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What we think about, and what we'd like you to think about

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Cool Roofs for a Cool Baltimore: An Environmental Weapon Against Climate Change, Air-Conditioning Costs, and Sweltering Summer Heat.

ABELL SALUTES:

Baltimore's Sexual Assault Response Team, for reducing the number of unfounded reports of sexual assault—in service to victims and community.

In 2010 and the years leading up to it, Baltimore held a national record it was not proud of: The number of rape cases reported within its jurisdiction and then dismissed as unfounded ("determined to be false or baseless") was at 32 percent—one-third of victims' complaints.

Today, unfounded reports vary between 2 percent and 3 percent.

Making the difference, explains Heather Brantner, is the enhanced Sexual Assault Response Team, or SART. Brantner, a former director of a Howard County domestic violence shelter, was hired by the city nine months after The Sun revealed these grim unfounded rape-charge statistics and is now the program's coordinator.

This reorganized and expanded SART program represents a multidisciplinary approach, effectively combining the resources of Mercy Hospital Medical Center;

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Seven Recommendations for Putting White-Roofs to Work – Faster.

By Joan Jacobson

From New York to California, governments, scientists and nonprofits dedicated to energy efficiency, mitigating climate change and weatherizing homes for the poor are embracing the widespread adoption and installation of "cool roofs." Also called "white roofs," cool roof systems are designed to reflect the sun's rays and limit heat absorption. Unlike traditional black roofs, cool roof reflective surfaces stay up to 60°F cooler, reducing a building's temperature, cutting air conditioning costs and eventually shrinking the "urban heat island" effect that makes cities so unbearable in summer. Longer lasting, cost-competitive, and often safer to install than traditional black roofs, cool roofs could become Baltimore's next climate mitigation priority and environmental target.

Roofs play an obvious function in keeping buildings sealed and protected from moisture. Yet increasingly, rooftops are being looked to for their environmental potential, including cooling, stormwater retention and solar energy production, all of which can also lower operating costs. While green or vegetated roofs and rooftop solar panels can also address a building's environmental and energy performance and should be encouraged, this report focuses primarily on the potential for expanding the installations of cool roofs.

Baltimore stands to learn much from the experience of other cities and states in promoting widespread installation of cool roofs through enabling building code requirements, availability of utility rebates and incentives and nonprofit programs. Cooling a significant number of Baltimore buildings with reflective roofs can increase energy efficiency and relieve peak demand on the electrical grid, reduce emissions and greenhouse gases, improve air quality, and reduce heat-related health risks for the elderly and vulnerable populations, while at the same time enhance Baltimore's resilience to withstand prolonged heat events as a result of climate change.

Increasing the number of high-performance roofs could go a long way toward achieving city and state energy-saving, sustainability, and climate action goals, especially as Baltimore focuses on the implementation of the newly released Climate Action Plan, and Baltimore City Public Schools are on the brink of an unprecedented $1.1 billion overhaul of school buildings including renovation of existing buildings and construction of new buildings. High performance roofs should be considered

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as the city reviews its green building codes and standards, and utilities and government are working to meet ambitious energy consumption reduction targets.

Report Overview

This report contains six sections: 1) a definition of cool roofs; 2) a summary of cost, environmental and public health benefits and considerations; 3) a comparison to other environmentally beneficial roofing options; 4) examples of cool roofs in Baltimore through government, nonprofit and private efforts; 5) examples of other city and state initiatives designed to increase adoption and implementation of cool roofs; and finally, 6) recommendations to increase the pace of cool roof installations in Baltimore.

What is a "Cool Roof?"

A cool roof is designed to reflect sunlight, and to maintain a lower roof temperature than a traditional roof.[1] It can be installed on any size building—from a typical, 800-square-foot roof of a Baltimore rowhouse to a commercial building as big as a Wal-Mart where there has been widespread adoption among its 6,000 stores. Ideal for flat and low-sloped roofs,[2] cool roofing system options are available locally for both new construction and replacement. For example, a cool "elastomeric" roof is installed by applying a multi-layer liquid coating that is strengthened with mesh reinforcement. A cool roof can also be installed as a "membrane," a sheet of pre-fabricated material that will seal the roof and protect it from leaking. The result of both options is a strong and durable white surface that remains cool to the touch even on hot summer days. White or silver paint offers some reflectance, but it is not considered a cool roof system as it does not seal and protect the building from the weather.

What are the Benefits of Cool Roofs?

Cost-effectiveness, lower long-term maintenance costs, and lower life-cycle costs

The installation price of a cool roof—compared to a traditional black roof—varies, depending on the type. The material and installation prices among local roofers range from $3.90 to $5.00 per square foot for an acrylic elastomeric coating system to $5.70 to $9.50 per square foot for a membrane system, and are cost-competitive with an asphalt roof that can cost between $4.00 and $8.25 per square foot.[3]

Apart from the upfront installation costs of cool roofs, their long-term maintenance is cheaper, which can make them less expensive overall. While a building with a traditional roof suffers from heat expansion and contraction that can cause cracks and leaks, a roof that stays cool is also less vulnerable to deterioration, reducing the cost of repairs and extending the life of the roof.

Cool roofs with liquid acrylic coating systems last about 10 years and can then be re-coated every five years to extend the life of the roof to 25 or 30 years. The products are lighter in weight than traditional asphalt roofing systems, so they can often be installed over existing roofs.[4] This reduces the environmental mess of discarding refuse into the landfill and lowers the overall cost, as roof tear-offs are currently priced at 60 cents to $2.20 per square foot. Roofs with membrane sheets generally require a prior full tear-off, but will also last 25 to 30 years with minimal maintenance. Black asphalt roofs typically require a full tear-off sooner due to weight from the build-up of multiple re-applications of heavier asphalt products. Installing a cool roof is also much safer for workers who may suffer burns from touching hot asphalt on a conventional roof and face the threat of a fire breaking out from torches used in the process.

Brian Devlin, former director of rental services for Baltimore's St. Ambrose Housing Aid Center, offered a cost comparison for 92 rowhouses over a 10-year period that estimates a substantial savings with cool elastomeric roofs. Each average-sized traditional hot asphalt built-up roof would cost $1,025 with two coatings at $220 each during that decade, plus a replacement roof in the 10th year costing another $1,025. If that asphalt roof were seriously deteriorated, however, it would need to be torn off, dumped in a landfill for a fee and replaced with a costly new roof. A cool roof would be a little more expensive to install at $1,250, but would only need one $400 re-coating at 10 years. St. Ambrose estimates it would save $840 per cool roof, or $77,280 for 92 roofs.[5]

Lower air-conditioning costs, greater energy efficiency, and reduced peak demand

Cool roofs can reflect up to 80 percent of sunlight; black roofs, about 8 percent.[6] Because less sunlight is absorbed, on a 100°F day the temperature of a cool roof can be 60°F lower than that of a black roof.[7] Scientific studies have shown that a cool roof

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can cut air-conditioning costs by up to 20 percent and lower the indoor temperature in a non air-conditioned building by several degrees, increasing the energy-efficiency and comfort for occupants.[8]

The amount of heat reduction of a cool roof depends on the type of building and its location and orientation, as well as the amount of insulation. The U.S. Environmental Protection Agency (EPA) compiled more than 25 articles that studied heat reduction from cool roofs around the U.S. The agency compared air-conditioning energy savings for several types of roofs, from a 960-square-foot school trailer in Sacramento, California, which saved 34 percent in annual energy costs and 17 percent in peak demand savings, to a 100,000-square-foot retail convenience building in Austin, Texas, which saved 11 percent annually, with 14 percent peak demand savings.[9]

Reducing the energy used to cool buildings generates, in turn, a corresponding reduction in power plant emissions, including carbon dioxide, sulfur dioxide, nitrous oxides, and mercury. The reduction in peak electric power demand at the hottest times of day—a goal of the state's Empower Maryland initiative to decrease overall and peak electricity consumption—helps prevent power outages and reduces the need to expand costly transmission infrastructure, in addition to reducing greenhouse gas emissions that contribute to global warming.

Health effects of lower indoor temperatures

The EPA study also noted that buildings without air conditioning benefited from reduced temperature on the top floor directly under the cool roof. This reduction is significant in understanding the potential benefit of cool roofs in homes occupied by elderly and at-risk low-income residents who are vulnerable to heat, but cannot afford air conditioning. A 2004 report from the Energy Coordinating Agency of Philadelphia showed indoor temperatures in rowhomes occupied by low-income households were lowered by several degrees in the rooms just below the roof after cool roofs were installed.[10] The ceiling temperature under a black roof was 4°F to 9°F hotter than the rest of the room while the ceiling temperature under a cool roof was about the same as the rest of the room. The report states, "In homes without bedroom air conditioners, the peak indoor ceiling temperatures were reduced by about 4°F to 5°F on hot days while bedroom air temperatures declined by about half that amount."[11]

The study concluded that these temperature reductions could be crucial in saving lives during a heat wave. The lower room temperatures "can tip the balance from one side of the threshold temperature to the other—potentially making the difference between severe heat-related health problems such as heat stroke and even death and just very warm conditions."[12]

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"Baltimore stands to learn much from the experience of other cities and states in promoting widespread installation of cool roofs."

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Reducing the Urban Heat Island Effect

An "urban heat island" is created when city development replaces vegetation with asphalt, stone, brick and cement surfaces that absorb incoming sunlight. Heat-generating car motors, air-conditioning units, and smoke stacks compound heat absorption by leaving no room for trees or grass to cool the air through "evapotranspiration" (or cooling through evaporation). These conditions contribute to a city's high heat in summer, where it can be up to 10 degrees hotter than nearby rural or suburban areas.[13] Studies of heat islands in large cities note that the more thermal heat created by hot surfaces, such as black roofs, the higher the air temperature. That higher temperature is often accompanied by unwanted smog or generally poor air quality (and a greater need for air conditioning).

Cool roofs can go a long way to mitigate this particular thermal consequence; the waterproof and reflective materials used so effectively to reflect the sun's heat can, as mentioned above, lower the surface temperature of a roof by 50°F to 60°F compared to traditional black roofs, according to the U.S. Environmental Protection Agency.[14] Studies modeling widespread installation of cool roofs in Los Angeles predict the ambient temperature could be lowered by 1°F to 3.5°F at the hottest times of day. Lower temperatures citywide would result in less smog production and significant energy savings related to reduction in use of air conditioning.[15] A study simulating cool roof installations on 50 percent of New York City buildings predicted city temperature reductions ranging from 0.3°F to 1.4°F, depending upon time of day.[16]

To view evidence of the high temperatures in many Baltimore neighborhoods that create the so-called "urban heat island" effect, click onto the Baltimore Heat Island map on the Internet from the NASA earth observatory: http://earthobservatory.nasa.gov/IOTD/view.php?id=36227.[17] In East Baltimore, particularly the area surrounding Patterson Park, the temperatures are rated among the hottest in the city, with black-roofed rowhouses, most with no front yards and minimal back yards. In contrast, the map shows an adjacent rectangle rated only "warm" that represents 137-acre

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Patterson Park, with all its cooling trees and grass.

What Happens Under a Cool Roof in Winter?

Questions have been raised about the wisdom of installing cool roofs in a northern climate where buildings need to retain heat in winter. "Heating penalty" is the term used to refer to the loss of heat in winter under a cool roof. Studies have shown, however, that the heating penalty in winter in many parts of the country is so small that it has a negligible impact on the summertime benefits of a cool roof.

One roofing industry article offered this summary: "It might seem that a cool roof would have a negative impact in winter because a facility should absorb the sun's energy, thereby reducing the heating load. For several reasons—from lower sun angle, to fewer sunny days on average, to snow on a roof acting as a reflective roof anyway—the so-called heating penalty almost never overwhelms the energy benefits generated by cool roofs during the summer air conditioning months."[18]

The EPA confirmed this conclusion, after reviewing studies that showed cities with long heating seasons—such as Chicago, Philadelphia, and Washington D.C.—nevertheless reaped net energy savings with cool roofs.[19] (None of the studies of cool roofs reviewed by the EPA or other environmental organizations mentioned Baltimore, presumably because of the city's small number of cool roofs.)

Data also show that benefits are optimized when insulation and cool roofs are used together, especially for climates like Baltimore's, where there is hot and sunny weather for at least three months of the year as well as cold weather heating needs during the winter months.[20] Insulation serves as the barrier protecting the house from heat loss or gain through a roof system and should be installed with all roofing systems. In addition, proper sealing of the entire house to protect from air infiltration that results in unnecessary heating and cooling costs is also an important consideration—along with lighting and other improvements—to maximize conservation, comfort and cost savings.

As new products have become available, cool roof retrofits can now be installed in conjunction with rigid foam insulation as a way of simultaneously re-roofing and insulating rowhouses. The system minimizes heat gain and loss, avoids moisture condensation, and can be installed from the exterior, requiring no disruption in the interior space.[21]

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"Because less sunlight is absorbed, on a 100°F day the temperature of a cool roof can be 60°F lower than that of a black roof."

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Green Roofs and Solar Installation Options

Green roofs

Green, or vegetated roofs, have two main advantages over cool roofs: they are planted with material that absorbs rainwater that can otherwise contribute to stormwater runoff pollution, and they provide additional insulation. The plants also cool the atmosphere through "evapotranspiration" (or cooling through evaporation) but do not have the highly reflective quality of cool roofs that can better reduce global temperature.[22]

Vegetated roofs can be expensive to install; a local environmental nonprofit, Blue Water Baltimore, which installed a green roof on its existing headquarter building, estimates that a residential green roof with basic plants like sedum may cost a minimum of $15 per square foot, with cost reductions for larger roof areas. But as green roofs can last up to 50 years, in one life-cycle analysis of the costs of installation, maintenance and replacement weighed against the benefits of energy and stormwater-related cost savings, the annualized cost premium of a green roof over a white roof turns out to be only 30 cents per square foot.[23]

Given this relatively small annualized difference in cost, the authors of the study suggest that a building owner making a long-term investment choice between a white roof and a green roof could base the decision on a combination of environmental preference and comparative environmental impact. If the owner is primarily concerned about greenhouse gas emissions and climate change, a white roof might be chosen, whereas if the owner is more concerned about reducing stormwater runoff or increasing local biodiversity, the green roof might be preferred.[24]

The environmental benefits of white roofs lie in the phenomenon that the white color reflects the sun's heat rather than absorbs it, whereas black roofs and, to a lesser extent, green roofs, absorb the sun's heat. As stated earlier, buildings with white roofs require less energy to cool in the summertime, leading to a reduction in carbon dioxide, or CO2, emissions. White roofs offset approximately three times as many tons of CO2 as do green roofs (approximately 10 tons of CO2 for white roofs as opposed to 3 to 4 tons of CO2 for green roofs).[25]

Green roofs, on the other hand, absorb stormwater and thus minimize the amount of water pollution caused by stormwater runoff. Green roofs can absorb the first inch of water from storms, thereby slowing the rate of excess water—and associated pollution—that flows from the roof and ultimately into streams and bodies of water. Green roofs also enhance biodiversity by attracting birds, bees and

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other plants, and can contribute to the local food economy through the production of fruits and vegetables.[26]

In one unusual side-by-side comparison in Chicago, the Cook County government and Chicago City Hall share a building, but maintain separate rooftops. Chicago City Hall installed a green, or vegetated, roof in 2001 at the behest of Mayor Richard M. Daley. Nine years later the Cook County government installed a white roof, sparking a "Battle of the Bulbs" competition to gauge which building saved more electricity. The white roof won, as Cook County saved more than $65,000 a year, while City Hall only saved $22,000 with the green roof. The white roof was also 2 degrees cooler than the green roof.[27]

Solar photovoltaic

Solar photovoltaic (PV), or solar panels that convert sunlight to energy, can play a key, long-term role in using renewable energy, rather than straining a traditional electrical grid. Unlike cool roofs, solar panels do not reflect the sunlight, but they convert sunlight to electricity to power air conditioning, as well as lighting and appliances. Because solar panels do not often cover an entire roof, they can complement a cool roof by providing a building with some shading that keeps the roof cooler and by producing clean energy. Solar panels also work more efficiently in a cooler environment, so they will likely produce more energy on a cool roof.[28] And local roofing experts believe cool roofing systems are the ideal platform for solar mounting hardware. The cool elastomeric roof can even be applied after the mounts have been installed, addressing the challenge of roofing maintenance and repair during the lifetime of a solar installation.[29]

A 3 to 4 kilowatt (kW) system designed to serve one-half to three-quarters of the electricity needs of a typical single-family house will require approximately 12 to 16 solar panels at a materials and installation cost of $12,000 to $16,000. To reduce this cost, the federal Residential Renewable Energy Tax Credit will cover up to 30 percent of the cost of a system (the Business Energy Investment Tax Credit offers a comparable credit for commercial roofs). And various government programs around the country offer incentives and renewable energy credits that can reduce the eventual cost of solar panels, varying greatly depending on geography.[30] In Maryland, the state's Residential Clean Energy Grant of $1,000 and the sale of solar renewable energy credits (SRECs) can both offset residential installation costs. The environmental benefits of reducing power plant emissions and reductions in peak energy demand from the grid can be realized immediately upon installation. At current utility rates, annual savings of $700 to $800 might be expected from solar installations, requiring a long-term view of investment payback and overall cost savings.

Erin Reilly, a Baltimore homeowner in Reservoir Hill, installed a cool roof in 2006 and later added 14 solar panels and a solar hot water heater. In addition to finding the rooms in her top floor much cooler, her BGE bill was dramatically reduced. "In some months," she said, "my BGE bill was zero."[31]

Cool Roofs in Baltimore

Possibly the city's first cool reflective roof was installed in 1981 on a section of a Charles Village rowhouse by a homeowner who later founded his own conservation technology company.[32] Through the 1990s there is a lack of documented cool roof activity in Baltimore. In 2003, David Brosch was working for the Baltimore Department of Housing and Community Development's federally funded Weatherization Program when representatives from the Energy Coordinating Agency of Philadelphia told him about their cool roof program, which dated back to 1990.[33] With a $12,000 Maryland Energy Administration grant, the city created a pilot project to coat 14 cool roofs in houses occupied by low-income homeowners.[34]

More recently, officials at the city's Department of Housing and Community Development (HCD) have encouraged the installation of energy-efficient white roofs to address roof leaks through their housing rehabilitation financing programs. Homeowners, depending upon income, receive five-year or deferred loans and have the ability to select their contractor, as well as the type of roofing materials. From FY 2009 to FY 2011, HCD loans enabled replacement of 192 roofs, half of which are estimated to be cool roofs.[35]

Baltimore is a national leader in the field of weatherization, but faces a major roadblock at the U.S. Department of Energy when it comes to obtaining federal funds for roof replacements generally and cool roofs specifically. HCD has found that leaky roofs are the single biggest reason households are ineligible to receive federal weatherization funding, so as a result, the city has sought supplemental funding to correct deficiencies in homes prior to implementing weatherization improvements. That said, HCD has been able to finance 22 cool roofs in the last fiscal year, thanks to a $1 million Constellation Energy Fund grant for new furnaces and roofs.[36]

Other city agencies have pursued reflective roofing systems as well. The city Homeless Services Program installed a cool, white roof on a new homeless shelter building along the Fallsway downtown.[37] The city school system has installed about 20 new roofs with salt and pepper-colored particles of crushed granite and ceramic on traditional roof material (though the material is not as reflective as the official cool roof) as

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it renovates and weatherizes school buildings. In one school, Francis Scott Key Elementary-Middle School in South Baltimore, a 2008 weatherization with 100,000 square feet of new roofing resulted in an annual utility bill reduction from $169,000 in 2008 to $105,000 in 2012 after the new roof and other energy upgrades.[38]

Outside city government, nonprofit groups and private companies have looked to cool roofs for their environmental and cost benefits. Civic Works, a nonprofit organization affiliated with AmeriCorp and dedicated to both workforce skills training and green programs to save energy, has taken on the job of installing cool roofs in many Baltimore rowhomes.[39] Using funding through various federal and state programs, Civic Works has installed 126 cool roofs to date.[40] After working with the city and Civic Works to install cool roofs and weatherization improvements in 11 houses within its rental portfolio in the Barclay neighborhood, St. Ambrose Housing Aid Center was also sold on the roofing technique.[41]

The Southeast Community Development Corporation has renovated its new $1.5 million headquarters in a former public library in Highlandtown with three rooftop levels, each with a different energy-saving component, including a cool roof.[42] The top roof has a cool roof coating with solar panels that will be linked to a monitor in the lobby to show how much solar energy is being created for the building.[43] The second level has rain barrels and space for a rooftop garden; the organization hopes to rent space to a restaurant that will plant vegetables there. Finally, the first level has a deck made of sustainable hardwood with a planter box and a planted "green wall."

On the other side of town, the TerraLogos Energy Group, a private energy improvement company, installed a cool roof on its office in Bolton Hill (after removing and dumping 8 tons of material from the old roof).[44] The Roland Park Country School installed a 22,000-square-foot cool roof in 2008 on one of its new building additions.[45]

In 2013, the city's cool roof efforts will get a jump start from a recent $2.8 million award from the Maryland Public Service Commission's Customer Investment Fund for grants to low-income homeowners to install 500 cool roofs under its Weatherization Program. The funds will be granted to low-income residents who qualify for weatherization services and will fill the funding gap to allow the complete weatherization of a home. The city's application notes that the city would collect "energy usage information through utility consent forms" to show the "cost-effectiveness of reflective roofing on energy savings."[46] The city received another $300,000 from the same fund to support its Baltimore Energy Challenge program to promote energy-efficiency improvements, including cool roofs, in city neighborhoods.[47] In addition, the funding from the Customer Investment Fund includes $300,000 over three years for another program aimed at reducing the urban heat island effect. The program would be modeled after New York City's nonprofit White Roof Project, which raises private funds and uses volunteers to coat the roofs.[48] The new funding is projected to cover 22 to 50 roofs a year for three years.

In addition to these recent awards, the Baltimore Planning Commission approved the city's Climate Action Plan in November 2012 to reduce the city's greenhouse gas emissions by using several strategies, including cool roofs. The plan recommends an ambitious voluntary effort to cool 30 percent of the city's commercial buildings and 10 percent of homes with reflective roofs by 2020.[49]

Efforts to Accelerate Cool Roof Installation in Other Cities and States

In other cities and states, elected officials, government agencies, scientists, utilities and nonprofit groups have encouraged the installation of thousands of cool roofs by adding requirements in building codes, creating public-private partnership programs, and offering incentives through rebates and loan programs, and through initiatives by nonprofit organizations.

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"Lower temperatures citywide would result in less smog production and significant energy savings related to reduction in use of air conditioning."

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Cool roof building code requirements

Perhaps the most influential scientific crusader promoting the benefits of cool roofs is Arthur H. Rosenfeld, Ph.D., a physicist from the U.S. Department of Energy's Lawrence Berkeley National Laboratory in California and a former energy-efficiency advisor to the U.S. Department of Energy. Dr. Rosenfeld's research has demonstrated the benefits of cool roofs to cut searing indoor temperatures in California and India, and has shown how the roofs reduce greenhouse gases that can potentially cool an entire city.[50]

Dr. Rosenfeld began thinking of how to cool a city back in 1975 when Los Angeles was engulfed in smog. He figured if LA could cool down its "cooking rate," the smog would disperse. After some scientific study, Rosenfeld and other scientists calculated that if the city could coat flat buildings or pavements with a

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reflective white or light-colored coating, it could reduce its smog by 12 percent. Cooling roofs seemed like an easier sell to the public than cooling pavements. After all, people would be likely to buy a new roof coating if it could lower their air-conditioning costs. But the public had no similar incentive to cool the roads or sidewalks.[51]

In 2001, rolling blackouts in California provided added incentives as public utilities determined that cool roofs reduced peak demand for electricity, lowering the risk of outages and cutting down electricity costs.[52] More urgent incentives to promote cool roofs came years later in a deadly form: in 2003, more than 50,000 people died in a heat wave across Europe.[53] Rosenfeld figured that many of them who lived in buildings with flat roofs could have survived if their roofs were coated with a reflective white or light-colored substance. He said, "That's when I thought, 'this is silly.' There is no reason in having 50,000 people die when you can save a quarter of them if their roof is flat."

As a gubernatorial appointee to the California Energy Commission, Dr. Rosenfeld led California's enactment of a statewide cool roof requirement in 2005 for new and renovated nonresidential buildings.[54] Because cool roofs save both money and energy, in October 2005, they became part of the prescriptive requirements of California's energy code, the Title 24 Building Energy Efficiency Standards.

Other cities and states have modeled their building code requirements after California's code (though Georgia's 1995 code, which questionably reduces insulation requirements in exchange for cool roofs, actually predates California's).[55] Florida required cool roofs in 2007; Chicago and Houston in 2008; New York City and Washington D.C. in 2009; and Philadelphia in 2010.[56] New York City expanded its building code in 2012 to require cool roofs on buildings that are substantially renovated, in addition to new construction.[57]

Cool roof rebates and incentives

Many utilities across the country offer incentives such as rebates and low-interest loans to homeowners and businesses for installation of cool roofs.[58] Several California utilities offer rebates, ranging from 10 cents to 30 cents per square foot, for both low-sloped and steep-sloped reflective roofs. Southern California Edison offers homeowners up to $4,000 incentive payments to make energy-efficient improvements, including cool roofs. The Los Angeles Department of Water and Power, a municipally owned company, offers rebates for cool roofs along with one-time payments and fixed-rate purchase of net energy to incentivize the purchase or lease of solar photovoltaic installations on houses, commercial buildings and nonprofit facilities.

Tallahassee, Florida, offers loans (at 5 percent interest) ranging from $500 to $20,000 for owners of homes and commercial buildings who install energy-efficient upgrades, including reflective roofs. There is no income requirement to obtain the loans.[59] Set to expire at the end of 2013, federal income tax credits can be used to cover 10 percent of the costs of energy-efficiency improvements (up to a lifetime maximum of $500), including the installation of reflective roofs that meet U.S. Environmental Protection Agency's voluntary ENERGY STAR standards.

Philadelphia

In 1984, the nonprofit Energy Coordinating Agency of Philadelphia (ECA) was founded to address the energy needs of poor Philadelphians after 30,000 low-income homes had natural gas turnoffs due to utility nonpayments.[60] Six years later 164 people died in a heat wave; most were elderly and poor, living in traditional flat-roofed rowhouses with no air conditioning.[61]

ECA staff looked at a passive cooling solution that did not involve air conditioners, which many low-income people could not afford, but instead emitted heat outside a building. With some knowledge of cool roof installations in the country's southwest, they obtained a small grant from a private foundation and approached Rohm and Haas, a company—now owned by the Dow Chemical Company—that manufactures the polymer they could use on a cool roof.

The company provided the coating material, technical assistance, and equipment. It also trained workers on how to install the roof coating. In the last 20 years, the ECA has installed more than 1,000 roofs, logged data showing how the homes were cooled and administered a "coolest block contest." The contest encourages residents from Philadelphia's many rowhouse neighborhoods to submit applications to win energy-efficiency upgrades for their entire block, including energy-saving cool roofs, air sealing and insulation. The Dow Chemical Company has contributed products and technologies, and the Dow Chemical Company Foundation provided financial support for the contest.

New York City

Under the administration of Mayor Michael Bloomberg, New York City has an aggressive program called NYC °CoolRoofs, an effort launched with the help of corporate sponsors, including Con Edison and Goldman Sachs, to coat government buildings with cool roofs and require new and renovated private buildings to install them. The city worked with manufacturers to arrange discounts on materials and products. The effort is intended to coat enough roofs to reduce greenhouse gas emissions in the city by 30 percent by 2030.

Since 2009, the New York City

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Construction Code has required owners of new buildings with flat roofs to install reflective roofs. The code was expanded in January 2012 to require existing buildings to add reflective rooftops if a roof is being replaced or if 50 percent or more of a building is being renovated (or more than 500 square feet of a roof area is being repaired).[62] In the last three years, more than 3.7 million square feet[63] of New York rooftops were covered with reflective white roof coatings.[64]

New York City's cool roof program is linked with Columbia University's Center for Climate Systems, which has instruments on the roof of the Museum of Modern Art's storage and research facility in Long Island City, an area which logs some of the city's highest temperatures. From there, scientists are monitoring the changes in the urban heat island effect as thousands of square feet of cool roofs are installed each year.[65]

At the same time, a nonprofit group has emerged to expand New York City's cool roofs. Nearly three years ago, a group of community leaders in New York City was considering volunteer projects to launch, when a member of the Sierra Club suggested cool roofs. The group contacted the Bowery Mission in Manhattan and asked if volunteers could install a cool roof on its building where the homeless and hungry have been served for more than a century.[66] "We were going to do one building and had no intention of going further," said Heather James, executive director of the White Roof Project. Two years later, the White Roof Project has coated 400[67] rooftops with the help of 1,000 volunteers.

About that first roof at the Bowery Mission, James said, "We thought we wouldn't have enough volunteers, but we had so many interested people. We think it's because it's a very simple concept and people can actually see it being done. Normally when you volunteer you don't see the final results."

The White Roof Project combines volunteers with a sponsor, such as a business or labor union, which pays for materials when a building owner can't afford the cost. Cool roof experts, however, have noted some drawbacks of such a program: it reduces the potential for training and employment of professional roofers, and its roof projects could result in uneven workmanship by inadequately trained volunteers.

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"Many utilities across the country offer incentives such as rebates and low-interest loans to homeowners and businesses for installation of cool roofs."

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Chicago

While perhaps better known for green roofs through the prominent installation of a green roof on City Hall, the city of Chicago requires that all new, near-flat roofs meet cool roof standards as part of the Chicago Energy Conservation Code. The city's Cool Roofs Grant Program, developed under former Mayor Daley's administration, provided a tax credit of up to 80 cents per square foot, or a maximum of $6,000, to help residents and small business owners install roofs that meet or exceed the cool roof requirements. Chicago's Small Business Improvement Fund pays up to 75 percent of cost, or $250,000 for energy-efficiency improvements, including cool roofs, implemented in commercial and industrial buildings.

Houston

In 1999, a Houston nonprofit organization of scientists called the Houston Advanced Research Center, a nonpartisan promoter of sustainable development, held year-long workshops on climate change and began looking at the urban heat island effect in the city.[68]

The result was "Cool Houston! A Plan for Cooling the Region, for Clean Air & Quality of Life Benefits," published five years later. The plan, an ambitious roadmap for reducing the city's heat island effect, calls for cooling down the city with cool paving plans, tree plantings and cool roofs.

Since then, under the leadership and direction of former mayor Bill White, the city of Houston enacted a building code requiring cool roofs on new commercial buildings with flat or low-sloped roofs. In an effort to encourage other environmentally beneficial roofing types and uses, green roofs and rooftop solar equipment are exempt from mandatory requirements; rooftop decks are also exempt.

Recommendations for Baltimore

Cool roofs provide a practical roofing alternative: their energy-reducing, heat island-cooling benefits are immediate; they require less-expensive maintenance and are long lasting; and they can be installed easily and quickly on a range of building types at competitive cost. Baltimore has a unique opportunity to build on the successful award of funds from the Customer Investment Fund, the recent approval of the city's draft Climate Action Plan, the city's extensive plans to renovate city schools, the ambitious city and state goals to reduce energy consumption and a review of the city's green building code to encourage and accelerate the pace of cool roof installations.

It is clear from the examples of other cities and states with accomplished cool roof programs that a successful Baltimore plan would benefit from the commitment and involvement of political leaders in city hall and community involvement through grassroots organizing and nonprofit efforts. A cool roof program would

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also ideally include the Maryland Energy Administration; the state's utility companies, which could offer rebates to owners of reflective roofs; as well as the Maryland Public Service Commission, to encourage energy conservation and to "explore innovation that will encourage the efficient delivery of public utility services."[69] Because many other cities and states have already created cool roof roadmaps for Baltimore to follow, it would not require reinventing the wheel when it comes to addressing city-owned buildings and leading by example, including requiring cool roofs in the building code, offering incentives and loans for cool roof installation, and raising funds from both government and the private sector.

1. Baltimore's Commission on Sustainability has set ambitious goals for a voluntary effort to promote cool roofs. The Commission could turn to a more aggressive effort, however, to promote cool roofs by educating representatives in the Mayor's office, the health and housing departments, and especially the City Council to integrate cool roofs into the building code's Green Building Standards. The standards could require cool roofs on new commercial buildings and on commercial and residential buildings being substantially rehabilitated. As the city readies a review of its Green Building Standards, now is the opportune time to follow the lead of New York and Chicago, and consider amending the code to include threshold requirements for cool roofs, with allowances to exceed standards with green roofs and solar installations.
2. The Maryland Energy Administration, the Public Service Commission and BGE should consider making cool roofs part of their energy-efficiency rebate and financing programs to meet Empower Maryland goals to reduce electricity usage and peak demand.
3. The Baltimore City Public Schools, having just won state support for a $1.1 billion plan to upgrade 40 schools, face an opportunity to incorporate cool roofs and insulation as a minimum standard into each school's construction and renovation plans, possibly recruiting corporate sponsors to finance the cool roofs thereby reducing the public costs.[70] The Baltimore City Public Schools could look at the Southeast Community Development Corporation's model of coupling a cool roof with solar panels; schools being renovated, most of which have flat roofs, could include solar panels on reflective roofs as a teaching tool for students to study the cooling effects of the white roofs and the electricity generated by solar panels.
4. City leaders could begin a cool roof program to coat government buildings by beginning with one high-profile building, as a symbol of its commitment to energy savings and to reducing Baltimore's heat island effect. The city could also make one city block of low-income homeowners a model block of reflective roofs, with follow-up analysis of reductions in both indoor and outdoor temperatures.
5. While several other cities and states are far ahead of Baltimore, many have had difficulty keeping count of the cool roofs installed. Baltimore could be a national leader by beginning with a program that includes a method of keeping track of the number of cool roofs and the square footage covered, modeled after the ticker counter on New York City's website.[71]
6. The Office of Sustainability's Baltimore Energy Challenge (BEC) is already planning to educate residents in neighborhoods about the benefits of cool roofs. BEC could begin the process of developing a database for public use of roofing companies with experience installing cool roofs and businesses that sell cool roofing materials.
7. The involvement of numerous community groups would be beneficial in launching an accelerated cool roof program. There are a number of organizations that offer housing financing and improvements, and that connect residents to energy resources that could potentially be involved, such as Neighborhood Housing Services, Citizens Planning and Housing Association, and Healthy Neighborhoods with its network of neighborhood-based nonprofit organizations across the city. Baltimore Civic Works, already the cool roof leader in Baltimore, would be instrumental in this education process.

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University of Maryland Pediatrics; the Mayor's Office on Criminal Justice; TurnAround, Inc.; the State's Attorney Office; Maryland Coalition Against Sexual Assault; Sexual Assault Legal Institute; and Baltimore Child Abuse Center.

Brantner sizes up the dramatic change in the data: "Baltimore City got to its earlier record of high-unfounding of rape complaints through a culture of victim blaming, understaffing, a system that allowed for officers to investigate and 'unfound' at the scene, the mistakes made as a consequence of working under pressure to clear cases, and lazy police work, such as failure to interview witnesses or suspects, to use technology, and to maintain a relationship with the victim. The turnaround," she says, "came about as a result of our introducing 'disciplined programming.'

"Disciplined programming means, first of all, establishing closer relationships with our partners. Meaningful collaboration among them in the interest of the victim is critical to the process. The programming recognizes the need for better training of police officers and in particular, establishing a protocol for them—that a detective must go out, personally, to the scene and investigate the victim's complaint, contact the detectives, and write a report detailing his or her findings.

"Since we started this initiative, we have made many changes in personnel. We realized that we needed people on board who could work well in the collaborative process. For too long the individual partners worked pretty much alone, in silos. But we know that all of the research shows that when you work in the collaborative process, when you have people sitting around the table together, talking through issues together, sensitive issues like distrust of one another and conflicts of interest, when people talk

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about these issues openly, exchanging points of view, outcomes are better. In the best interest of the victims, we made this collaborative process a part of the overall process."

According to Brantner, the reorganized SART program includes "huge" policy changes. "For example, as we are now structured, a patrol officer can't walk up and unfound at the scene. Detectives must follow national best practices, and under those same best practices, an 'unfounding' cannot be based on a victim's recant alone, saying that the assault 'didn't happen.'"

SART now also offers support for victims whereby TurnAround, Inc. provides access to advocacy throughout the criminal justice process. Further, the program calls for a daily review of patrol officers' reports, follow-ups of all cases, and intensified training.

It was in March 2011 when Mayor Stephanie-Rawlings Blake called for immediate reorganizing of Baltimore's SART program. She says: "The number of unfounded rape and sex offense cases has since declined by 93 percent, ensuring that future victims of sexual assault will have their complaints investigated thoroughly and fully, and are treated with dignity and respect. Another positive development: We are seeing a 68 percent increase in the number of rape cases—a positive, as more of the city's victims feel comfortable reporting their assaults."

The Abell Foundation salutes Mayor Stephanie Rawlings-Blake for her prompt and robust response to the findings made public about the city's much-too-high number of unfounded rape cases, and Heather Brantner, program coordinator of SART, who successfully brought down those figures.

Ann's Story...

Ann arrived at the emergency room of Mercy Hospital for treatment of physical injuries, having been directed there by 911 as a victim of domestic violence, including rape, by her husband. Ann was now in the SART system.

A nurse immediately examined and documented Ann's wounds. At the same time, an advocate from TurnAround, Inc.—a center that provides refuge and services for victims of sexual assault—was called in to offer emotional support and resources. The advocate assisted Ann in moving forward with a report to the Baltimore Police Department's Sex Offense Unit.

In Ann's case, there was also a parallel investigation of child abuse charges against her assailant. The Baltimore Child Abuse Center conducted a forensic interview with Ann's oldest daughter, who also suffered sexual abuse. However, Ann found herself under pressure from her spouse and other family members to withdraw both her and her daughter's accusations.

One of the sex offense detectives requested that an advocate talk with Ann in her home, giving her—as a victim—an opportunity to speak privately with the advocate. After the conversation and comforting engagement with supportive services, she decided to move forward with the complaints. The assigned detective then met with Ann, allowing her to tell her story in a safe environment with the support of the advocate. Because Ann had been assaulted in her home, the detective dispatched a mobile crime unit to the venue; the unit took photographs of the scene and collected bedding and clothing for forensic testing. This evidence was turned over to the Baltimore State's Attorney's Office, which would be prosecuting her case.

With assistance from her detective and advocate, Ann obtained a protective order and legal assistance in pursuing emergency family maintenance from her husband, and filed for divorce. Advocates assisted Ann in locating safe housing for her and her children, and worked with the landlord regarding her lease. They also accompanied her to interviews with the prosecutor and court appearances.

The perpetrator violated the protective order on several occasions and Ann contacted the police as well as an advocate, who facilitated contact with the prosecutor's office. With SART managing the complex case, there are currently charges of both physical and sexual assault against the assailant, all of which are moving forward. At the same time, Ann and her children are likewise moving toward recovery, and receiving support and services as the trial date approaches.