Housing and Community Opportunity within the House Committee on Financial Services;
- The House Committee on Oversight & Government Reform;
- The Subcommittee on Transportation, Housing and Urban Development, and Related Agencies within the House Appropriations Committee; or
- The Subcommittee on Transportation, Housing and Urban Development, and Related Agencies within the House Appropriations Committee.

After identifying the appropriate legislators, EDF could work with the legislators’ staff to look into the issue further and develop questions for HUD about its programs and metrics for success. The legislators could then issue a Congressional Letter of Inquiry to HUD asking how HUD plans to monitor and report public housing energy consumption and/or utility subsidies. Congress could also inquire about the effectiveness of the EPC review process, and how HUD can document progress towards its goal of streamlining this review process.

Additionally, Congress can ask HUD to develop quantifiable metrics to annually report on its internal success in helping PHAs to become more energy efficient, and its external success in reducing overall energy use and utility subsidy levels in public housing.

Filing a lawsuit against HUD may seem like a direct way to make an impact, but legal action is not appropriate in this case. The regulations that HUD has developed do not conflict with the law, which contains little explanation and delegates authority to HUD, nor has HUD overstepped its regulatory limits in overseeing the utility subsidy and related programs.

Gaining public support for an issue is a critical step in creating political momentum. EDF can develop marketing materials to share with its members, PHAs, and public housing residents to encourage people to contact their respective lawmakers to support this issue.

2.3.2 Analysis of Option Three

Given the current situation, political action is not the most effective strategy for EDF. HUD has expressed interest in refining its EPC approval process and is open to outside suggestions. As outlined in HUD's 2008 progress report on implementing its energy strategy, HUD is continuing to streamline its approval process to increase the ease of use.³⁵ Rather than working against HUD, EDF should take this opportunity to work with HUD to refine current policies. HUD might not have executed its programs as effectively as possible, but it is prioritizing energy efficient and sustainable communities.

Because the current law governing energy conservation measures is broad and flexible, it gives HUD discretion in implementing programs. HUD has the authority to alter its policies, so it is possible to affect change without going through Congress.

Additionally, this issue is very specific to public housing, so a marketing campaign to the general public is unlikely to encourage anyone outside of this group to rally for the cause. At this point in time, EDF should not use a political strategy to attempt to change HUD's regulations or procedures. EDF may wish to reconsider a political campaign at some point in the future if other attempts are not successful.

2.4 MOVING FORWARD WITH OPTIONS ONE AND TWO

EDF should pursue options one and two to enable increased energy efficiency investment. The two options will work in concert and can be initiated simultaneously. EDF will need to determine its internal capacity, both in terms of staff and funding, to support this strategy. Based on EDF's internal priorities, it may choose to focus on particular aspects of this strategy first.

Working with HUD, PHAs, and partner organizations is the most effective way to promote energy efficiency investment in public housing and promote environmental sustainability. While implementing this strategy, EDF may wish to work with partner organizations to conduct focus groups with PHAs of various sizes and locations to gather feedback on several of the policies outlined in this strategy.

³⁵ U.S. Department of Housing and Urban Development (2008)

3. CONCLUSIONS

Working with public housing authorities, HUD, and partner organizations, EDF has the ability to help decrease U.S. energy consumption and reduce greenhouse gas emissions associated with energy use. Developing a Public Housing Energy Efficiency Initiative will help EDF protect the environment, and preserve affordable housing for those who need it most.

Some housing authorities have already performed energy efficiency retrofits; others have not yet become involved in programs to reduce energy use. EDF can work with housing authorities of varying levels of experience to help increase investment in energy efficiency nationwide.

Implementing the strategy outlined here will be an ongoing process as EDF continues to work with PHAs and develop its relationship with HUD. Making public housing more energy efficient appears to be an important priority for the Secretary of HUD and the Department has been moving to develop strategies for increased opportunities for energy efficiency. HUD is currently working on an energy report for Congress, which should be available in the spring of 2012.³⁶ The data and analysis in this report will provide an important baseline to measure progress and success in reducing energy consumption.

3.1 NEXT STEPS

In addition to the work outlined in this strategy, it will be important for EDF to attract attention to this issue to increase national support for energy efficiency. To do this, EDF should track the results of its efforts. EDF should provide regular updates on its successes in working with HUD, affordable housing and sustainability organizations, and PHAs. It should document lessons learned and best practices from this process.

If EDF is successful in its strategy, it should expect to see housing authorities of all sizes using locally- or context-appropriate funding models to invest in energy efficiency. Successful PHAs should share best practices, and HUD should track and report energy savings on a national level. To track progress towards this vision, EDF should set measurable goals (e.g., help HUD publish baseline energy use statistics for all PHAs, place Climate Corps Fellows at 10 PHAs, post three funding best practices on the website).

3.2 BROADER IMPLICATIONS

The successes in public housing can be transferred to the greater affordable housing community. Better documenting and sharing the successes and failures of energy efficiency financing in public housing can help other organizations to learn from the process and implement creative financing strategies in other affordable housing areas.

Public housing authorities are essentially landlords that manage large numbers of residential properties. In this sense, PHAs are often similar to commercial building owners. The policy

³⁶ Paradise (2012)

implications of this strategy may drive successful investment in energy efficiency in the public sector which can serve as an example for the private sector.

EDF can continue to expand its influence into these other areas of residential energy efficiency to help build a nation of sustainable housing options. Much of the work in this strategy focuses on greening existing buildings. In the future, EDF can determine the best way to help green new construction of affordable housing. EDF may be able to build off the partnerships it has developed through its focus on energy efficiency retrofits to become involved in a comprehensive strategy focused on greening new and old buildings.

APPENDIX A: ENERGY CONSUMPTION ESTIMATE FOR 2010

HUD's Financial Assessment Subsystem-Public Housing (FASS-PH) tracks each PHA's utility expenditures. This data is for PHA-paid utilities, and does not include any resident-paid utilities. As current energy consumption data is not available, the expenditure data is used to create an estimate of consumption.

This estimate uses high values for energy prices to give a conservative estimate of the amount of energy used in PHAs. For 2010, \$0.15/kWh represents electricity prices across states and is a conservative estimate of corresponding energy use. The average price is actually \$0.11 per kWh.³⁷ Natural gas prices are more similar across state lines; the cost in most states was between \$90-100 per tcf in 2010.³⁸ Heating oil prices varied over 2010, between \$2-3 per gallon.³⁹

	Expenditures (\$million/year)	Assumed Prices (\$/unit)	Estimated Annual Consumption
Electricity	\$532	\$0.15/kWh	3.5 billion kWh
Natural Gas	\$302	\$100/tcf	3 million tcf
Fuel Oil	\$221	\$3/gallon	72 million gal.
Total	\$1,055		

To determine the effect of a potential 25 percent decrease in overall energy consumption relative to 2010 levels, the greenhouse gas emissions from 25 percent of the estimated electricity, natural gas, and fuel oil is calculated. The U.S. EPA's Greenhouse Gas Equivalencies Calculator converts kWh of electricity and therms of natural gas to metric tons of CO₂ equivalent (mtCO₂e).⁴⁰ Using a conversion factor of 22 pounds of CO₂ per gallon of fuel oil,⁴¹ this equates to 182,700 mtCO₂e. The total 827,000 mtCO₂e is then entered into the Greenhouse Gas Equivalencies Calculator to show equivalent emissions in terms of passenger vehicles removed from the road.

	25% of Estimated Consumption	GHG Equivalent (metric tons CO ₂ equivalent)
Electricity	880 million kWh	606,800
Natural Gas	750,000 tcf (7.5 million therms)	37,500
Fuel Oil	18 million gal.	182,700
Total GHG Equivalent		827,000
Equivalent Passenger Vehicles Removed from Road		162,157

³⁷ U.S. Department of Energy (2011d)

³⁸ U.S. Department of Energy (2012b)

³⁹ U.S. Department of Energy (2012c)

⁴⁰ U.S. Environmental Protection Agency (2011)

⁴¹ State of Vermont Department of Buildings and General Services (2006)

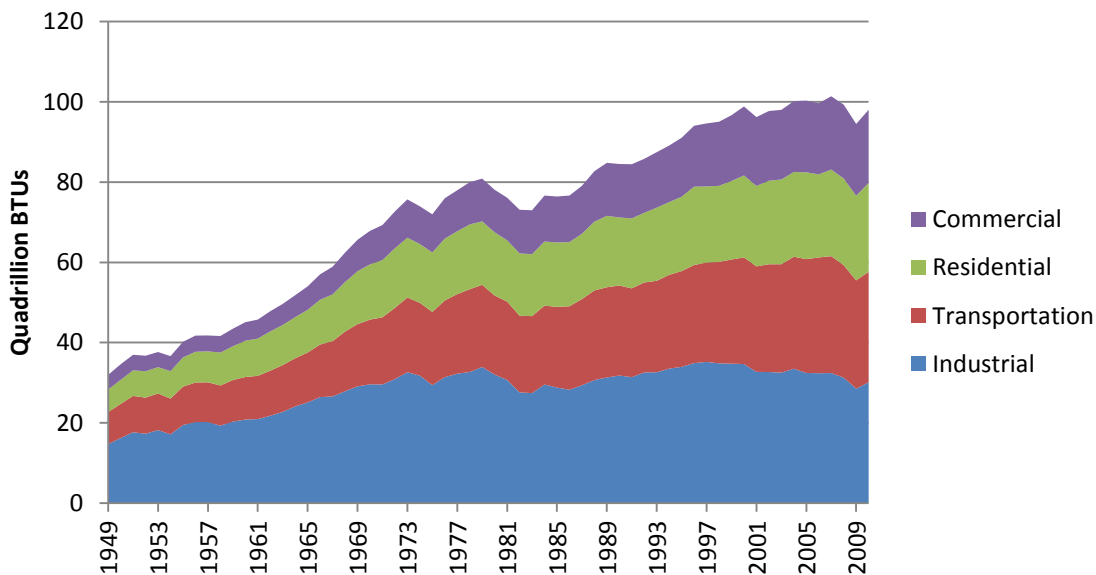
APPENDIX B: LITERATURE REVIEW

Amid concerns of energy price increases, global warming, and energy security, our nation has developed a renewed interest in ways to reduce energy consumption. Much attention has focused on the scale of energy use in buildings and the potential for reductions in energy use through efficiency. Recent research has analyzed the various barriers to implementing energy efficiency technologies and strategies to overcome those barriers.

Rationale for Pursuing Energy Efficiency Options

Around the world, the general public is concerned about the cost and long-term availability of energy.⁴² As global population has been rapidly increasing and improved living standards around the world have increased per capita energy expenditures, world energy consumption has been increasing. In the U.S., we consume approximate 100 quadrillion BTUs of energy each year (see Figure A1).

Figure A1. Total U.S. Energy Consumption, 1949-2010



Source: U.S. Energy Information Administration

As energy use has increased, we have looked to strategies to continue economic growth while developing energy sources and preserving the environment. These strategies have included intensification of resource extraction, renewable energy generation, and energy efficiency. Energy efficiency refers to the concept of using improved technologies or techniques that use

⁴² Accenture (2010)

less energy to create the same level of productivity,⁴³ while energy conservation requires a behavioral change, and is often perceived as a decrease in comfort levels or a sacrifice.⁴⁴

Energy efficiency is an important way to slow growth in energy consumption. California, for example, has determined that energy efficiency should be first in its loading order when determining how to achieve energy goals.⁴⁵ The loading order requires utilities to prioritize energy efficiency projects over other demand-side management programs, renewable energy generation, or fossil fuel generation to meet customer demand for electricity.

The potential cost savings of energy efficiency have also been widely discussed. In 2007, McKinsey & Company published a document showing the costs to abate greenhouse gas (GHG) emissions using various strategies.⁴⁶ While many strategies such as generating more solar energy are costly, this report showed that many energy efficiency measures could reduce GHG emissions with negative costs, i.e. the investments would save money over time.

Our current housing stock represents a great opportunity for energy efficiency investment. According to the Energy Information Administration, energy use in buildings accounts for 40 percent of national energy consumption at an annual cost of \$400 billion,⁴⁷ about half of which is from residential buildings.⁴⁸

Some of the upgrades with the shortest payback period are lighting, insulation, and heating, ventilation, and air conditioning (HVAC) system upgrades. Other common efficiency measures include installing new fixtures and showerheads, replacing old appliances with more efficient Energy Star certified appliances, and improving weatherization by better sealing buildings.⁴⁹

Barriers to Energy Efficiency

Researchers have tried to understand why, if particular energy efficiency measures save money and reduce emissions, more individuals and firms do not make these investments. There are several key barriers to full deployment of cost-saving energy efficiency techniques. These include lack of information, split incentives, uncertainty about future savings, and high upfront capital costs.^{50,51}

Lack of Information

Consumers may not be aware of the potential cost savings associated with energy efficiency improvements. They also may be unfamiliar with efficient products and may not know to look for certain labels or designations. Understanding how energy efficient products work can be very technical in nature, and too difficult for many to understand. Computing cost savings requires

⁴³ Alliance to Save Energy (2011)

⁴⁴ Schellenberg (2010)

⁴⁵ California Energy Commission (2005)

⁴⁶ McKinsey & Company (2007)

⁴⁷ U.S. Department of Energy (2011a)

⁴⁸ U.S. Department of Energy (2005)

⁴⁹ U.S. Department of Energy (2011b)

⁵⁰ Kapur (2011)

⁵¹ The Economist (2008)

knowing how much energy the efficiency measure saves, what the price of energy is, and how long the equipment will operate. The average person is unfamiliar with this data, and the transaction costs associated with learning the technical details may be too high. This lack of technical information also makes it difficult to ensure contractors performing energy efficiency upgrades are qualified.

Split Incentives

Split incentives can take many forms and often occur when the people or funds paying the utility expenses differ from those paying capital or construction costs. For example, landlords do not want to spend additional money to install energy-efficient appliances, because they will not benefit from the reduced utility costs.⁵² Rather, they buy cheaper equipment for the tenant, who will face the costs of higher utility bills. Ultimately, split incentives result in higher energy use. Information asymmetry – the tenant might not be aware of the level of efficiency of the house and therefore unwilling to account for those savings in the rental price – is a driver of this split incentive.

In another example, some agencies or firms that invest in energy efficiency will pay the upfront costs through their capital budget. The subsequent reduction in energy use decreases utility bills and decreases operating costs. If the firm has separate capital and operating budgets, these kinds of investments are difficult to justify in the capital budgets, as capital budgets will not decrease in subsequent years, even as the firm is decreasing costs overall. Institutional structures can provide different incentives to different groups.

Uncertainty of Future Savings

Not only are future cost savings difficult to predict, but it is also difficult to measure exactly how much energy savings is attributable to an installed technology. Accounting for weather, energy disruptions, and simultaneously installed technologies can make it difficult to compare energy bills from one year to the next.⁵³

The Efficiency Valuation Organization has developed the International Performance Measurement & Verification Protocol, which many ESCOs use to help measure and verify energy savings.⁵⁴ Despite this, some contend that there are currently not many reliable ways to make these measurements.⁵⁵ Further, different organizations define and calculate savings in different ways and there is usually less certainty in predicting energy savings past the first year of installation.⁵⁶

High Upfront Capital Costs

Equipment that is more energy efficient is generally more expensive.⁵⁷ When updating equipment as part of a normal replacement cycle, decision makers may favor cheaper equipment

⁵² InterAcademy Council (2007)

⁵³ Rahim (2011)

⁵⁴ Efficiency Valuation Organization (2011)

⁵⁵ Kapur (2011)

⁵⁶ State Energy Efficiency Action Network (2011)

⁵⁷ Texas A&M University (2011)

because it has less of an impact on their current budget, especially if departments use a first cost, rather than a life cycle approach to product analysis.

As explained in a working paper of the National Bureau of Economic research, “[f]rom an economic perspective, energy efficiency choices fundamentally involve investment decisions that trade off higher initial capital costs and uncertain lower future energy operating costs.”⁵⁸ Work from behavioral economics has suggested that firms and consumers have a much higher implicit discount rate for future energy efficiency savings than market borrowing or savings rates.⁵⁹ These two factors mean that although energy efficiency investment will bring future savings, people and firms have a hard time justifying these savings when they are faced with large present costs.

Even if an organization takes a longer-term approach and considers future cost savings when making investments, the organization might not have access to the capital required to make the upfront investment. This lack of capital might lead the decision maker to procure cheaper, more inefficient products.

Finding Funding to Address Barriers

To the extent there is an economic gain from energy efficiency investments, even when firms and individuals may fail to understand the trade-off over time as a gain, a number of financing options have arisen to increase energy efficiency investments. Table A3 below summarizes relevant types of funding arrangements that have been successful across the residential and commercial sectors.^{60,61}

⁵⁸ Gillingham (2009)

⁵⁹ Lawrence Berkeley National Laboratory (2004)

⁶⁰ Kats (2011)

⁶¹ U.S. Department of Energy (2011c)

Table A3. Energy Efficiency Financing Models	
Financing Model	Description
Energy Performance Contract	One of the most widely-used funding mechanisms, especially in the public sector markets. Organizations typically work with an ESCO, who provides financing to implement energy conservation measures. The ESCO and organization share in the energy cost savings.
Energy Services Agreement	An organization contracts with a third party and pays either a fixed fee for energy costs avoided or a floating fee as a percentage of their utility rate in exchange for installing and managing an energy conservation measure.
State/Local Loan Programs	State and local governments have used ARRA funds and other sources to create funding pools. They use this funding to provide loans to homeowners and organizations. Loan repayments allow for additional lending from the pools.
Sustainable Energy Utilities	Uses rate surcharges on utility bills to provide technical assistance and financial incentives for building owners to implement energy conservation measures.
Mortgage-backed EE Financing	Gives borrowers a mortgage with enough borrowing capacity to finance energy efficiency improvements without requiring an additional loan.
Property Assessed Clean Energy (PACE)	Allows energy retrofits to be financed by property tax surcharges (which transfer with the house) as authorized by local governments.
On-Bill Financing or Repayment	Utility funds or third-party capital pay the upfront costs of energy efficiency investments, which customers repay in installments as part of their utility bills.

Addressing Human Behavior

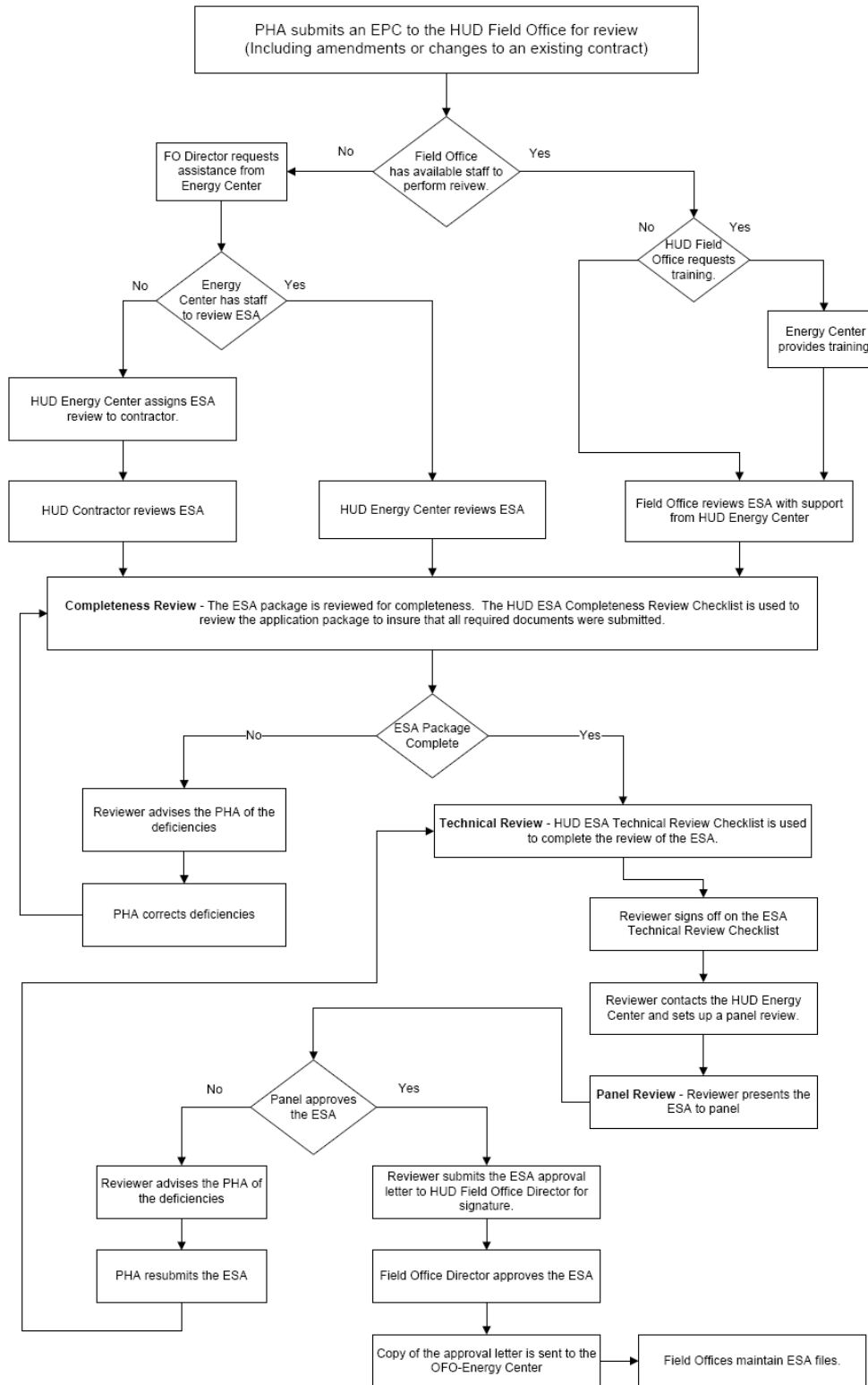
One concern regarding the impact of improved energy efficiency is the rebound effect – that some of the reduction in energy use from energy efficiency will be offset by price-induced behavioral changes that increase energy use.⁶² For example, if a new air conditioning unit uses less energy than in the past, lowering the operating cost, a home owner may run the unit more frequently, negating some of the efficiency gains. There is debate among economists and energy experts over how large this rebound effect is.⁶³

Another aspect of human behavior that is of particular concern in housing authorities is the fact that for many PHAs, utilities are included in the tenant rent. Tenants have little financial incentive to conserve energy, as they are not responsible for the bills. This arrangement puts a limit on the extent to which a housing authority has control over reducing a building’s energy consumption.

⁶² Herring (2007)

⁶³ Tollefson (2011)

APPENDIX C: HUD EPC REVIEW PROCESS



Source: <http://portal.hud.gov/hudportal/documents/huddoc?id=epc-approvalprocess.pdf>

APPENDIX D: ANALYSIS OF LAW AND REGULATIONS

There is only one law that provides any type of guidance on how HUD administers its utility subsidies. The regulations HUD created in response to the law are much more detailed and provide additional information about how a PHA receives its utility subsidy and what the incentives are for reducing energy use.

Law

The United States Housing Act of 1937, as amended by the Quality Housing and Work Responsibility Act of 1998, established an operating fund to assist PHAs with managing public housing.⁶⁴ This law directs the HUD Secretary to establish a formula that determines the amount of federal assistance a PHA will receive. The law also dictates that part of the operating fund will be used for energy.⁶⁵

This law is very broad and delegates authority to HUD to determine the specifics of how to determine subsidies. The law also stipulates that a PHA will financially benefit from any reduction in energy use resulting from a contract with a third party.⁶⁶ The law does not make it clear if the third party must finance the energy conservation measure, or if the third party must perform the work to implement it.

Regulations

Under the law, HUD developed two regulations that are relevant to energy performance contracting. While the regulations provide much more detail and explanation than the laws, they do not provide all of the guidance necessary to fully understand and develop an EPC.

The first rule briefly discusses energy audits and energy conservation measures (24 CFR Part 965). PHAs are required to conduct energy audits every five years to identify energy conservation measures. The housing authorities should analyze each energy conservation measure to determine the expected payback period of the investment.⁶⁷ Housing authorities can initiate EPCs with private organizations to help finance these costs.

In the second rule, HUD developed the Public Housing Operating Fund Program (24 CFR Part 990). This rule established three factors to determine the level of subsidy a PHA is eligible to receive: project expense level, utilities expense level, and other formula expenses. Utilities expense level and other formula expenses are relevant to this discussion.

Under normal circumstances, the utilities expense level is calculated using the rolling base consumption level, which is the average yearly consumption for each utility over a previous three-year period.⁶⁸ This rolling base means that a PHA's current subsidy level is determined by

⁶⁴ U.S. Code (2010)

⁶⁵ U.S. Code (2010)

⁶⁶ Public Law 105-276 (1998)

⁶⁷ Code of Federal Regulations (2010)

⁶⁸ Federal Register (2005)

its past energy costs, and there is a new baseline every year. For example, if a PHA is calculating its subsidy for the 2011 funding period, the rolling base is computed using consumption from July 2006 – June 2009; the 2012 subsidy is based on consumption from July 2007-June 2010. An inflation factor accounts for increasing costs over time. This formula encourages PHAs to reduce energy consumption, because if energy costs have decreased from the time when the rolling base consumption level is calculated, PHAs are able to keep 75 percent of the savings between the rolling base and current consumption level.

In this rule, HUD identifies incentives for energy conservation that are financed by an entity other than HUD: frozen rolling base and the add-on subsidy. Any type of incentive, such as an EPC, must receive HUD approval in order to be eligible for these incentives. HUD will grant approval if it believes the contract can be funded from the anticipated cost savings.

The first incentive described in the regulation is the frozen rolling base. The rolling base consumption level described above is frozen when the energy conservation measure begins. As the project is implemented, and energy costs decrease as a result of the efficiency measure, PHA energy costs decrease. Because the base level is frozen, the level of subsidy should be greater than utility costs as efficiency measures take effect. The PHA is able to retain all of the savings, as long as at least 75 percent of it goes to pay off the debt. A PHA can use the remaining 25 percent for any eligible operating expense. Once the energy contract is complete, the base is unfrozen.

A PHA can be eligible for a subsidy add-on to amortize the cost of a loan for energy conservation measures. With the add-on subsidy, the rolling base consumption level is used. The PHA will retain 75 percent of any decrease in consumption relative to the rolling base (or absorb 75 percent of any increase). From the regulation, it is not clear whether the amount of the subsidy is based on the cost to pay the debt services associated with implementing the measure or the expected energy cost savings.

APPENDIX E: CLPHA MEMBERS⁶⁹

Housing Authority	State
Akron Metropolitan Housing Authority	OH
Alaska Housing Finance Corporation	AK
Albany Housing Authority	NY
Atlanta Housing Authority	GA
Baltimore City Housing Authority	MD
Birmingham Housing Authority	AL
Boston Housing Authority	MA
Bridgeport (Housing Authority of the City of Bridgeport)	CT
Buffalo Municipal Housing Authority	NY
Cambridge Housing Authority	MA
Camden (Housing Authority of the City of Camden)	NJ
Charlotte (Housing Authority of the City of Charlotte)	NC
Charter Oaks Communities (Stamford Housing Authority)	CT
Chester Housing Authority	PA
Chicago Housing Authority	IL
Cincinnati Metropolitan Housing Authority	OH
Cook County (Housing Authority of Cook County)	IL
Cuyahoga Metropolitan Housing Authority	OH
Dallas Housing Authority	TX
Denver (Housing Authority of the City and County of Denver)	CO
District of Columbia Housing Authority	DC
El Paso (Housing Authority of the City of El Paso)	TX
Elm City Communities (Housing Authority of the City of New Haven)	CT
Fayette County Housing Authority	PA
Fresno City and County Housing Authority	CA
Greensboro Housing Authority	NC
Harrisburg Housing Authority	PA
Hawaii Housing Authority	HI
Home Forward	OR
Housing Authority of the Birmingham District	AL
Houston Housing Authority	TX
Jersey City Housing Authority	NJ
Kansas City (Housing Authority of Kansas City)	MO
King County Housing Authority	WA
Long Branch Housing Authority	NJ
Los Angeles City Housing Authority	CA

⁶⁹ CLPHA (2009)

Housing Authority (cont.)	State
Los Angeles County (Community Development Commission and Housing Authority of Los Angeles County)	CA
Lucas Metropolitan Housing Authority	OH
Miami-Dade Public Housing and Community Development	FL
Milwaukee (Housing Authority City of Milwaukee)	WI
Minneapolis Public Housing Authority	MN
New Brunswick Housing & Redevelopment Authority	NJ
New York City Housing Authority	NY
Newark Housing Authority	NJ
Norfolk Redevelopment and Housing Authority	VA
Oakland Housing Authority	CA
Oklahoma City Housing Authority	OK
Paterson (Housing Authority of the City of Paterson)	NJ
Philadelphia Housing Authority	PA
Providence Housing Authority	RI
Puerto Rico Public Housing Administration	PR
Richmond Redevelopment & Housing Authority	VA
Rochester Housing Authority	NY
Sacramento County Housing & Redevelopment Agency	CA
Saint Paul Public Housing Agency	MN
San Antonio Housing Authority	TX
San Bernardino County (Housing Authority of the County of San Bernardino)	CA
San Buenaventura Housing Authority	CA
San Diego Housing Commission	CA
San Francisco Housing Authority	CA
Santa Clara County (Housing Authority of the County of Santa Clara)	CA
Seattle Housing Authority	WA
Syracuse Housing Authority	NY
Tacoma Housing Authority	WA
The Habitat Company	IL
Trenton Housing Authority	NJ
Vancouver Housing Authority	WA
Virgin Island Housing Authority	VI
Yonkers (Municipal Housing Authority for the City of Yonkers)	NY
Youngstown Metropolitan Housing Authority	OH

Forging Sustainable Partnerships: How EDF's Climate Corps Program creates lasting partnerships to break down barriers to energy efficiency implementation

About Climate Corps

EDF Climate Corps places graduate students in companies, cities and universities to build the business case for energy efficiency. Fellows work with staff in operations, finance, and corporate sustainability to understand the organization's energy use and develop a customized energy plan that quantifies the financial and environmental benefits of energy efficiency investment.

Identifying Barriers

Many fellows discover that their host organizations face barriers to implementing energy efficiency measures, even when these upgrades can save money within a few years. Lack of information, organizational structure, and lack of capital can all be barriers.

Forming Partnerships

EDF has continued to work with Climate Corps host organizations after fellows complete their internship. EDF can partner with these organizations to help remove barriers to implementing the fellows' plans for energy efficiency.

Case Study

In 2011, EDF placed two Climate Corps fellows at the New York City Housing Authority (NYCHA). When developing their plan for energy efficiency, the fellows identified some barriers to efficiency investment that are specific to public housing. Investing capital into measures that reduce energy consumption ultimately decreases the level of utility subsidies from the U.S. Department of Housing and Urban Development. This makes it difficult for housing authorities to repay upfront retrofit costs with future energy cost savings.

EDF has continued working with NYCHA to better understand this barrier and identify ways to help NYCHA employ financing mechanisms that will allow it to both invest in energy efficiency and recoup the cost of their initial investment through energy cost savings.

Recognizing that other public housing authorities face similar issues, EDF has reached out to other public housing authorities and public housing trade organizations to learn more about their experiences, and provide policy assistance through partnerships.

Find more information at: edfclimatecorps.org

April 2012

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