The U.S. EPA Heat Island Reduction Program webcast titled **“Cool Pavements and Sustainable Pavement Technology”** will start in a few minutes.

Thank you for joining us.

Cool Pavements and Sustainable Pavement Technology

U.S. EPA Heat Island Reduction Webcast
January 28, 2010

EPA

Webcast Agenda

- U.S. EPA Heat Island Reduction Program and Webcast Logistics
  - Neelam R. Patel, U.S. EPA
- Scientific Overview of Pavements and Heat Islands
  - Kamil Kaloush, Arizona State University
- Brief Introduction of U.S. DOT, Federal Highway Administration (FHWA) Sustainability Initiatives
  - David Carlson, U.S. FHWA
- Long-Life Asphalt Pavements for the 21st Century - Warm Mix Asphalt Technologies
  - Matthew Corrigan, U.S. FHWA
- Chicago's Sustainable Streets Pilot Project
  - Janet Attarian, City of Chicago
- Q and A Session

GoTo Webinar Software Logistics

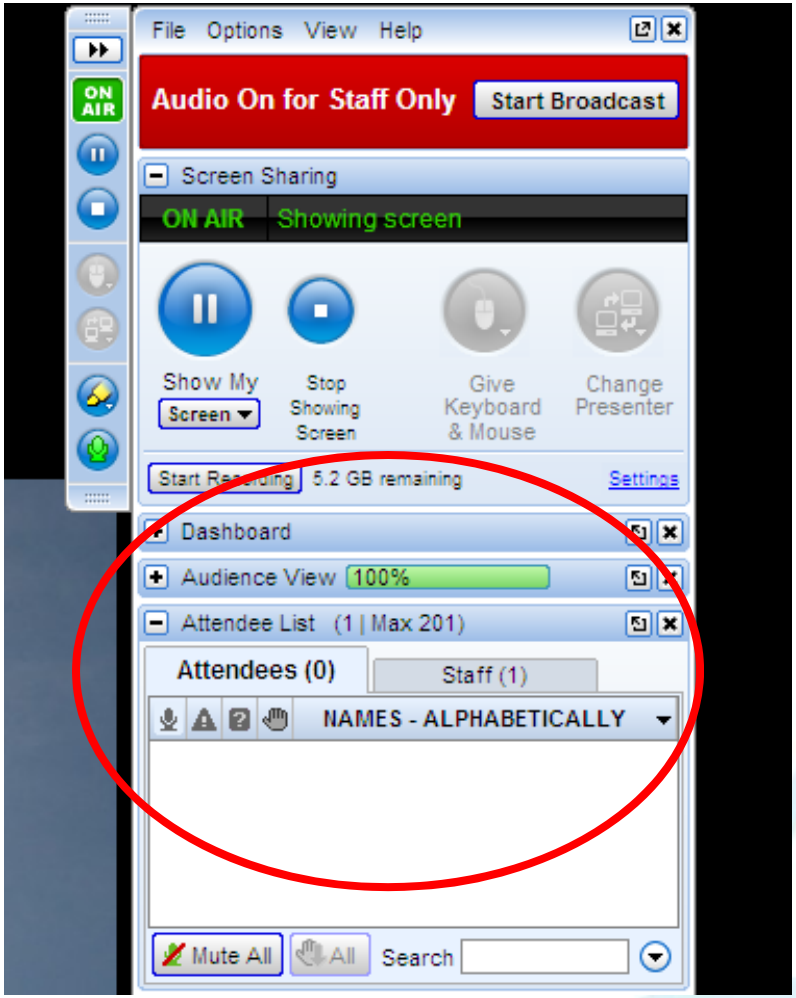
- **You will be muted throughout this webcast to minimize background noise. You'll be able to submit questions and comments in writing.**

- **Today's session will be recorded and will be made available for download in mid-February at:**
  - www.epa.gov/heatisland/resources/webcasts

- **Throughout the webcast, if you have problems, please contact Lauren Pederson at Lpederson@icfi.com**

Attendees (GoTo Meeting)

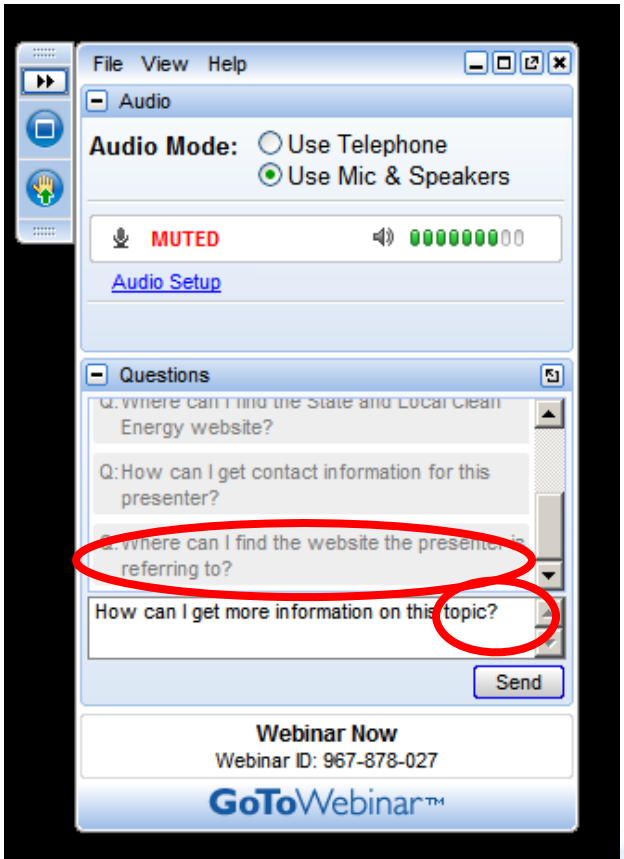
You can see who else is participating in the Attendees list.



Questions (GoTo Meeting)

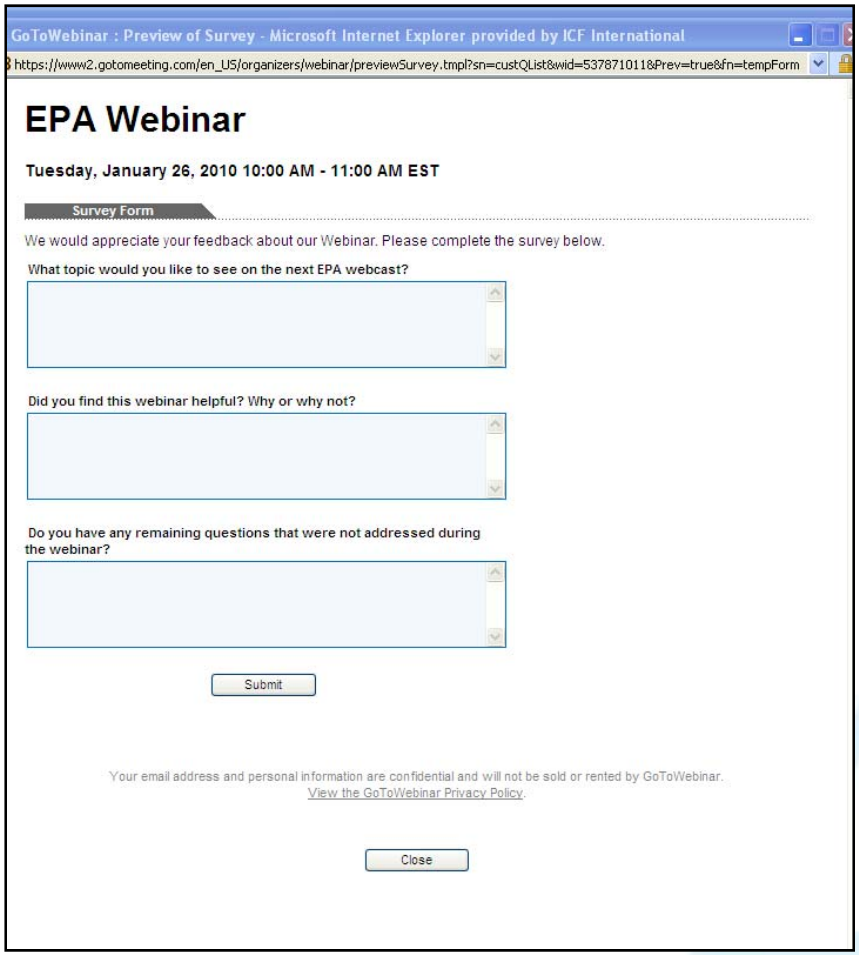
If you have a question, submit through the question pane.

We will compile these questions, and ask them during the Q&A session. Please include the name of the presenter who should answer your question.



Optional Feedback
(GoTo Meeting)

A pop-up window will appear once you exit GoTo Meeting. If you have feedback, please respond to the optional questions in the designated areas.



U.S. EPA
Heat Island Reduction Program

Heat Island Webcast:

Cool Pavements and Sustainable Pavement Technology

January 28, 2010

Neelam R. Patel, Program Manager

Outline

- Heat Island Effect Overview
- U.S. EPA Heat Island Reduction Program
- Heat Island Implementation Activities
  - Heat Island Mitigation Connections to Other Programs
  - Local-level Implementation
  - EPA Sustainable Skylines Initiative Grant Program
  - California Cool Communities Program (LBNL, CEC, CARB)
- Leveraging Funding
  - ARRA Funds
  - Climate Showcase Communities Grant Program
- Meetings & Initiatives Related to Heat Islands/Pavements

Heat Island Effect Overview

Definition

- Micro-scale temperature differences between urban and rural areas
- Urban areas can be 9 – 27 ° F higher than rural areas

Formation

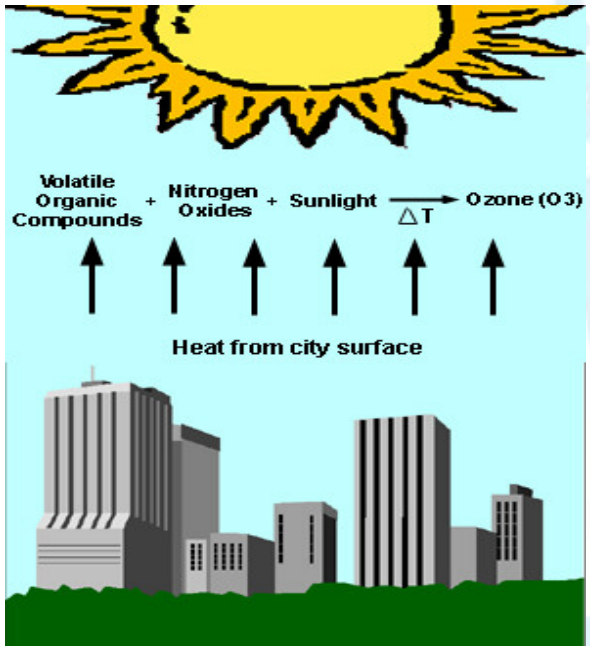
- Reduced vegetation
- Materials used to build urban infrastructure
- Urban geometry

Energy and Air Quality Impacts

Impacts

- **Increased energy use**
  - 5 – 10 % of electricity demand is to cool heat islands effects
  - Longer peak periods; pressure on E grid; brownouts, blackouts

- **Air quality and greenhouse gas (GHG) emissions**
  - Increased GHG emissions
  - Increased air pollution
  - Ozone formation

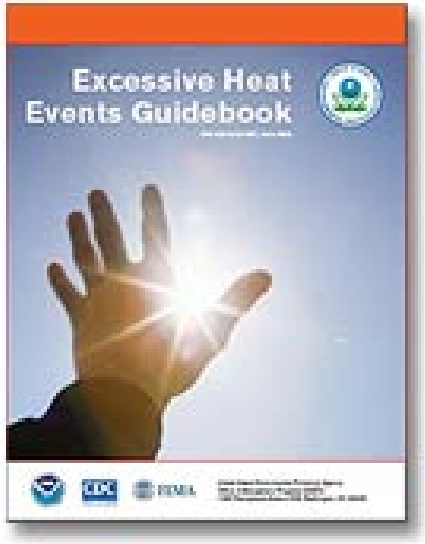


More Impacts

***Impacts** cont'd*

- **Water Quality**
  - Warmer water runoff = ecological shock in waterways
  - Increased water runoff = more pollutants in waterways

- **Human Health**
  - Respiratory difficulties
  - Heat cramps
  - Heat exhaustion
  - Non-fatal heat stroke/sun stroke
  - Heat related mortality



www.epa.gov/heatisland/about/heatguidebook

Mitigation Strategies

Communities can take action to reduce urban heat islands using four main strategies.

- Trees and Vegetation
- Green Roofs
- Cool Roofs
- Cool Pavements

Mitigation Strategy: Trees and Vegetation

- Most U.S. communities have opportunities to increase the use of trees and vegetation in their land cover to reap multiple benefits.

- Strategically planting trees maximizes energy savings and reduce GHG emissions (among other things).

  - Buildings
  - Parking lots
  - Streets

Mitigation Strategy: Green Roofs

- Decrease heat island impacts by shading roof surfaces and through evapotranspiration
- Can save energy both in the summer and winter; energy savings depend on local conditions and building circumstances
- Can be installed on a wide range of buildings, from industrial facilities to private residences

Green Roof Types

- **Extensive** - 2-inch covering of hardy groundcover
- **Intensive** - complex as a fully accessible park complete with trees

Mitigation Strategy: Cool Roofs

- Cool roofing products are made of highly reflective and emissive materials that can remain approximately 50 to 60°F (28-33°C) cooler than traditional materials during peak summer weather.

Cool Roof Types

- Low-sloped roofs
  - Coatings
  - Single ply membrane
- Steep-sloped roofs
  - Asphalt shingles
  - Metal roofing
  - Tiles
  - Shakes

Mitigation Strategy: Cool Pavements

- Materials range from established to emerging technologies
- Tend to store less heat and have lower surface temperatures compared with conventional products
- Do not have standards or an official definition like cool roofs

EPA Pavement Activities:

- Hosted Cool Pavements workshop in 2005, helped identify future research areas
- Created the Transportation Research Board Subcommittee Meeting: Pavemer and the Urban Climate, encourages furtl pavement research

U.S. EPA Heat Island Reduction Program

Program Objective

- Communicate policy, programmatic developments, and scientific, technological advancements to heat island community

Program Community

- Policymakers, program designers and program implementers
- Researchers/academia
- Industry, developers of new technology
- General public (e.g., K-12 students and teachers, coaches)
- Media

Messages to Heat Island Community

Topics of Interest to Scientific Community

- Heat island science, modeling, and measurement
- Innovative mitigation technologies in areas such as cool pavements, cool roofs, green roofs, and trees and vegetation

Activities for Programmatic and Policy Community

Voluntary Efforts

- Urban Forestry Programs
- Demonstration Projects (i.e., LBE)
- Weatherization
- Outreach and Education Programs
- Awards

Policy Efforts

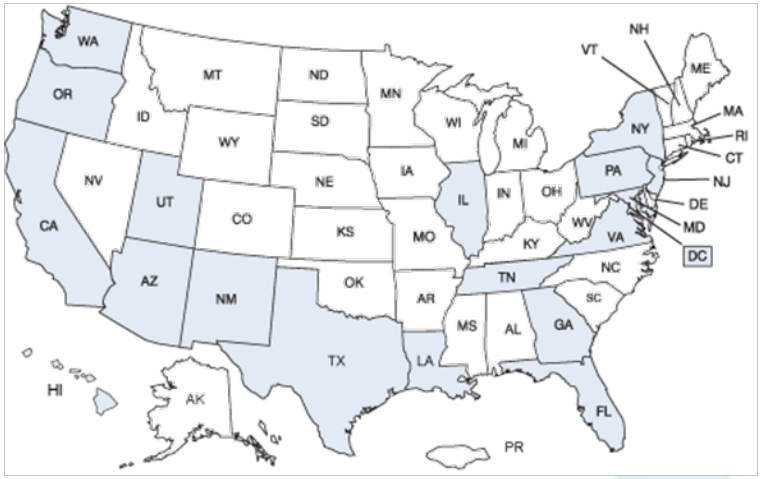
- Procurement
- Resolutions
- Tree and Landscaping Ordinances
- Comprehensive Plans and Design Guidelines
- Zoning Codes
- Green Building Standards
- Building Codes
- Air Quality Requirements

Key Program Features

- **Website**, features include user-friendly format, updated content, calendar of events, heat islands in the news, updated database, **Science Corner**
- **Database**, "Where You Live"
  - Provides info on more than 75 local and statewide initiatives to reduce heat islands and achieve related benefits *(more on upcoming slide)*
- **Compendium** of Strategies: Reducing Urban Heat Islands
  - Document describes the causes and impacts of summertime urban heat islands and promotes strategies for lowering temperatures *(more on upcoming slide)*
- **Webcasts**, www.epa.gov/heatislands/resources/webcasts.htm
  - Routine online meetings for our diverse program audience spotlighting local/regional urban heat island programs, new scientific findings, and upcoming meetings
- **Listserve**, www.epa.gov/hiri/admin/listserv.htm
  - Disseminates info to heat island community, e.g., funding opportunities, conference call for papers, webcasts, and more

Database

- Actions listed in the database are some efforts underway to cool communities while saving energy, reducing greenhouse gas emissions and improving air quality
- Each entry in the database includes a description of the activity, its current status, and a link to a website (if available) for more information.
- The database can be searched by:
  - Clicking on U.S. map (diagram on right)
  - State and locality
  - Initiative Type
  - Strategy



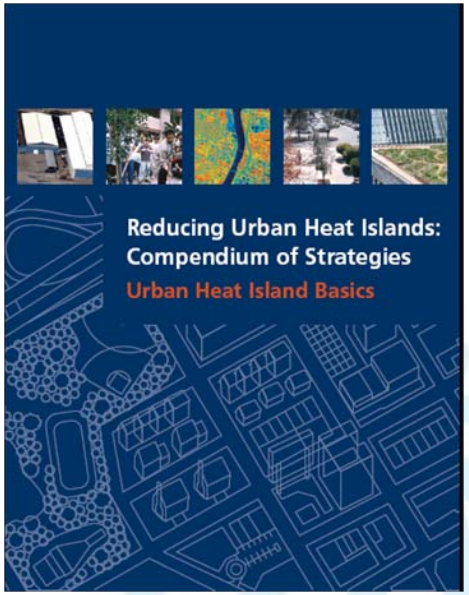
- If you are aware of heat island initiatives, please submit through our website.

http://yosemite.epa.gov/gw/statepolicyactions.nsf/webpages/HIRI_Initiatives.html

Compendium

Reducing Urban Heat Islands: Compendium of Strategies

- Provides an overview of latest science, mitigation strategies, case studies, and recommendations for additional resources
- Chapters
  - Heat Island Basics
  - Trees and Vegetation
  - Green Roofs
  - Cool Roofs
  - Cool Pavements
  - Heat Island Reduction Activities



www.epa.gov/heatislands/resources/compendium.htm

Cool Pavements Compendium Chapter

- Presents basic information and provides general understanding of cool pavement issues to consider; not intended to provide decision guidance

- Chapter covers:
  - Pavement properties and how they can be modified to reduce urban heat islands
  - Conditions that affect pavement properties
  - Potential cool pavement technologies
  - Potential benefits and costs
  - Cool pavement initiatives and research efforts
  - Resources for further information

www.epa.gov/heatisland/resources/pdf/CoolPavesCompendium.pdf

Webcasts

- EPA holds free, national, routine heat island webcasts.
- Stakeholders from around the country inform each other of their urban heat island-related work.
- Scientists, practitioners, industry representatives, and government officials and staff all participate.
- Webcasts cover topics such as:
  - Measuring and Modeling Urban Heat Islands
  - Heat Island Impacts (e.g., air, water quality)
  - Mitigation (e.g., strategies, technologies, activities)

www.epa.gov/heatisland/resources/webcasts.htm

Heat Island Reduction Implementation Activities

Heat Island Connections with other Programs

- Fold heat island messages into other EPA programs to promote multiple benefits of mitigation strategies
  - Stormwater Green Infrastructure Program
  - Green Scapes Program
  - Smart Growth, www.epa.gov/hiri/resources/pdf/smartgrowthheatislands.pdf
  - Brownfields Redevelopment
  - Green Building activities

- Link to climate adaptation issues
  - Promote mitigation strategies to address heat health, energy conservation, and climate mitigation for local, regional and state programs
  - Use mitigation strategies to support actions for extreme weather (high rainfall, heat)

Urban Heat Island Mitigation and LEED™

U.S. Green Building Council's Rating System
Leadership in Energy and Environmental Design (LEED™)

LEED Rating System

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials & Resources
- Indoor Environmental Quality
- Innovation & Design Process

1st LEED Platinum in AZ:
The Arizona Biodesign Institute at ASU

For more information: www.usgbc.org

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LEED™ and Pavements

- **Sustainable Sites**
  - Credit 7: Landscape and Exterior Design to Reduce UHI (2 points)

    Intent – Reduce heat islands to minimize impact on microclimate

    7.1 NON-ROOF SURFACES (1 point)
    - Provide Shade – (<5years) on at least 30% of non-roof impervious surfaces

      OR use light colored (reflectance >0.30) for 30% of non-roof

      OR place a minimum of 50% of parking underground

      OR open-grid for minimum of 50% of parking lot area

Other non UHI related pavement credits…

- **Materials and Resources**
  - Credit 2: Construction Waste Management (1-2 points)
  - Credit 3: Resource Reuse (1-2 points)
  - Credit 4: Recycled Content (1-2 points)
  - Credit 5: Local/Regional Materials (1-2 points)

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Implementation at the Local Level Activities

Part of climate, energy, sustainability, air quality, water, adaptation, or building efforts

- Voluntary Efforts
- Policy Efforts

Heat Island Reduction - Voluntary Efforts

- Demonstration Projects
- Incentive Programs
- Urban Forestry Programs
- Weatherization
- Outreach and Education
- Awards

Heat Island Reduction - Policy Efforts

- Procurement
- Resolutions
- Tree and Landscape Ordinances
- Comprehensive Plans and Design Guidelines
- Zoning Codes
- Green Building Programs and Standards
- Building Codes
- Air Quality Requirements

U.S. EPA Heat Island Supported Projects

- EPA Regional Heat Island Activities – *Sustainable Skylines Initiative Grant Program*
  - Development and implementation of heat island mitigation program Dallas, TX
    www.sustainableskylines.org/Dallas

  - Development of program, “Parking Lots to Parks” Kansas City, KS and MO

    www.epa.gov/region07/citizens/ssi.htm
    www.sustainableskylineskc.org/projects/parkinglotstoparks.asp

EPA and Kansas City Project: Parking Lots to Parks

Parking Lots to Parks objectives:

- Design sustainable parking lots to achieve multiple goals
- Convene and educate key stakeholders (e.g., architects, engineers, planners)
- Develop concept plans to build capacity of stakeholders

Sample Strategies:

- Right-sized parking
- Permeable pavements
- **Cool pavements**
- Landscaping

Case Studies:

- Vehicle Impound Facility – Kansas City, MO

www.epa.gov/region07/citizens/ssi.htm
www.sustainableskylineskc.org/projects/parkinglotstoparks.asp

Cool Communities Program
California-based Initiative

Objective:

Provide technical assistance to California communities for development of "cool community" programs that save energy, reduce emission of greenhouse gases, and improve the urban environment.

Background:

- Funded by California Air Resources Board (CARB) & California Energy Commission (CEC)
- Implemented by Lawrence Berkeley National Lab (LBNL)
- Global Warming Solutions Act of 2006 (AB 32)
  - Caps greenhouse gas emissions
  - CARB prepare plans to achieve objectives
- "Cool Communities" identified as a voluntary early action program
  - Estimate cool community measures reduce GHG emissions by 4 MMT CO_2 e/y

Cool Communities Program
Pavement Training Task

Cool Pavement Trainings

Goals

- Create training courses for building and public works professionals on the needs, benefits and options for cool community practices, such as the selection of cool paving materials.

Deliverables/Activities

- Create training courses
- Conduct train-the-trainers
- Create supplemental instructional materials

Dates

- Trainings and materials completed August 2010

Contact

- Haley Gilbert – Senior Research Associate, Heat Island Group

  HEGilbert@lbl.gov

  510/486-7325

Cool Communities Program Pavement Study Task

Cool Pavement Study

Goals

- Compare the solar reflectance and temperatures of various pavements (e.g., asphalt concrete, cement concrete, coated pavements, pervious pavements)

Details

- Trafficked and untrafficked sites
- Seasonal and long term changes

Dates

- Preliminary results by August 2010
- Long term monitoring for several years

Contact

- Ronnen Levinson– Acting Group Leader, Heat Island Group

RMLevinson@lbl.gov

510/486-7494

Leveraging Federal Funding

Heat Island Funding Opportunity in ARRA 2009 (DOE)

DOE Energy Efficiency and Renewable Energy Office received $16.8 B

- **Weatherization** **$5.0B**
- **State Energy Program** **$3.1B**
- **EECBG Program Formula** **$2.8B**
- **EECBG Competitive** **$400M**
- Appliance Rebate Program $300M

ARRA Tax Credits - Roofing

- Under ARRA 2009, a 30% tax credit (with the limit of $1,500) is available for Energy STAR labeled metal and asphalt roofs through the end of 2010.
  - Installation costs are not covered.
  - Material must be expected to last 5 years or have a two-year warranty.
  - Note: $1,500 applies to all energy efficiency improvements combined.

www.energystar.gov/index.cfm?c=tax_credits.tx_index

Heat Island Funding in Climate Showcase Communities Grant

2009 Appropriations Bill, 2010 Appropriations Bill

- $10M Competitive grant to assist local communities in pursuing their own climate change initiatives
- Goal is to achieve documentable, replicable GHG reductions from a range of activities- **includes Heat Island Management**
- Program will:
  - Foster collaborative partnership between communities and with the Federal government
  - Ensure federal investments spur local innovation and produce concrete results
  - Promote transfer of best practices among localities
  - Identify strategies to overcome institutional barriers to local governments achieving energy use and GHG reductions
- **First round of grantees will be awarded in February 2010**
  www.epa.gov/cleanenergy/energy-programs/state-and-local/showcase.html
- **Next Solicitation will open in late spring 2010**

Meetings and Initiatives Related to Heat Islands and Pavements

Meetings and Initiatives

Upcoming Meetings, ww.epa.gov/heatisland/resources/calendar

- Concrete Sustainability Conference, April 13-15, 2010, www.sustainabilityconf.org
- Urban Environmental Pollution 2010 Conference, June 20–23, www.uep2010.com
- AMS Symposium on the Urban Environment, August 2–6, 2010, http://ams.confex.com/ams *
- TRB Subcommittee on Pavements and the Urban Environment, January 2010, www.TRB.org or contact Kamil Kaloush at kaloush@asu.edu *
- Call for papers open

Initiatives

- Massachusetts Institute of Technology, Concrete Sustainability Hub

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www.epa.gov/heatislands

U.S. EPA Heat Island Listserv sign-up:

www.epa.gov/hiri/admin/listserv.htm