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UHIMI NEWS

ENERGY STAR Roof Products Program questions answered; Data inputs for the "Urban Fabric Analysis" and air quality model discussed

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ENERGY STAR Roof Products Program questions and answers

Rachel Schmeltz (EPA) provided a brief introduction and description of the ENERGY STAR Roof Products Program.

What are the specifications?

The ENERGY STAR Roof Products Program specifications only consider the reflectivity of the roof surface. The threshold levels include both the initial reflectivity of the roof product and how that reflectivity is maintained over time. There are also some provisions for minimum warranty requirements. Because these alternative roof products are relatively new to the marketplace, consumers need the assurance that the products will last. Therefore, manufacturers are required to offer warranties comparable to those offered for traditional non-reflective products.

Wooden shakes and slates cannot meet the specifications because of their general nature. Most other roof products have reflective alternatives.

The roof product manufacturers interested in obtaining a label for their product sign a MOU with EPA. The MOU includes the specifications and the test methods the manufacturers use to ensure that their product meets the specifications.

What are the test method requirements?

The ENERGY STAR Roof Products Program is voluntary; manufacturers are not required to participate, and there are no fees or fines. The manufacturer tests its own products. EPA does not necessarily require manufacturers to send test data to EPA; ENERGY STAR Programs are self-policing. However, if EPA discovers that the product does not meet the specifications, EPA has the right to spot-check the test results.

What is the status of the ENERGY STAR Roof Products Program?

Rachel is working on finalizing the specifications. The specifications, including the test methods and some of the definitions in the MOU, have been reviewed by manufacturers, and Rachel is incorporating the comments received. She will be submitting a revised version with a draft MOU in the next two weeks to industry representatives to review. She noted that the roof products industry, including manufacturers and trade associations, has submitted most of the comments. Eventually, the ENERGY STAR Roof Products Program will have its own Website which will list the manufacturers in the program and their products.

The ENERGY STAR Roof Products Program will be officially launched at the Earth Technologies Forum to be held in Washington, DC at the end of October. Manufacturers who have signed the MOU will be in attendance; some of them may have already started to test their products. After their products are tested and they have determined that they meet the specifications, the products will be labeled.

Are these roof products already available or do the manufacturers have to create the products according to the specifications?

There are many commercial products available for flat and low-sloped roofs. However, the residential sector is dominated by asphalt shingles. The most reflective asphalt shingle available only has a reflectivity maximum of 35 percent and most are much lower. For example, a dark asphalt roof has a reflectivity of 10 percent or less. The ENERGY STAR Roof Products Program specification is designed so that at least one existing product within each category of roof material (e.g., shingles, membranes) can meet it. For example, the specification is set lower for steep-sloped roofs (35 percent). However, the energy savings in the residential sector will be less than that in the commercial sector, where often there is a drastic change before and after the reflective roofing material is installed. For example, there are roof products available for the commercial sector that have a reflectivity of 80 percent.

Are there any legal issues for EPA in terms of being perceived as recommending one product over another?

The ENERGY STAR Roof Products Program is completely voluntary; EPA is not labeling the product, the manufacturer is. EPA is giving recognition to the products and manufacturers, but does not endorse the products that are in the ENERGY STAR Program.

What are the specifications for the reflectivity that should be achieved for the various roof products?

The draft ENERGY STAR Program specifications require a minimum of 65 percent initial reflectivity on commercial or low-sloped buildings. After three years, the threshold value required will decrease to 50 percent. (It is important to mention that these are draft numbers that are subject to change.)

In order to maintain the reflectivity of the roof, the ENERGY STAR Program recommends that the building owner follow the maintenance procedures. The maintenance required per roof depends on the product and the conditions. For example, a high-slope roof in an area with a lot of rainfall will not require as much maintenance as a flat roof. Routine maintenance also helps to retain the water-tight integrity of the roof and, therefore, extend the life of the roof.

Is it really cost effective to clean and maintain roofs?

The cost effectiveness of routine maintenance depends on the roof product, the situation, and the slope of the roof. Studies have shown that following maintenance procedures will enhance the lifetime of the roof.

Do the specifications address dust-resistance?

The ENERGY STAR Roof Products Program does not address dust-resistance in the specifications because there is not a lot of information available on that issue, and there are no standard test procedures for it. There are some current studies that address dust resistance; the program could potentially be modified to reflect further developments in this area.

What are the draft specifications for residential roof products?

The specifications are separated into two categories: low- and steep-sloped roofs; there is not much of a distinction made between residential and commercial roofs in this industry. The specification for residential

roofs is a minimum of 35 percent initially, and 20 percent after three years. There is not as much of an energy savings achieved as in the commercial sector, and the specifications are based on product availability. A residential building could achieve higher reflectivity if more reflective roof products are used, but this would involve choosing non-traditional materials. Shingles are the most widely used residential roofing material, and are the least expensive.

Where should the ENERGY STAR Roof Products Program focus its efforts to implement the specifications?

The roofing products industry involves a complex distribution chain. The industry primarily obtains its information from the contractors; they know the most about the products and have a large influence on purchasing decisions, particularly in the residential sector. The ENERGY STAR Program will be educating contractors with a software training program that EPA has just begun developing.

Architects can also influence the type of roof materials, but they often work with the contractors to determine the best material to install.

Most roofing product professionals also rely on trade associations to obtain information, and EPA is working with them to communicate project results to coordinate between those involved.

What about providing ENERGY STAR Roof Products Program software training at the academic level?

Meryl Redisch (Salt Lake City) suggested that this software be made available to landscape architects and planners to supplement their coursework. Maury Estes (NASA) said that colleges have building construction departments, and this type of information tool would fit within the curriculum.

What does the market look like for the roofing product industry?

There are over 200 roof product manufacturers in the U.S. There are eight large firms that comprise 40 percent of the market share. However, the number of manufacturers estimated does not include the small companies that produce roof coatings. It is therefore difficult to reach the manufacturers. Many of the firms are consolidating; the big firms are buying up the small- to mid-size firms to broaden product scope and distribution.

Is there an effort underway to relate albedo to potential energy savings?

Studies show that increased albedo can result in anywhere from 10 to 50 percent in energy savings, but this depends on the climate, the amount of insulation in the building, the initial reflectivity starting point, routine maintenance procedures, etc. The energy savings achieved can only be determined on a situation-by- situation basis. This is why the contractor training software is important.

Haider Taha (LBNL) noted that several LBNL staff are conducting extensive modeling using albedo to build an energy simulation program. They have also conducted field demonstrations to show the correlation between albedo change and air quality. However, the more inputs used to run the model, the more limited the output is in terms of its application to other situations. Much work is being done at LBNL to examine the tradeoff between the level of insulation needed (among other parameters) and the albedo change to achieve a given performance level.

Maury noted that it is worth trying to refine the estimates to a narrower range (than 10 to 50 percent), especially for use in future discussions with policy-makers, developers, and the public, in trying to convince them to implement these recommendations on a large scale.

Why does the [*DOE2?*] program seem to underestimate the benefits of using reflective roofs?

Haider explained that when LBNL was comparing the observational data and the DOE2 data to develop “if...then” questions, they detected a two-fold discrepancy. One possible reason for the discrepancy is that the building cannot be described accurately due to cost constraints and the vast number of inputs. Another possible reason for the discrepancy is that the model may not be responsive to particular conditions. However, there is a new version of DOE2 available that corrects for this discrepancy.

Regional-specific model inputs

Virginia Gorsevski (EPA) previously e-mailed pilot project coordinators asking them to identify proto-typical buildings in their region (i.e., two residential and two commercial buildings specific to the region). LBNL will use those inputs to achieve results specific to each area. Utilities are one of the best sources of information on regional energy use and insulation.

"Urban Fabric Analysis" and air quality model update and discussion

What are the objectives for conducting the modeling?

Haider reported that the end result of the modeling is to identify the impact of cool community strategies on the regional meteorology and air quality (e.g., smog production and ozone levels). The purpose of the model is to try to understand where heat islands form, where they do not form, and the impact of these surfaces on regional meteorology and therefore, on air quality. It is important to note that cool community strategies are effective regardless of whether there is a heat island; the strategies can lower air temperature even if there is no heat island present.

LBNL is using the model to understand where to implement these strategies. There are combinations of albedo and forestry that will work in one region, but not in another, and the model will help to identify which combination is the most effective in a particular region. In addition, the model will help identify the best combination of cool community strategies and emission control strategies, which will vary among regions depending on the local emissions and meteorology, etc.

Reducing air temperature is not always beneficial in terms of improving air quality; reduced air temperatures in some areas can result in reduced air quality. The models are also being used to determine the best strategy combination that will not cause negative effects.

What are the inputs for the models?

LBNL uses two models: (1) a meteorological model; and (2) an air quality model. The models include a description of the regional meteorological and air quality conditions, pollution emissions, surface topography, distribution of land and water bodies, etc. Haider noted that it is also useful to acquire information on the amount of transboundary pollution to which the region is susceptible.

Are more data inputs needed from the pilot cities?

Haider does have the information needed to run the models, but could benefit from more specific or improved data that the pilot cities can provide.

What is the status of the modeling?

Haider has completed running all of the base case simulations for the pilot cities using the data gathered over the past six months. (There are six base case scenarios in all, three for the meteorological model, and three for the air quality model.)

He will be developing cool community scenarios to test the impacts on all of the parameters. He is going to develop these scenarios with information on regional land use and land cover classifications. The pilot cities could improve the models by providing estimates (or the actual numbers) of the distribution of vegetation, roofs, and roads in a particular area.

Haider will provide the pilot cities with information about the variables needed for the model to in turn inform the cities of the type of data that might improve and refine the information already in the model.

The model's spatial parameters typically cover approximately 400 kilometers by 400 kilometers. The model is set up like a checkerboard, with 2,000 squares in total. Haider inputs into the model the information to cover each of these 2,000 squares. For example, one square might appear to include approximately 50 percent tree cover, 30 percent roof cover, 20 percent roads, and 10 percent water confined within the area. The data from the flyovers will provide some of the information needed for the modeling through the detailed photographs taken. The Atlas and USGS data will be used to help extrapolate the flyover data to a broader area.

Estimates of the percentage of residential, commercial, industrial, high-rise buildings, etc. are useful because, for example, residential buildings have different albedo levels and are treated differently in the model. Atlas data and flyover photographs will hopefully improve the amount of information available on building types.

Haider confirmed that it would also be useful to do a [*NDVI?*] classification on the Atlas data like NASA did with the satellite data.

Mark Guillory (Baton Rouge, LA) just completed working with the Army Corps of Engineers to develop a digital photo of the Parish (222 square miles) down to one meter of resolution and asked whether this would be useful. Haider responded in the affirmative.

Do the models include expected development?

The base case scenarios assume no growth, but in some of the scenario simulations, Haider will choose varying levels of expected development. However, if cities have information on expected development for their areas, they should provide it to Haider because it will help to generate better results.

Haider also noted that LBNL is conducting studies on how the urban area has evolved over time. LBNL would like to determine how urbanization plans have affected meteorology and air quality since 1970.

What information do the base case simulations provide?

The base case simulations establish what the current situation is. They are also useful in determining whether the model is working properly by comparing the simulations with observation data. Haider used the emission inventory input received from each of the cities as the input for the air quality model because it is probably more reliable than using the outputs from the meteorological model. The only link between the meteorological and the air quality model will be when LBNL runs cool communities simulations and compares the meteorology map with the air quality map.

What type of data are generated from the flyovers?

The photographs taken during the flyover in Sacramento will have a resolution of one foot. LBNL will use the photographs to characterize the makeup of 14 different neighborhoods by identifying the percentages of sidewalks, trees, grass, water, etc. These estimates will be extrapolated to the entire region. LBNL will also try to obtain the actual albedo from the photographs.

How do you establish the albedo using digitized color photographs?

The main purpose of the flyover is to conduct the urban fabric analysis; another purpose is to try to characterize the albedo. The cameras provide digital data in the red, green, and blue bands. LBNL will try to extrapolate from this narrow band of reflectivity to the broader range. The definition of albedo is about 1.28 to 3.0 micrometers and the camera on the plane is sensitive to a range of 0.4 to 1.0. Color panels will be placed on the ground so that when the aircraft flies over them, the red, green, and blue bands in the data results can be calibrated. A number of combinations of different levels of black and white will be placed on the ground to characterize the albedo. LBNL will also try to select different surfaces and compare the red, green, and blue data to the signature calibrated from the panels. This information will be used to extrapolate and find the reflectivity for each type of surface. The results can be verified by taking the panels to a laboratory to measure the actual albedo, then deriving the albedo from the aerial photographs using statistical methods to find out how the two sets of results compare.

If the flyover in Sacramento is successful and the results are useful, flyovers will be scheduled for SLC and Baton Rouge.

Follow-up

Virginia asked pilot cities to provide Haider with rough estimates of the types of data discussed during the conference call. This will make the data more defensible when the cities use it to persuade policy-makers to implement new ordinances. It will be useful for the cities to be able to state that they already figured out how much of the area can be modified using UHIMI strategies.

Pilot city updates

Salt Lake City

- Camille Russell (Salt Lake City, UT) reported that Maury and Jeff Luvall (NASA) are in SLC again because during the past flyover, there was a loss of the power supply that made efforts to calibrate data difficult. The flyover has been rescheduled for August 20.
- Camille, Meryl, Renee Gluch (SLC), Jeff, and Maury met with city planners yesterday to demonstrate the [*MAPIX?*] program, which provides land cover classification information. Building permitters and a representative from Envision Utah also attended. (Envision Utah is a non-profit organization in the

process of identifying four growth scenarios for SLC and the corresponding ramifications for air quality, projected to 2050. The scenarios will be submitted to [*QGET?*] for analysis.

- SLC is continuing its work with schools and may be initiating another educational program using temperature devices.
- Camille, Jeff, and Maury are meeting with Kevin Foley [*spelling?*], a roofing contractor, on August 20, to collect information on the roofing materials of some roofs in the area. On August 19, they went on the roof of the courthouse building, which was identified as a hotspot. While they were there, they spoke with a roofing consultant who had information about the products that different roof manufacturers provide in SLC and what the trends are.
- On August 18, they met with the Director of Environmental Affairs for the Olympic Committee. She was very excited about the project. Maury offered to do mapping for her on the venue sites in the study area.
- SLC is also beginning to have repeat meetings with stakeholders. Camille reported that having the data results available has been valuable.
- Yesterday, SLC received a commitment from city planners to provide input into the action plan regarding their role.

Sacramento

Tom reported that the Cool Pavements Committee met and is aiming to accomplish four activities:

- Evaluate existing parking lot shading ordinances and consider the implementation process of the ordinances.
- Develop a taxonomy of parking lots in Sacramento County. Tom also noted that Greg McPherson (UCLA at Davis, CA) suggested holding a national workshop or conference on parking lots related to cool communities strategies next fall. Camille noted that the SLC Air Quality Division is doing a study on parking lots and strategies to reduce emissions.
- Identify local developers to involve them in strategic tree planting efforts. Sacramento has a great relationship with the local utility and has a well-funded strategic tree planting program. Sacramento would like to work with developers while they are developing landscape plans to assist them in strategically planting trees.
- Identifying a new library under development as a cool communities project.

Another area Sacramento is looking into is cool pavements.

Ray Tretheway (Sacramento) reported that the SMUD Board of Directors approved funding for an additional 5,000 trees for the cool communities shading portion of the project.

Baton Rouge

- Mark met with city planners this week and identified members for the steering committee, including city planners, school representatives, representatives from Louisiana State University, and others. The Director of Maintenance in Baton Rouge is interested, and has already identified several schools that need replacement roofs and has requested information on materials available to increase the reflectivity.
- Baton Rouge has a meeting next week with an architect who is redeveloping the inner city. The project has received a lot of media attention, and Mark would like to link the cool communities program with this development initiative. SLC is involved in a similar effort that developed a master plan including cool community strategies.
- Baton Rouge is also interested in parking lots, and has drafted a letter to the mayor requesting a change in the ordinances.

Maps

Maury will try to develop a map from the Atlas data by printing color copies of various sections and pasting them together. This map could be placed on a wall, and might help coordinators to start looking at various areas. He will be developing a map for Mark, and can develop one for the other cities if they are interested.

Relevant conferences

- Mark mentioned that he will be proposing sessions for the American Association of Geographers Conference next March and the American Planning Association National Meeting in Seattle next April.
- Representative Cooke from SLC will be sponsoring a Clean Air Conference, on September 2, regarding air quality problems and solutions. Jeff is probably going to be speaking on that panel, so the project will get exposure statewide. There will be two panels with high profile air quality

representatives in the state, and there will be several programs discussed to help mitigate poor air quality, including UHIMI and the Clean Cities initiative, which focuses on alternative fuels.

Earth Technologies Forum

Virginia noted that she has drafted the agenda for the Earth Technologies Forum side meeting and a letter of invitation. The side meeting discussion will occur during the afternoon of October 28, and will probably last two to three hours. Nancy Skinner (ICLEI) will be facilitating the roundtable discussion with Virginia. There will also be a UHIMI panel at the forum itself on the morning of October 28.

If anyone has any suggestions for potential discussion items or attendees, they should let Virginia know. She will be sending out invitations in about two weeks.

The next EPA/Pilot City biweekly conference call has been scheduled for _____.