Center for American Progress

The Buildings of Tomorrow Are Here Today

By Greg Dotson and Erin Auel April 30, 2015

Commercial and residential buildings in the United States account for 39 percent of the nation's carbon pollution through the consumption of fossil-fuel-generated electricity, natural gas, home heating oil, and propane.[1] Therefore, to achieve deep carbon-pollution reductions, the nation's buildings must become cleaner and more efficient. Fortunately, the technology exists today to eliminate the use of these fossil fuels in U.S. homes and workplaces. By adopting high energy efficiency and onsite renewable energy generation, buildings across the United States are demonstrating that fossil-fuel-generated electricity is no longer a necessity for every building. These buildings—called net-zero energy buildings—can be found in residential neighborhoods, among downtown office buildings, at commercial shopping centers, and in academic institutions.

The federal government is poised to implement net-zero building practices in its new buildings around the country. To make this a reality, the U.S. Department of Energy, or DOE, must now finalize a rule that explains the requirements to federal agencies.

The need for the DOE to act

The federal government has a history of driving energy-efficiency improvements in the United States. In 2007, Congress passed, and President George W. Bush signed, the Energy Independence and Security Act of 2007, or EISA—a law designed to lead by example in the transition to less-polluting buildings. Specifically, Congress put the federal government on track to progressively reduce the fossil-fuel-generated electricity consumption of federal buildings with plans for new buildings to have net-zero energy usage in 2030.[2]

Section 433 of the EISA amended the Energy Conservation and Production Act of 1976 and required the DOE "to establish revised performance standards for the construction of new Federal buildings" and major renovations of federal buildings.[3] In doing so, the federal government "expected to change the way federal structures are built by forcing the U.S. government to shift from using coal, oil and natural gas in its

buildings to using renewable energy."[4] The federal government is the largest consumer of energy in the United States, with 350,000 buildings and 600,000 road vehicles in the federal fleet.[5] In fiscal year 2007, federal buildings accounted for 36 percent of the U.S. government's energy use.[6]

The crux of Section 433 is setting specific targets for reducing fossil-fuel-generated electricity consumption in increments, starting with a 55 percent reduction in 2010 and an eventual 100 percent reduction by 2030.[7] Thus, by 2030 and thereafter, all newly constructed and majorly renovated federal buildings would not be consuming fossil-fuel-generated electricity. Instead, these buildings would be powered by nonpolluting energy sources and would incorporate advanced energy-efficiency technologies to reduce overall energy consumption.

However, implementation of this legislation has lagged. Although Congress required the DOE to issue a rule in 2008 explaining to federal agencies how to carry out this visionary law, the DOE has yet to finalize a rule. It finally issued a draft rule in 2010. In response, many groups and agencies came forward with concerns about the feasibility of the proposed rule. These included uncertainty about the designation of "major renovation," as the definition varied between agencies, and the ability to use renewable energy certificates rather than directly sourced renewable energy to meet the required fossil-fuel reductions.[8]

In 2011, with the rule stalled by these concerns, Congress began to re-examine the federal government's ability to work toward net-zero buildings. Members from both sides of the aisle spoke out in favor of amending Section 433, arguing that the DOE's targets were "unworkable."[9] In May 2013, Sens. John Hoeven (R-ND) and Joe Manchin (D-WV) offered an amendment to pending legislation in the Senate to repeal Section 433 and replace it with less-stringent reduction targets.[10] Among those who supported the amendment's new efficiency standards, many claimed that net-zero technology was economically infeasible. Some advocates of energy efficiency tacitly supported the approach, seeing it as a feasible path toward greater near-term efficiency improvements—even if it came at the expense of greater efficiency and reduced fossil-fuel dependence in the long term.[11]

In October 2014, however, the DOE released a supplemental proposed rule that addresses concerns from the 2010 proposal and sets a clearer path toward achieving net-zero federal buildings. It clarifies to which types of buildings and renovations the reduction targets apply, as well as what specific measures can be used to achieve net-zero energy by 2030. It provides that federal buildings in different climates are not held to a reduction based on the national average consumption; rather, new federal buildings and renovations must reduce consumption compared with the average of those in the same climate region.[12] It also proposes special accommodations for efficient combined heat and power systems that rely on natural gas.[13]

With these proposed changes, the DOE has demonstrated that it has heard the concerns about the 2010 proposed rule and is committed to addressing them. The revised rule indicates that federal agencies will lead the charge on transitioning electricity consumption from fossil fuels to renewable energy. Through it, the DOE is sending a signal to agencies and innovators that the demand for energy efficiency and renewable technologies will continue to rise. President Barack Obama further emphasized this by issuing an executive order in March 2015 that directs federal agencies to reduce greenhouse gas emissions by 40 percent compared with 2008 levels over the next decade.[14] While this is a different directive—the executive order focuses on emissions, while the proposed rule is concerned with fossil-fuel-generated energy consumption—both measures signal that the federal government is becoming a more invested client in low-carbon buildings. This is a growth opportunity for businesses to continue to innovate and develop the best methods for efficiency and renewable power generation.

Having proposed changes that resolve the concerns that have been expressed about Section 433, the DOE should now take swift action to finalize the rulemaking to ensure that the federal government leads by example as it works toward net-zero buildings.

Net-zero buildings have taken off

From homes and businesses to schools and offices throughout the United States, net-zero buildings have proliferated and have even become more cost effective. Examples of their success and neighborhood appeal can be found across the country. Local businesses, homeowners, and governments are choosing net-zero buildings as a smart way to save money in the long run.

Locally, schools and business are taking action. For example, Richardsville Elementary School in Bowling Green, Kentucky, was built in 2010, becoming the first net-zero school in the country. The efficiency measures are on display throughout the school and serve as a teaching tool for students to learn about energy use and savings.[15] Similarly, Oberlin College in Ohio built the Adam Joseph Lewis Center for Environmental Studies to be 63 percent more efficient than a comparably sized building by relying on the sun for lighting, passive heating, and power generation.[16] The building is equipped with real-time energy- and water-use monitoring on its dedicated website so that students can monitor its efficiency.[17] After a deadly tornado devastated Greensburg, Kansas, in 2007, the county school district opted to unify all of its schools into a new, single net-zero building.[18]

Setting an example for businesses, Walgreens opened the first net-zero energy retail space in the United States in Evanston, Illinois, in November 2013. The pharmacy and store meet all of their energy demands through onsite power generation from 850 rooftop solar panels and two wind turbines.[19]

Residential net-zero energy projects are also beginning to proliferate. For instance, Premier Gardens in Sacramento, California, is a "Zero Energy" subdivision comprised of 95 single-family homes that utilize high-efficiency and renewable energy technology.[20] Kaupuni Village is a net-zero energy affordable housing community in Hawaii made up of 19 single-family homes and a community center.[21] In Portland, Oregon, an infill project of townhomes has recently been constructed to net-zero energy specifications.[22] Additionally, hundreds of homes have been constructed that approach net-zero energy performance, such as the 306-home Scripps Highlands subdivision[23] in San Diego, California, and the 144-home Carsten Crossings development[24] in Rocklin, California.

This success among individual net-zero buildings has spurred their expansion to entire towns and other large outfits to achieve larger-scale net-zero status. Arvada, Colorado, will soon be the site of the largest net-zero energy neighborhood in North America.[25] Its 308 homes will be extremely energy efficient—using 80 percent less energy than the average equivalent home. Additionally, longer-lasting energy-efficient materials with lifespans of 20 years to 50 years will allow these net-zero homes to yield the benefits of energy efficiency for longer than ever. Due to the cost-saving and pollution-mitigating benefits of net-zero buildings, several states are working to encourage more widespread adoption. Colorado's Energy Saving Mortgage Program reduces mortgages by $8,000 for new and renovated homes that are classified as net zero.[26] In California, Gov. Jerry Brown (D) has released goals to increase new and renovated state buildings' efficiency. He signed an executive order requiring that these buildings be net zero by 2025.[27] The California Energy Commission is working to update the California Building Energy Efficiency Standards to ensure that all newly constructed homes in the state are net zero by 2020 and that all new nonresidential buildings are net zero by 2030.[28]

Additionally, net-zero homes are within the price range of most potential homeowners. In Seattle, homeowners were able to build a new, net-zero home for $125 per square foot—about $75 less per square foot than the average new home in Seattle.[29]

How the federal government can lead by example

The federal government can continue this trend of net-zero building and lead by example locally, nationally, and globally. In 2010, the DOE itself built the largest net-zero building in the United States—the National Renewable Energy Laboratory, or NREL, Research Support Facility in Golden, Colorado. This advanced building has achieved impressive energy efficiency, consuming 70 percent less energy than the average Denver office.[30] This low energy consumption is achieved through efficient lighting and heating and cooling technology and is offset onsite by the facility's solar arrays. In addition to being net zero, the Research Support Facility is also platinum Leadership in Energy and Environmental Design, or LEED, certified, the highest level of LEED certification. NREL undertook the project mostly to demonstrate the feasibility of net-zero buildings with today's readily available technologies, even on such a large scale.

The U.S. Army has also paid attention to the financial and security benefits of high-efficiency buildings and is working toward developing net-zero installations and facilities to reduce costs and increase energy security. In 2013, the Army released a summary report of its nine net-zero pilot programs to identify best practices. By its estimates, by renovating these nine sites to attain net-zero energy, the energy savings would be equivalent to "approximately 8% of the Army's current total installation energy use with renewable energy."[31]

Federal activities are yielding results. Between FY 2007 and FY 2013, the U.S. government reduced the annual energy use of its buildings by 7 percent.[32]

Other countries have realized the environmental and economic benefits of energy efficiency. The European Union implemented requirements in 2010 for all new public buildings to be "nearly zero-energy buildings," by December 31, 2018.[33] This qualitative standard aims to achieve very high energy-efficiency levels, supplemented by onsite renewable energy production, for all new buildings in the European Union by the end of 2020.[34] These goals will increase EU energy security and reduce energy costs for the governments that operate these buildings.[35]

Conclusion

Net-zero energy buildings are technically and financially viable today and are delivering benefits to their owners and users. Throughout the United States, private citizens and businesses are already demonstrating this by building and retrofitting spaces of the future that are highly efficient and renewable energy powered. Although the federal government is already equipped to continue its progress toward net-zero buildings, it is time now to finalize its commitment to ensure that its buildings are also part of this future. The DOE should finalize its rule in order to provide certainty and clarity and to allow federal agencies to plan how they will achieve greater reductions in their fossil-fuel-generated energy consumption. Furthermore, the rule will provide savings to both the federal government and to the American people while ensuring that the United States continues to reduce its carbon footprint.

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