Cool Roofs and Cool Roof Program Infrastructure

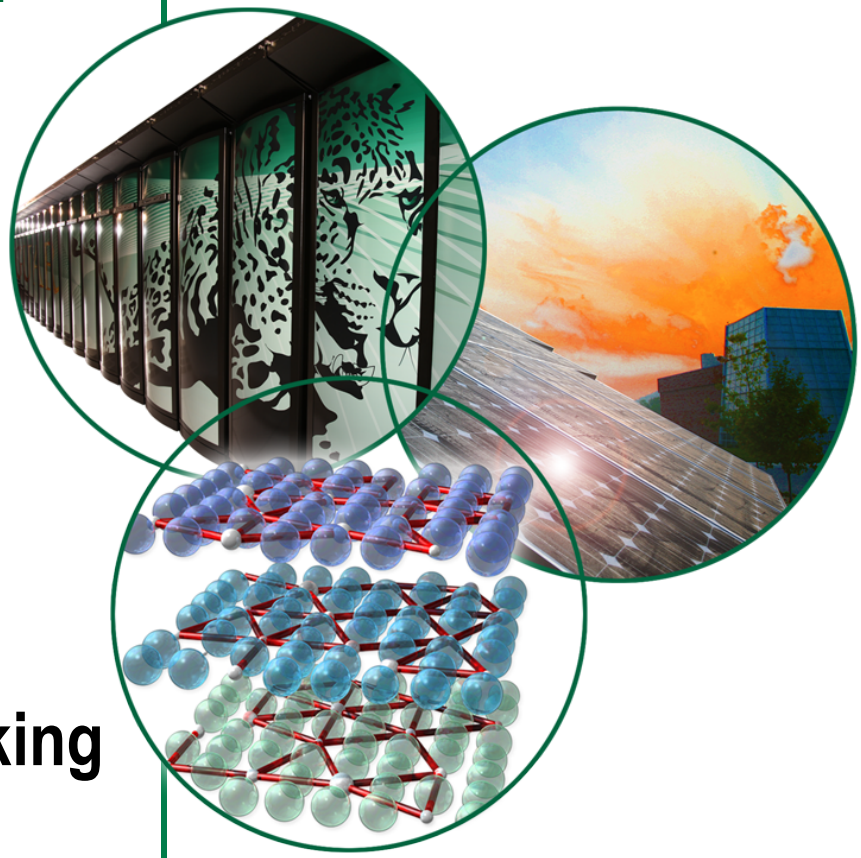
Andre Desjarlais

Oak Ridge National Laboratory

GSEP Workshop

Cool Roofs and Pavements Working Group

12 September 2011



U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY

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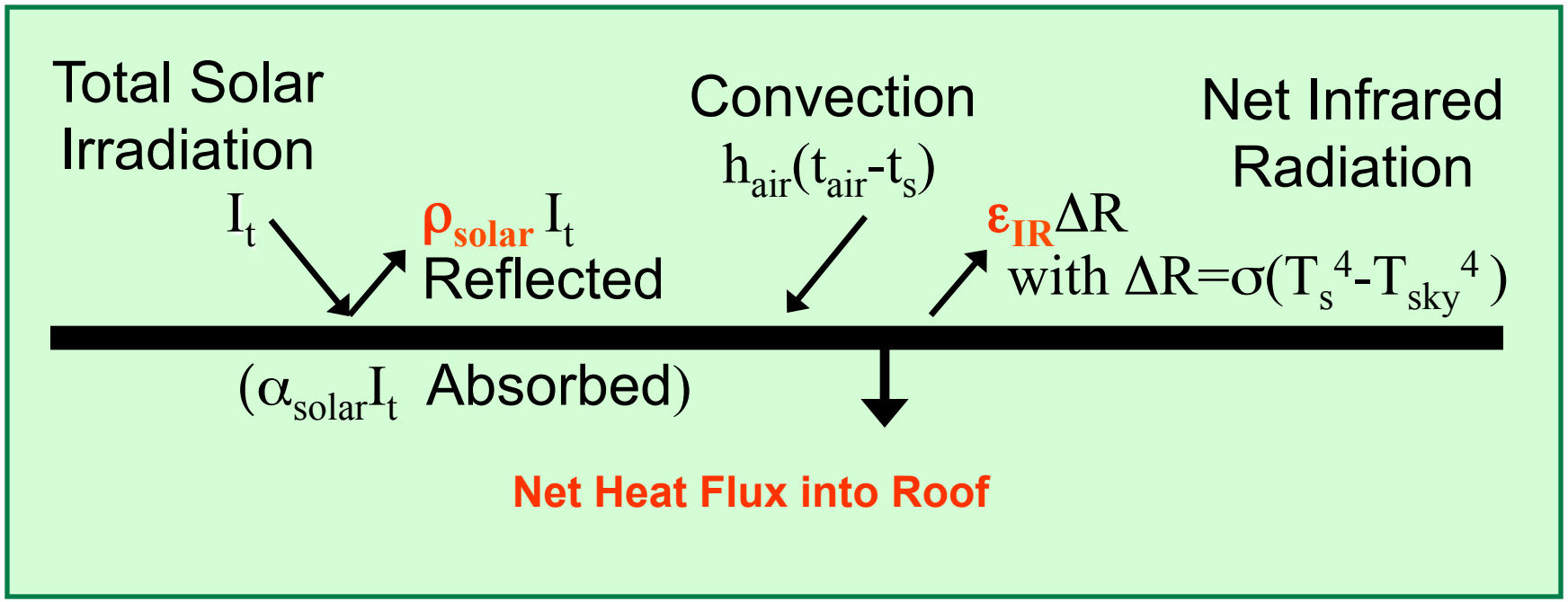
Presentation Summary

- What is a cool roof?
- Why use a cool roof?
- How are cool roofs rated?
- What are existing policies that impact cool roofing?

What is a Cool Roof?

- **Roof surface that has a high solar reflectance and a high thermal emittance**
  - **CA: 70% SR and 75%TE**
  - **EPA EnergyStar Program: 65% SR (new) and 50% SR (after 3 years)**

ρ_{solar} and ε_{IR} are Both Important



Why a Cool Roof?

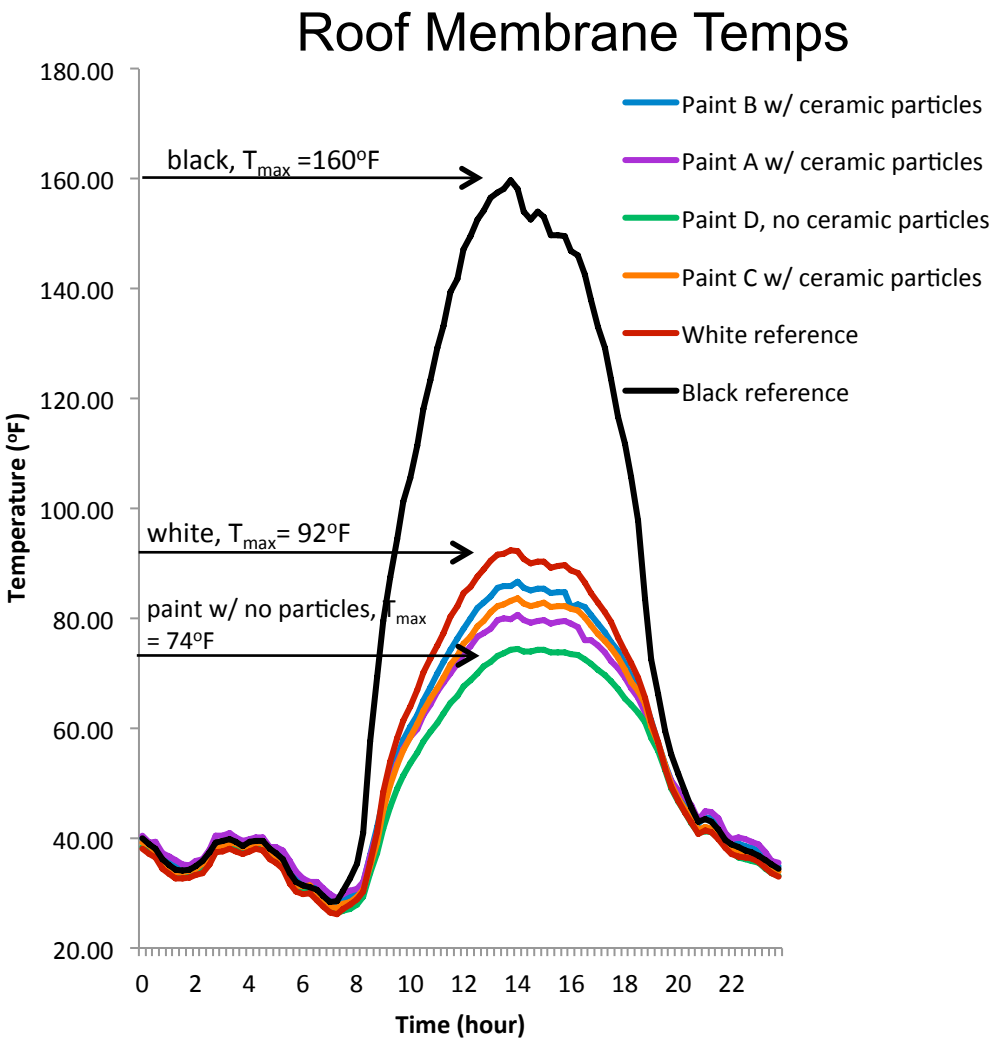
- Reduces cooling loads (building level)
- Reduces peak energy demand
- Can reduce ambient temperature in an urban setting (urban level)
  - Improved air quality
  - Further energy savings
- Possible global cooling implications (global levels)
- Cool roofs being included into energy codes

Cool Roofs Reduce Roof Surface Temperatures

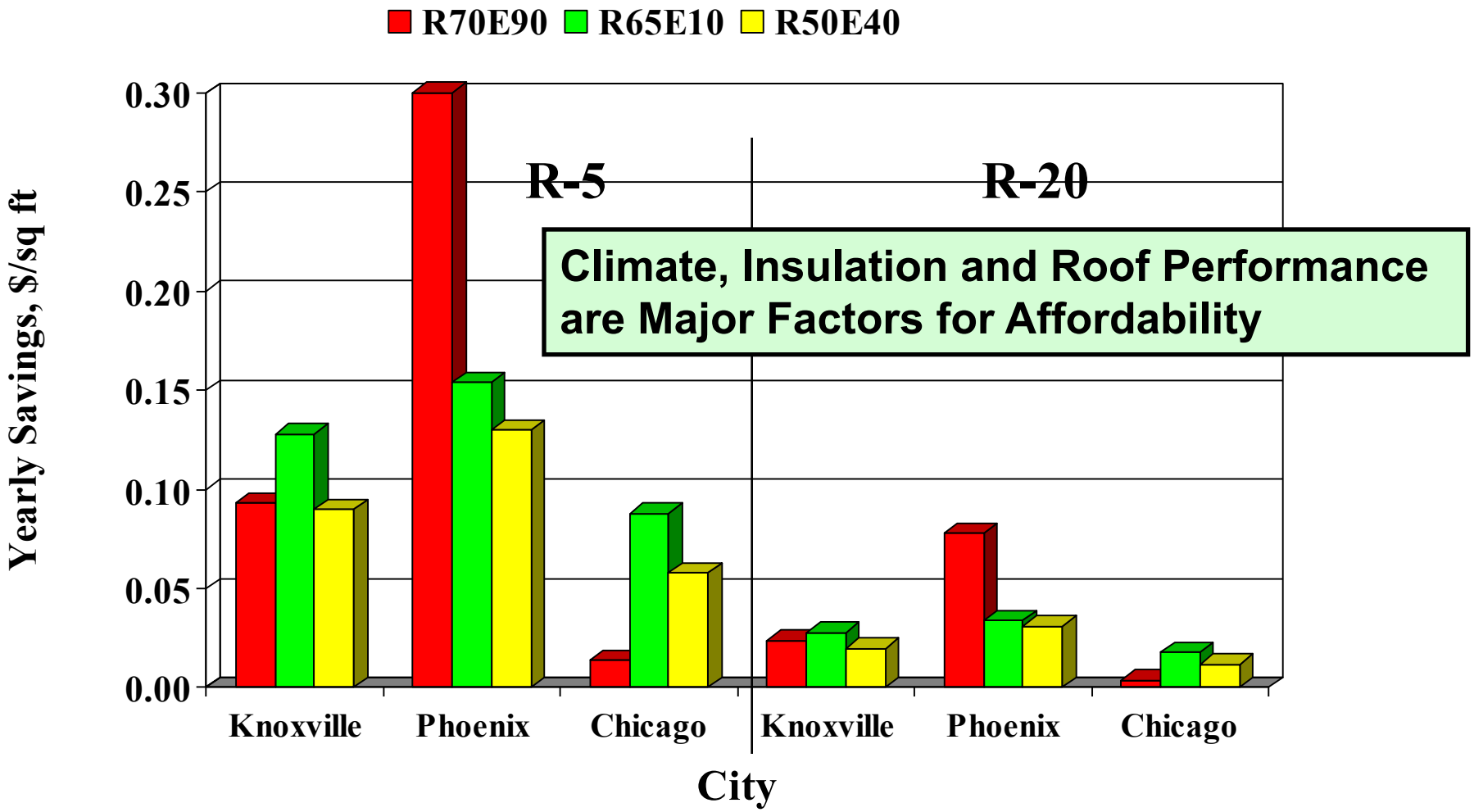
Sample data for sunny day, April 16, 2010

A coating ($SR_{initial}$ = 0.88) keeps roof cooler than coatings of lower SR ($SR_{initial}$ about 0.8) .

…and requires less cooling than other samples and heating penalty only relative to the black surface.



Roof Energy Savings

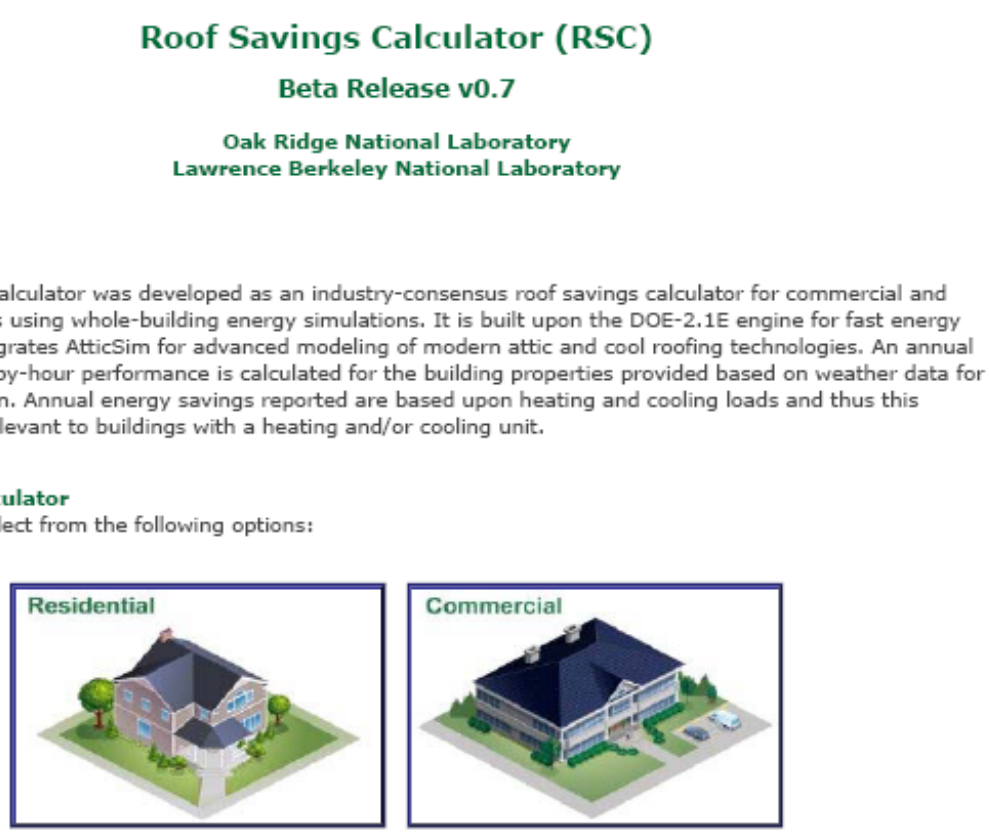


Climate, Insulation and Roof Performance are Major Factors for Affordability

10 cents/kwh, COP of 2.0, Furnace AFUE 0.80, $1.30 Therm
NO PEAK DEMAND CREDIT – COULD DOUBLE SAVINGS

Roof Savings Calculator

- Collaboration by ORNL and LBNL with funding from DOE and CEC
- Provides cool roof assessments and advanced roof options
- Runs full simulations
- See RoofCalc.com



Roof Savings Calculator (RSC)

Beta Release v0.7

Oak Ridge National Laboratory
Lawrence Berkeley National Laboratory

Introduction

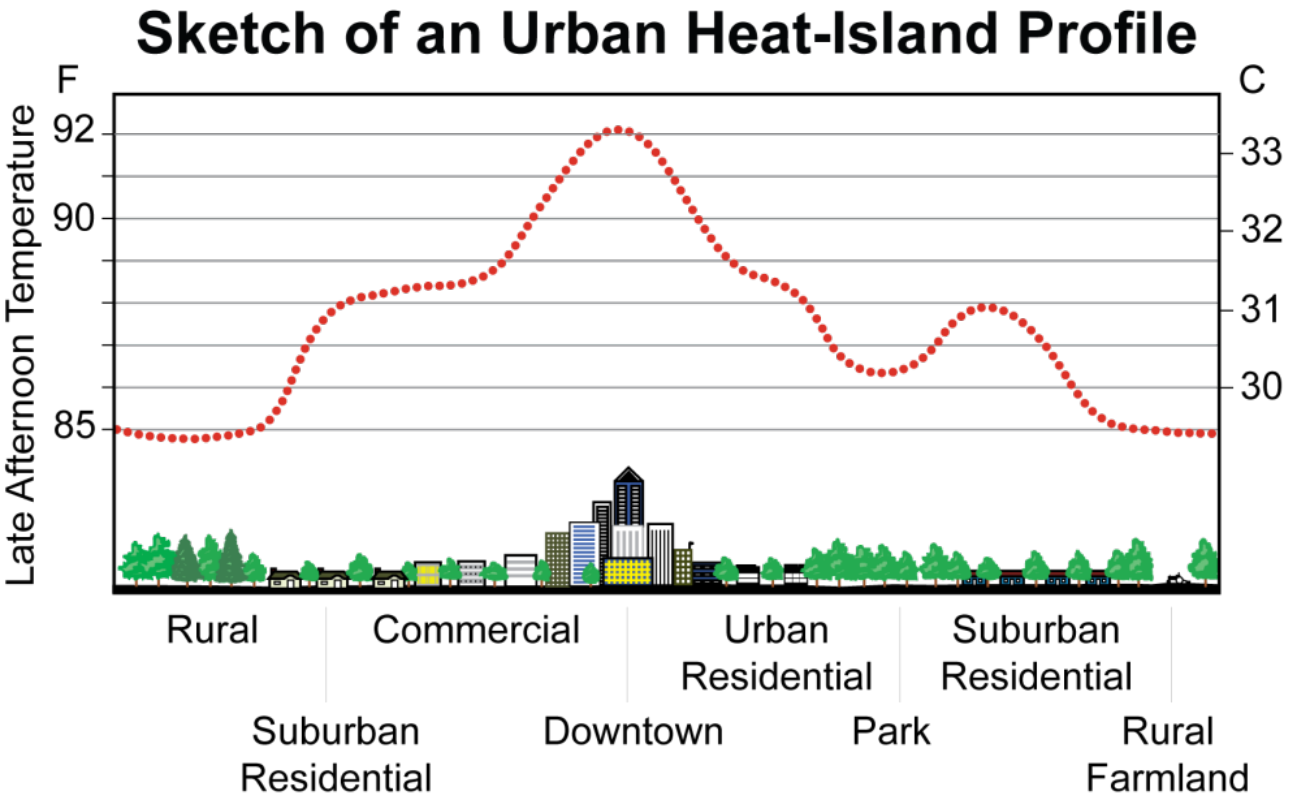
The Roof Savings Calculator was developed as an industry-consensus roof savings calculator for commercial and residential buildings using whole-building energy simulations. It is built upon the DOE-2.1E engine for fast energy simulation and integrates AtticSim for advanced modeling of modern attic and cool roofing technologies. An annual simulation of hour-by-hour performance is calculated for the building properties provided based on weather data for the selected location. Annual energy savings reported are based upon heating and cooling loads and thus this calculator is only relevant to buildings with a heating and/or cooling unit.

Roof Savings Calculator

To begin, please select from the following options:

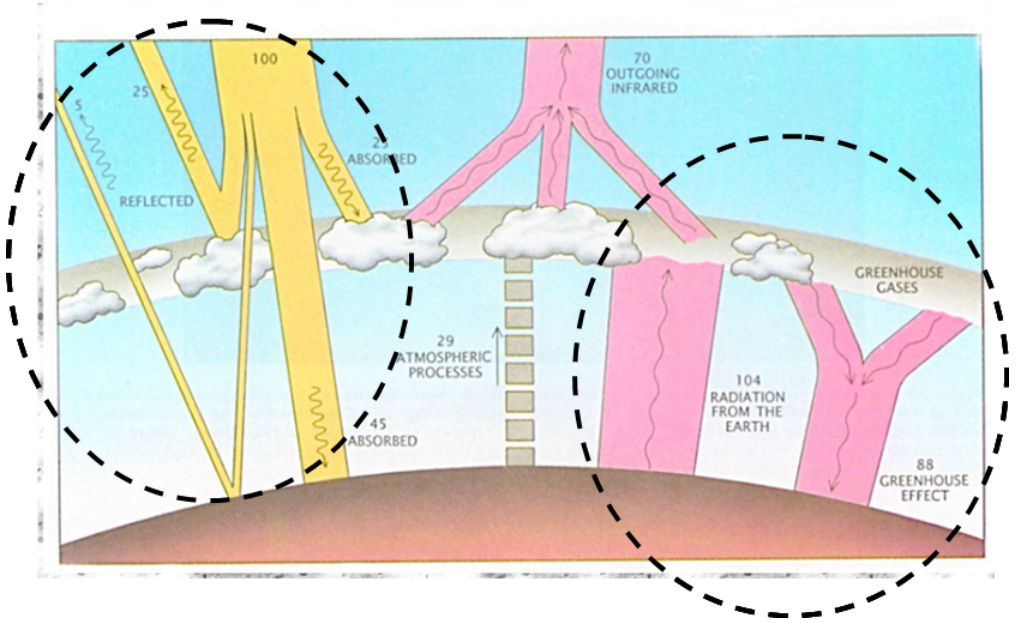
Urban Level

- **Widespread adoption leads to reduced temperatures in the urban core**



Global Level

- Global adoption may impact climate change strategies
- Total emitted CO_2 offset by cool roofs and cool pavements estimated at 44 GT



What is the Cool Roof Rating Council?

Non-profit organization to:

- **Maintain a fair, accurate, and credible rating system**
- **Support related research**
- **Provide education and objective support**

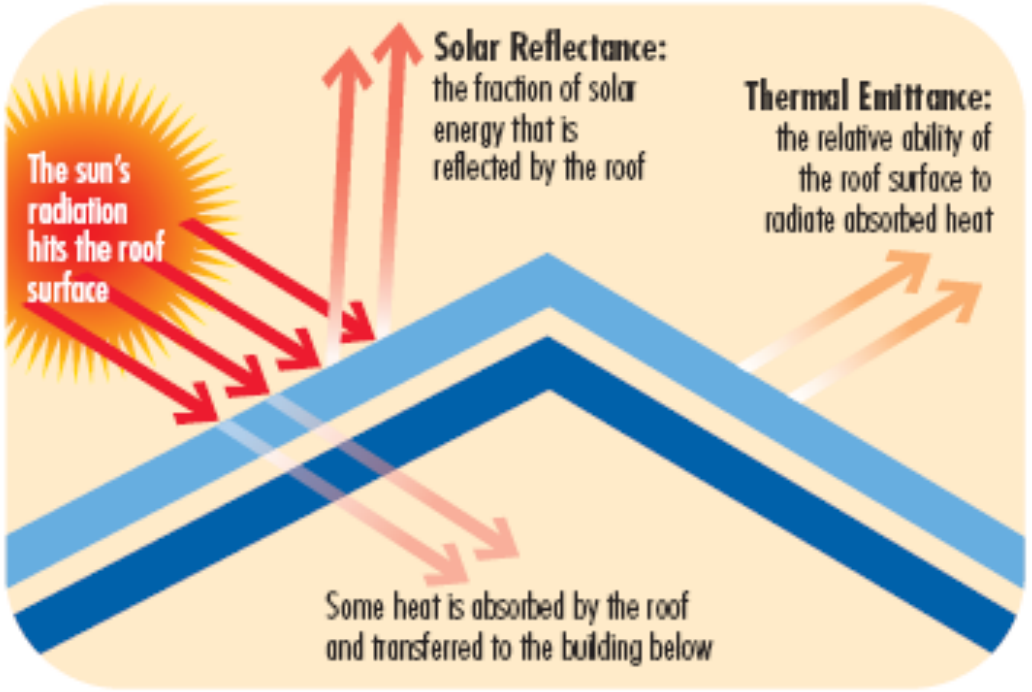
Cool Roof Rating Systems

CRRC
COOL ROOF
RATING COUNCIL

CRRC only looks at surface properties:

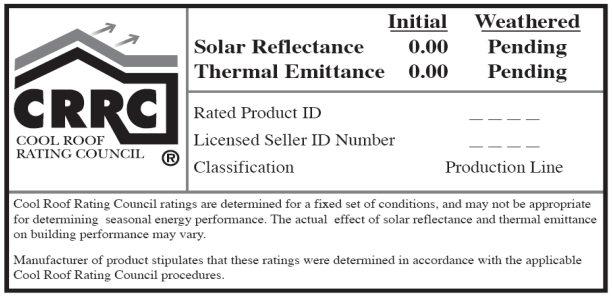
- **Solar Reflectance**
- **Thermal Emittance**

CRRC does not set minimum requirements



CRRC's Ratings Program

- Measures *reflectance* and *emittance* values
- Initial and three year values
- Actual weather exposure in 3 sites:
  - Hot/Humid (Florida)
  - Cold/ Temperate (Ohio)
  - Hot/Dry (Arizona)
- Directory and Product Label



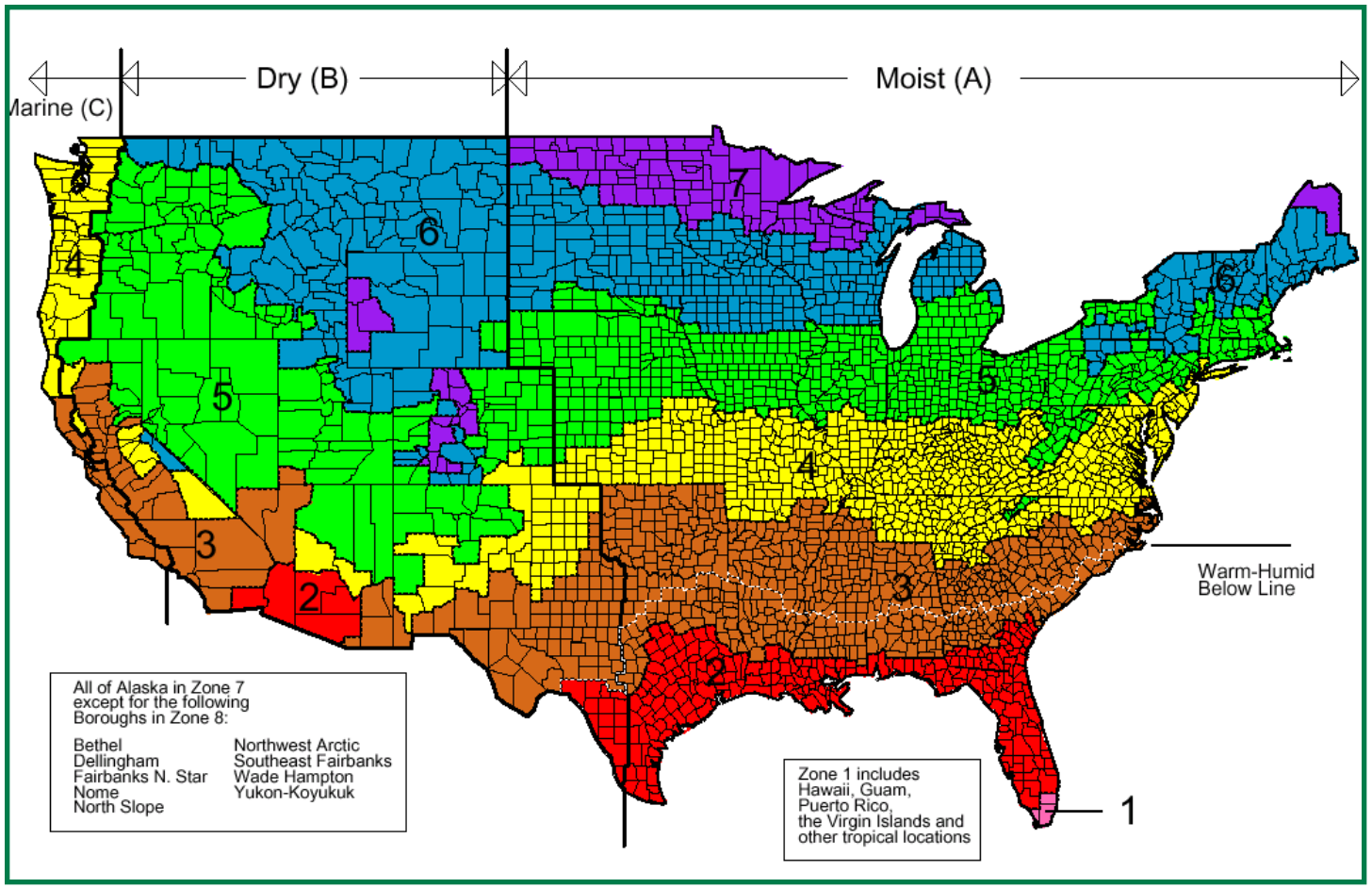
Credible Ratings System

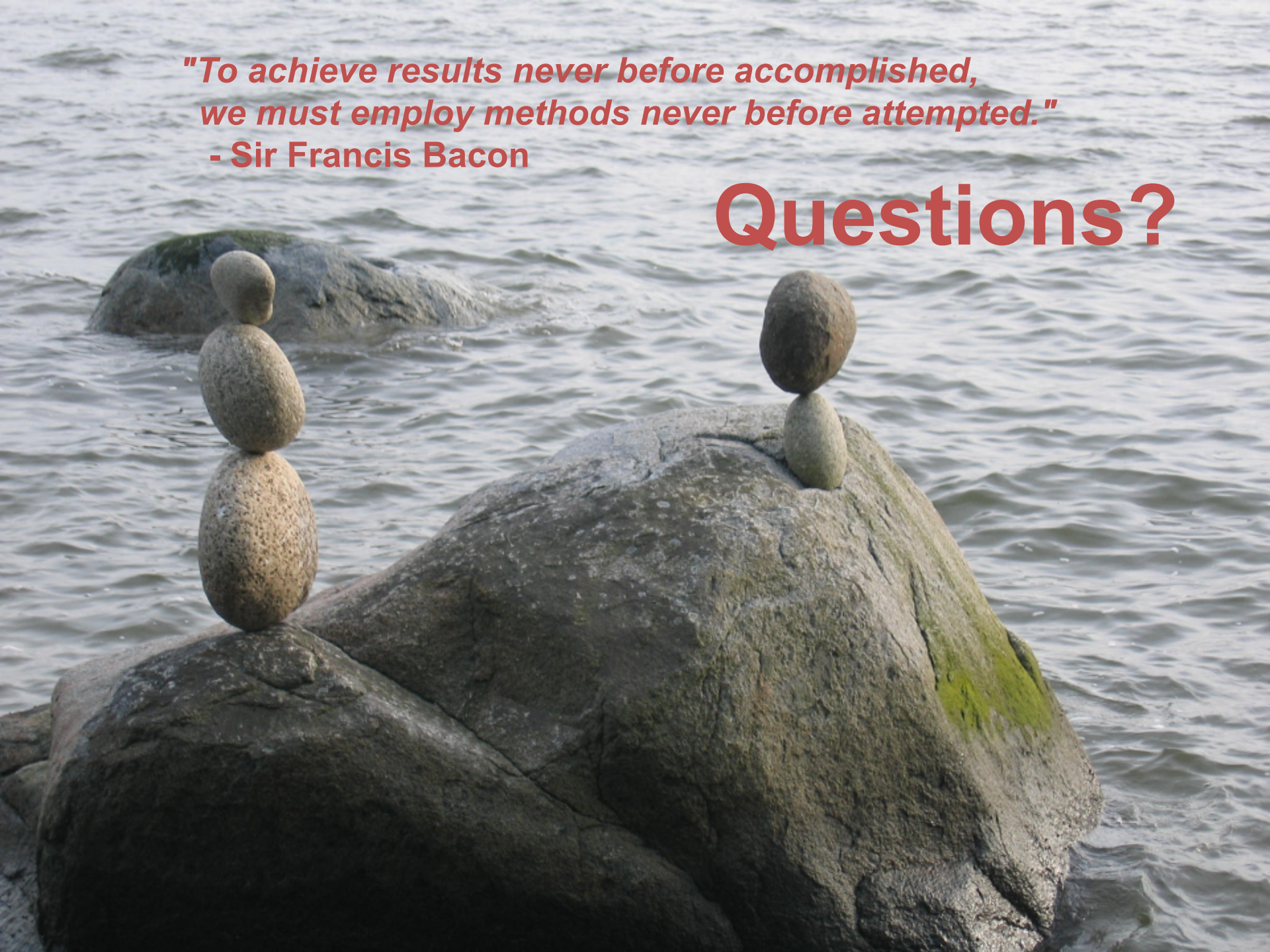
- Relies on third party testing (independent lab)
- Random testing
- The only independent, third-party roof rating system
- American National Standards Institute (ANSI) Accredited

DOE Cool Roof Policy

- **A low-sloped roof (pitch less than or equal to 2:12) must be designed and installed with a minimum 3-year aged solar reflectance of 0.55 and a minimum 3-year aged thermal emittance of 0.75 in accordance with the Cool Roof Rating Council program, or with a minimum 3-year aged solar reflectance Index (SRI) of 64 in accordance with ASTM Standard E1980-01. Steep-sloped roofs (pitch exceeding 2:12) must have a 3-year aged SRI of 29 or higher.**
- **Requires R30 Insulation**
- **Required unless determined to be not economical by life cycle cost analysis**

Cool Roofing Adopted in Many Jurisdictions




"To achieve results never before accomplished,
we must employ methods never before attempted."
- Sir Francis Bacon
Questions?