



Combining Community Resiliency and Energy Efficiency Retrofits: The Rutgers Center for Green Building with the Energy Efficient Buildings Hub (EEB Hub)

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Community Resiliency

At a time when many in the mid-Atlantic region are focused on recovery after Hurricane Sandy, there is an opportunity to think strategically about how to rebuild. Not every retrofit project can incorporate a full complement of green building strategies; however, every retrofit should benefit by an assessment of the opportunities to optimize resource efficiency and resiliency. The Sustainability and Efficiency Task Force Recommendations of the U.S. Department of Homeland Security emphasizes the connection between national security and energy use and suggests that sustainability planning increases resilience in face of a disaster.¹ In a recent interview on NPR's Brian Lehrer show, Judith Rodin, President of the Rockefeller Foundation, noted that focusing on preventative measures could save money in the long run. "If all we're doing is adding money to respond to these bad things after they happen, the cost will be double, triple, quadruple, relative to what taking preventative measures can truly prevent."²

Resource management is a critical element of disaster preparedness. Built infrastructure and natural systems are interconnected and when energy systems were overcome during Hurricane Sandy, the region's wastewater systems and local waterways were impacted. According to testimony to the NJ Senate Budget Committee by NJDEP Commissioner Robert Martin, eighty wastewater treatment plants in NJ were damaged during and after Hurricane Sandy, affecting 3.3 million people and discharging untreated waste into local waterways.³ Although the scale of these issues may seem disconnected to rebuilding or retrofitting an individual site, the cumulative effect of how resources are managed on individual properties impacts natural and built systems of the community and the region. Taking steps to protect these systems and conserve energy and water can help develop community resilience, not just in the face of catastrophic disasters but also for the more efficient use of resources over time.

There are many reasons to make energy efficiency a priority in existing buildings. The United Nations' Intergovernmental Panel on Climate Change found that the largest energy (and carbon) savings potential in 2030 is in existing buildings through retrofit and renovation.⁴ A study by the Rockefeller Foundation and Deutsche Bank suggests that energy efficiency retrofits could save \$1 trillion over the next ten years, which is equivalent to savings of approximately 30% of the annual electricity spent in the United States.⁵ In contrast, new construction accounts for only 2 to 3 percent of the existing building stock.⁶

¹ U.S. Department of Homeland Security. Sustainability and Task Force Recommendations. 2010. https://www.dhs.gov/xlibrary/assets/hsac_sustainability_efficiency_task_force_recommendations_2010.pdf Accessed December 19, 2012.

² Rodin, Judith. (2012, December 20). [Interview with Brian Lehrer, host of the Brian Lehrer Show]. Rebuilding *Resilience: Next Steps*. Retrieved December 21, 2012 from NPR website: http://www.wnyc.org/shows/bl/2012/dec/20/rebuilding-resilience-next-steps/?utm_source=/shows/bl/2012/dec/13/rebuilding-resilience/&utm_medium=treatment&utm_campaign=morelikethis

³ Mooney, John. *By the Numbers: Hurricane Sandy's Environmental Impact*. NJ Spotlight. December 4, 2012.

⁴ IPCC Fourth Assessment Report, Working Group III "Mitigation of Climate Change," Chapter 6

⁵ The Rockefeller Foundation and Deutsche Bank Group Climate Change Advisors. 2012. *United States Building Energy Efficiency Retrofits*. http://www.dbcca.com/dbcca/EN/_media/Building_Retrofit_Paper.pdf Accessed December 22, 2012.

An additional reason to focus on existing building retrofits is its potential for brownfield renewal. According to Dr. Judy Shaw, of the National Center for Neighborhood and Brownfield Redevelopment, "Existing sites – those already in productive use or those in need of rehabilitation – tend to have good access to utility infrastructure and transportation networks, making them highly suited to capitalize efficiently on energy conserving approaches when redeveloping." Advanced energy retrofits in existing buildings on brownfield sites are a win-win-win.

What is the Best Way to Accelerate Advanced Energy Retrofits (AERs)?

There is a unique multifaceted approach to investigating this question that is taking place in the greater Philadelphia area through the Energy Efficient Buildings Hub (EEB Hub). The goal of the EEB Hub, a U.S. DOE initiative, is to reduce annual energy use in average size commercial, institutional and multifamily buildings in the region by 20 percent by 2020. Advanced energy retrofits (AERs) make use of new but proven technologies, systems and processes to achieve significant energy and, ultimately, economic savings.⁷ EEB Hub Deputy Director Laurie Actman anticipates that EEB Hub efforts to accelerate AERs will “foster increased interest and investment in innovative and cost effective energy efficient building and retrofit strategies by the region’s building owners, creating a culture where that’s the norm rather than the exception.”

In New Jersey, the Rutgers Center for Green Building (RCGB) has been pursuing several objectives of the EEB Hub agenda. From a policy perspective, the team from RCGB is working to overcome market barriers that deter wider adoption of energy efficiency measures in existing buildings. RCGB is researching how existing codes and standards, state programs, and local government initiatives impact energy efficiency through tracking the code adoption process, developing municipal guidance and piloting best practices focused on encouraging energy efficiency, while also conducting energy modeling and cost estimating to assess the potential to extend the requirements of state energy efficiency programs into even deeper AER territory.

Informing the Code Adoption Process

This is a critical time in New Jersey in terms of codes and energy efficiency, and the code adoption process is serving as a laboratory for how codes affect advanced energy retrofits. Understanding the important role of strong building and energy codes in achieving increased energy efficiency, RCGB has collaborated as a member of the NJ Green Codes Group, together with USGBC-NJ and AIA-NJ, to inform the adoption and implementation of the 2012 ICC codes, including IECC and potentially an overlay of the International Green Construction Code (IgCC).⁸ The 2012 ICC codes⁹ are currently under consideration for adoption and are expected to pass in 2013. Understanding and tracking changes to the rehabilitation subcode that governs

⁷ EEB Hub, <http://www.eebhub.org/about-eebhub> Accessed January 21, 2013.

⁸ According to the International Code Council, the IgCC is the first model code to include sustainability measures for the entire construction project and its site — from design through construction, certificate of occupancy and beyond. The new code is expected to make buildings more efficient, reduce waste, and have a positive impact on health, safety and community welfare.

⁹ The International Codes, or I-Codes, published by ICC, provide minimum safeguards for people at home, at school and in the workplace. The I-Codes are a complete set of comprehensive, coordinated building safety and fire prevention codes.

existing commercial buildings in NJ is further critical to the implementation of advanced energy retrofits.¹⁰ Compared to many states, NJ has older building stock and a higher percentage of additions and alterations to existing buildings. The rehabilitation subcode, a stand-alone subchapter, was adopted in 1998 and is updated yearly. It is the first comprehensive set of code requirements for existing buildings and it was developed by the Department of Community Affairs under the direction of a 30-member committee and coordinated by the Center for Urban Policy Research at Rutgers University.¹¹

Municipal Guidance with Training Protocols

Part of RCGB's work with the EEB Hub has focused on implementing the policy and technical recommendations of the New Jersey Green Building Manual (NJGBM). The NJGBM is a comprehensive web-based document that defines a baseline of performance and provides enabling economic and environmental best practices for green building (www.greenmanual.rutgers.edu). As an outgrowth of the NJGBM, RCGB has developed municipal guidance to assist NJ municipalities with encouraging energy efficiency in privately owned commercial and multifamily buildings. The guidance provides step-by-step actions to approach this objective in a variety of ways including incorporating energy efficiency in redevelopment projects, using planning and zoning powers to achieve energy efficiency targets, promoting public/private partnerships that focus on financing energy efficiency, promoting energy efficiency programs and developing a targeted outreach campaign, creating an energy efficiency recognition program and promoting energy efficiency training programs. This guidance will be disseminated through Sustainable Jersey (<http://www.sustainablejersey.com>), a certification program for NJ municipalities that want to go green, save money, and take steps to sustain their quality of life over the long term.

NJ municipalities do not have jurisdiction over building code so are somewhat limited in their ability to impact buildings; however, the Local Redevelopment and Housing Law,¹² and planning and zoning per the Municipal Land Use Law (MLUL) provide opportunities to encourage energy efficiency. The Municipal Land Use Law is the legislative basis of planning and zoning boards of adjustment and defines the powers of these boards.¹³ The Local Redevelopment and Housing Law empowers municipalities to act to improve areas in need of redevelopment. Redevelopment plans provide an opportunity to incorporate specific energy efficiency measures into redevelopment projects. Leveraging these standards is a mechanism to overcome barriers to advanced energy retrofits.

This guidance also serves as a training tool for municipalities as well as developers and business owners in the private sector. Specific trainings tied to the NJGBM implementation recommendations are outlined, including standards ASHRAE 90.1, ASHRAE 189.1, IECC 2012, ICC-700, and IgCC and sessions on energy modeling, life cycle costing, and ENERGY STAR Portfolio Manager.

¹⁰ See http://www.state.nj.us/dca/divisions/codes/codreg/pdf_regs_former/nj_model_code_adopt_5_7_12.pdf for the history of NJ Model Code Adoptions

¹¹ NJ DCA. <http://www.state.nj.us/dca/divisions/codes/offices/rehab.html> Accessed December 22, 2012.

¹² N.J.S.A. 40A:12A-7 Title 40A. Municipalities and Counties. Ch.12A- Local Redevelopment and Housing Law. L.1992, c. 79. State of NJ Department of State <http://www.nj.gov/state/planning/resources-statelaws.html>

¹³ The New Jersey Planning Officials. http://njpo.org/NJPO_MLUL.html Accessed December 4, 2012.

Piloting Best Practices with Township of West Windsor, New Jersey

In recognition of the importance of sustainability to sound land use and resource planning, the New Jersey Legislature enacted an amendment to the Municipal Land Use Law (NJSA 40:55D-28b(15)) on August 5, 2008 that permits municipalities to prepare and adopt a Green Buildings and Environmental Sustainable Master Plan Element. This Element “shall provide for, encourage, and promote the efficient use of natural resources and the installation and usage of renewable energy systems; consider the impact of buildings on the local, regional and global environment; allow ecosystems to function naturally; conserve and reuse water; treat storm water on-site; and optimize climatic conditions through site orientation and design.”

Based on this authority, the Township of West Windsor Planning Board has adopted a Master Plan Sustainability Element to formally commit West Windsor Township to examine and implement actions that will continue to move the Township in a more sustainable direction and thus help ensure that it’s environmental, economic and social objectives are balanced and mutually reinforced. The over-riding goal is to make sustainability inherent in community policies and regulations. The Element was derived from the *Sustainable West Windsor Plan 2007* that was developed under the direction of the West Windsor Township Environmental Commission.

The Township of West Windsor’s pilot focuses on encouraging building owners and managers to take steps to increase energy efficiency in their buildings. A recent inventory of 274 commercial and multifamily buildings in West Windsor includes information about the building owner, property manager, age, use, square footage, height, number of stories, roof details, exterior finish, heating & cooling, solar panels and details about energy efficiency upgrades (type, cost, permit date, appliance, etc.). Based on data gathered through this inventory, building owners and managers have been invited to complete an energy efficiency survey and encouraged to participate in free energy benchmarking and the *Pay for Performance Program* available through NJ’s Clean Energy Program (<http://www.njcleanenergy.com>). Over time, the benefits realized through participation in the pilot and existing state programs will be used to build a peer-to-peer network as an effective strategy to promote energy efficiency at a larger scale.¹⁴

Energy Modeling and Cost Estimating

RCGB also is comparing, analyzing and presenting findings regarding the energy requirements of New Jersey’s Clean Energy *Pay for Performance Program*¹⁵ and the NJGBM Compliance Path Recommendations for Existing Commercial (and Multifamily) Buildings. The *Pay for Performance Program* requires buildings to include a package of energy efficiency measures that achieve the minimum performance threshold of 15% reduction in total source energy consumption. The NJGBM Recommendations include suggested compliance paths with specific energy efficiency targets and additional green building best practices for existing commercial

¹⁴ Living Cities and Institute for Sustainable Communities. *Scaling up Building Energy Retrofitting in U.S. Cities*. http://www.iscvt.org/who_we_are/publications/Green_Boot_Camp_Resource_Guide.pdf Accessed December 24, 2012.

¹⁵ NJ’s Clean Energy *Pay for Performance Program* is a comprehensive energy efficiency program that provides incentives towards whole-building energy improvements.

and multifamily buildings. A key result of this exercise is the development of real-data based energy optimization cost curves for achieving AERs.

Optimizing Resources & Resiliency

NJ provides a good testing ground for the EEB Hub's approach to reducing energy use through accelerating advanced energy retrofits. It is the most densely developed state and has older building stock and a higher percentage of alterations to existing buildings than many other states. Additionally, the NJ Department of Environmental Protection estimates that there are over 10,000 potential brownfield sites in the state, some of which contain existing buildings.¹⁶ The code adoption process in NJ provides an opportunity to have significant impact on energy efficiency and influence other states. NJ has a suite of energy efficiency programs in place and many building owners and municipalities are focused on rebuilding and recovery after the impacts of Hurricane Sandy. RCGB's efforts focused on codes and standards, best practices, resources and training are designed to meet the EEB Hub's advanced energy retrofit goal, ultimately improving energy efficiency in the greater Philadelphia region and beyond. This work is also reinforcing the importance of comprehensive assessment and planning in retrofit projects and highlighting opportunities to incorporate resiliency in the built environment.

¹⁶ NJ Department of Environmental Protection. Site Remediation Program.
<http://www.nj.gov/dep/srp/brownfields/faq/#howmanysites> Accessed December 27, 2012