

Implementation Issues for the 2006 24-Hour PM_{2.5} Standard



Salt Lake City, 2/3/09

*EPA / WESTAR
Residential
Wood Smoke
Workshop*

*Salt Lake City, Utah
March 1, 2011*

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Quality Planning and
Standards



Overview

- PM2.5 standards and nonattainment areas
- Implementation timelines
- Attaining the 2006 24-Hour PM2.5 standard
- PM2.5 implementation rule requirements
- Strategies for Reducing Residential Wood Smoke (EPA guidance, October 2009)
- Black carbon and climate



PM NAAQS

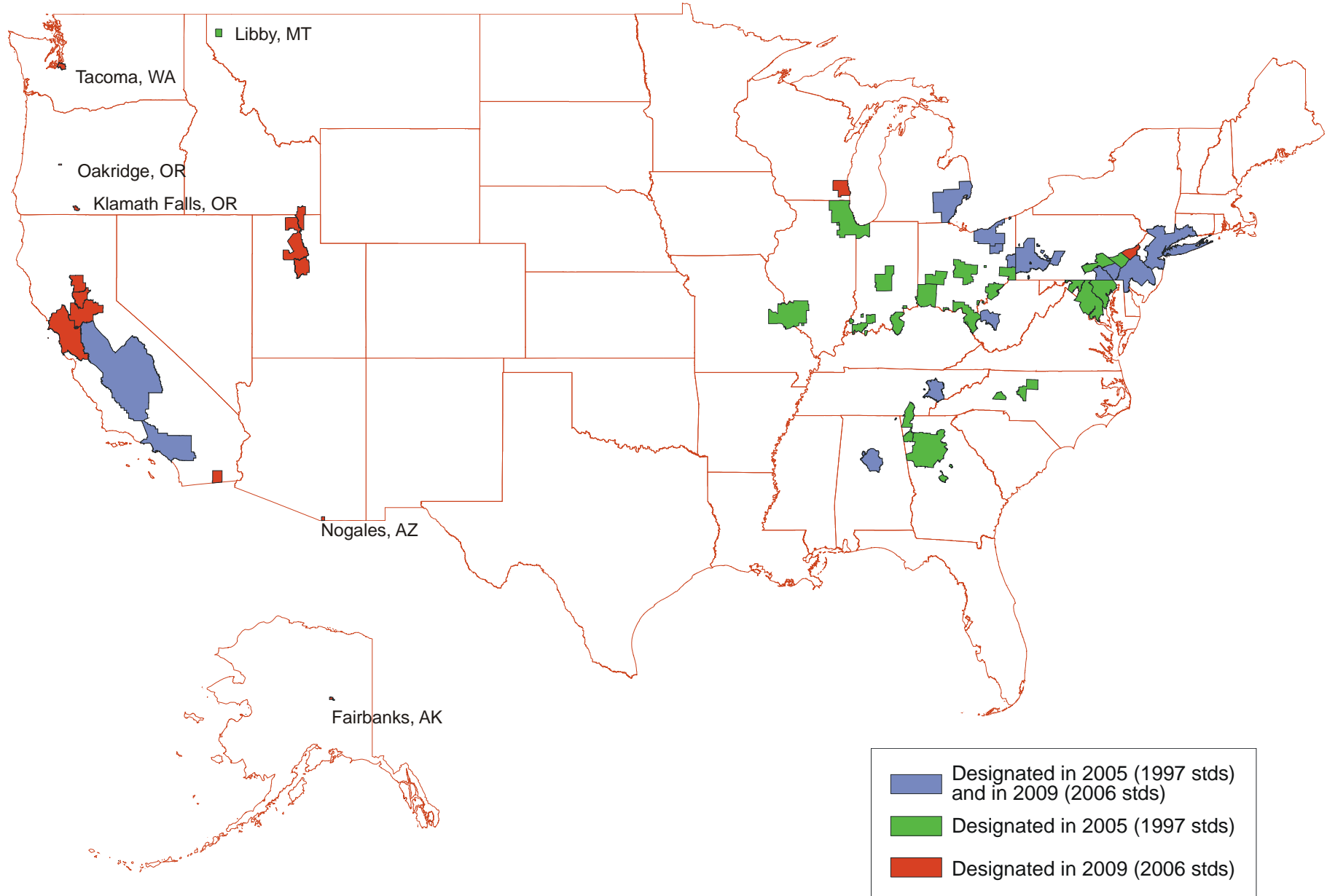
- *Health effects are significant*
 - *Aggravated asthma*
 - *Increases in respiratory symptoms like coughing, painful breathing*
 - *Chronic bronchitis*
 - *Decreased lung function*
 - *Premature death in people with heart and lung disease*

| | 1987 / 1997 Standards | | 2006 Standards | |
|---|---|---|---|---|
| | Annual | 24-hour | Annual | 24-hour |
| PM_{2.5} (Fine Particles) | 15 µg/m³ Annual arithmetic mean, averaged over 3 years (established in 1997) | 65 µg/m³ 24- hour average, 98 th percentile, averaged over 3 years (estab. In 1997) | 15 µg/m³ Annual arithmetic mean, averaged over 3 years | 35 µg/m³ 24- hour average, 98 th percentile, averaged over 3 years |
| PM₁₀ (Coarse Particles) | 50 µg/m³ Annual average (established in 1987) | 150 µg/m³ 24-hr average, not to be exceeded more than once per year on avg. over a 3-yr period | Revoked | 150 µg/m³ 24-hr average, not to be exceeded more than once per year on avg. over a 3-yr period |

$PM_{2.5}$ NAAQS

- 1997 $PM_{2.5}$ NAAQS
 - Estimated benefits = \$43-97 billion; estimated costs = \$6.7 billion
 - 39 nonattainment areas designated in 2005 (with 88 million population)
 - State plans were due in 2008
 - 28 of 39 areas are attaining based on 2007-9 data
 - SO₂ reductions from power industry were key strategy
- 2006 $PM_{2.5}$ NAAQS
 - Estimated benefits = \$17 billion; estimated costs = \$5.4 billion
 - 31 nonattainment areas designated in 2009 (with 70 million population); state plans are due in December 2012
 - Several new western areas with high winter values
 - **Larger role for nitrate and carbonaceous $PM_{2.5}$ (e.g., wood smoke)**
 - Transport Rule to provide continued SO₂ reductions in Eastern U.S.
 - Primary annual and secondary standards were remanded to EPA ⁶

PM2.5 Nonattainment Areas Designated in 2005 and 2009



Timeline for PM2.5 NAAQS Implementation

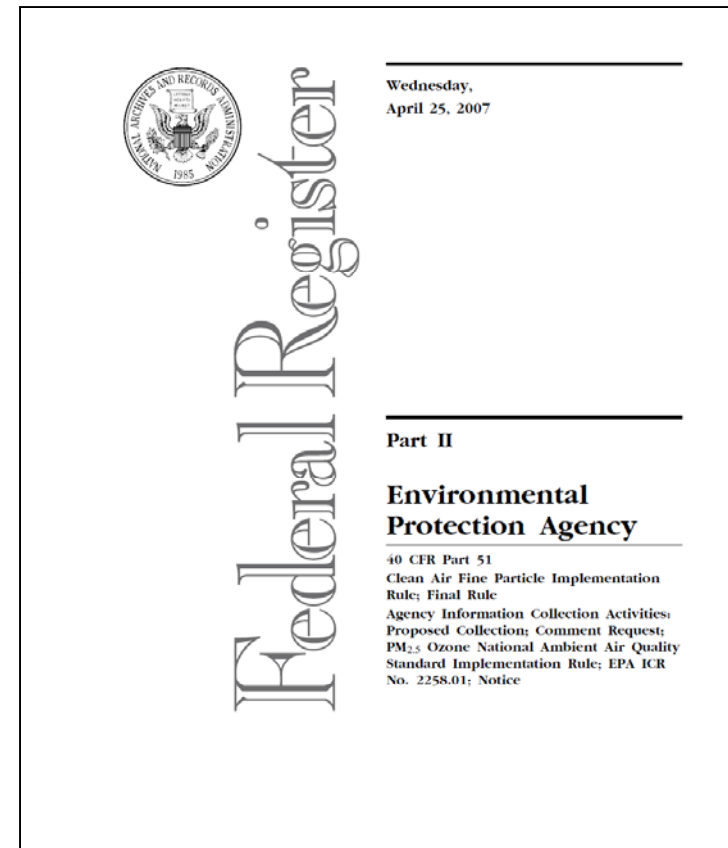
| Milestone | 1997 PM2.5 NAAQS | 2006 PM2.5 NAAQS |
|--------------------------------|--|--|
| Effective Date of Standard | September 1997 | December 2006 |
| Effective Date of Designations | April 2005 | December 2009 |
| SIPs Due | April 2008 | December 2012 |
| Attainment Date | April 2010 (based on 2007-2009 monitoring data) | Early 2015 (based on 2012-14 monitoring data) |
| Attainment Date with Extension | Up to April 2015 | Up to early 2020 (based on 2017-19 monitoring data) |

Attaining the 2006 24-Hour PM_{2.5} Standard

- Significant health benefits will be achieved through state and local actions to attain the standard!
- Regulatory impact analysis for 2006 PM NAAQS
 - Provides example control strategies and modeling
 - Direct PM_{2.5} emission reductions provide greatest air quality improvement and health benefits per ton
 - <http://www.epa.gov/ttn/ecas/ria.html>
- Not planning to issue new implementation rule at this time
 - Framework of existing implementation rule is appropriate for attainment planning for 2006 PM_{2.5} standards

PM2.5 Implementation Rule

- PM2.5 implementation rule (2007)
 - Precursor policies
 - Emission inventory
 - Control measures
 - Attainment demonstration
 - Control measures (RACM / RACT)
 - Modeling and other analyses
 - Attainment date – “as expeditiously as practicable”
 - Reasonable further progress
 - Contingency measures
 - Enforceable regulations



- June 2007 workshop presentations provide detailed information on implementation rule issues.

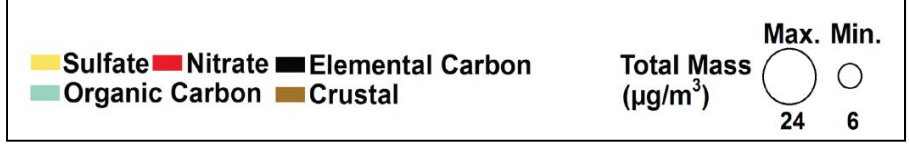
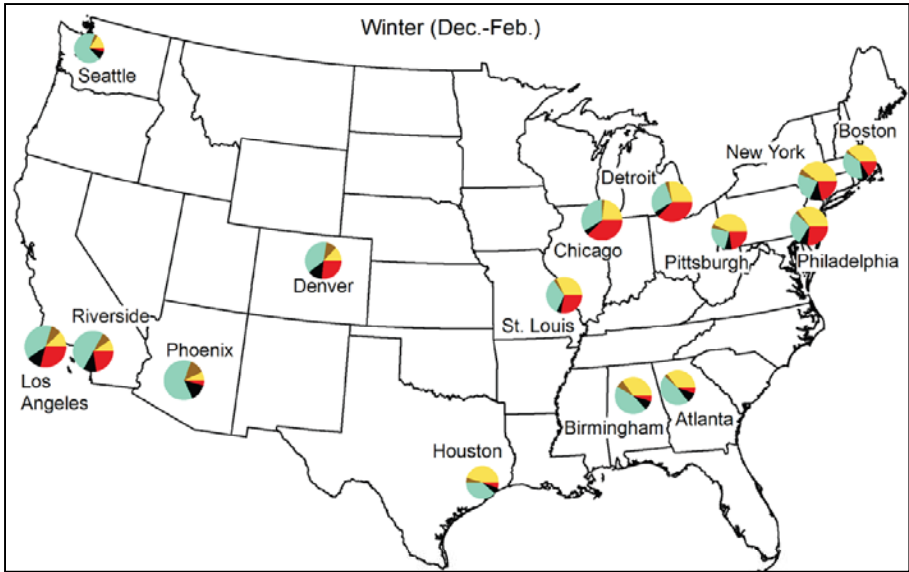
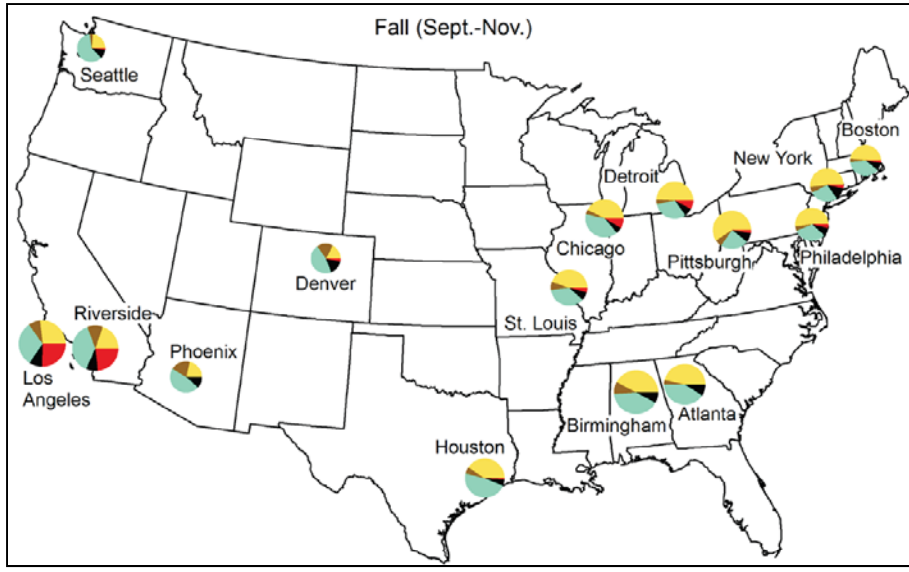
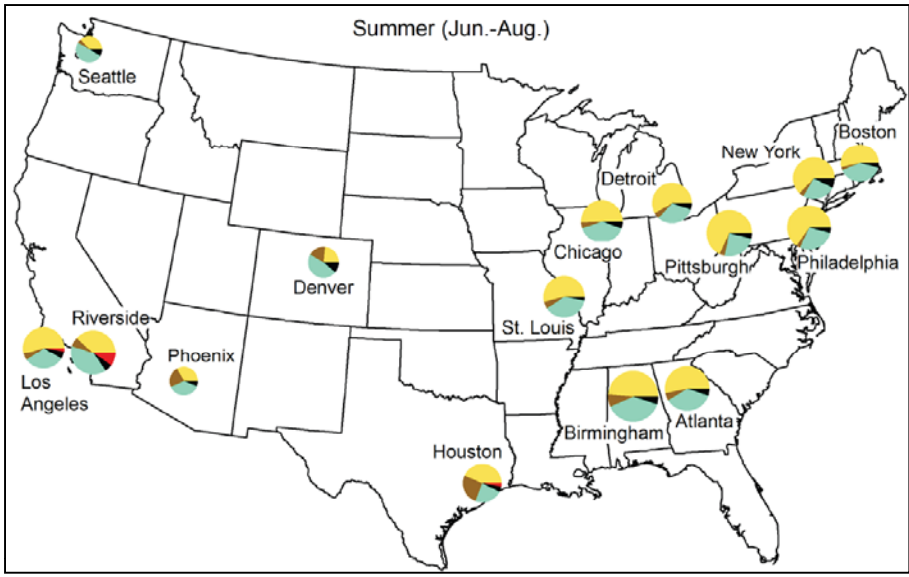
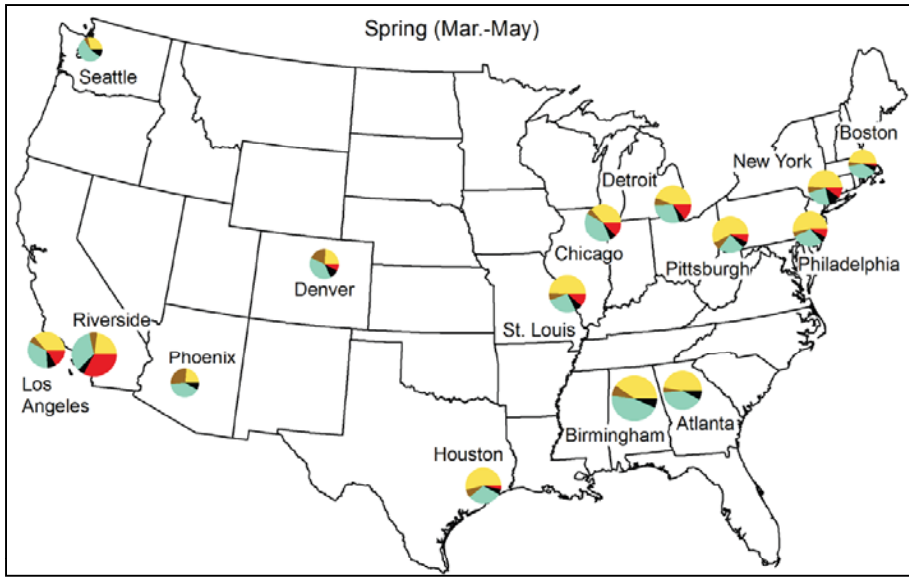
- See http://www.epa.gov/ttn/naaqs/pm/pm25_implementation_presentations.html

State Implementation Plans for 24-Hour PM_{2.5} Standard

- Develop baseline and projection year emission inventories
 - Baseline inventory: most recent statewide inventory, “or other suitable year”
 - Can use seasonal inventory if all exceedances occur in same season(s)
- Account for projected reductions and air quality improvement from Federal and State rules on the books
- Evaluate controls for local and in-state contributors to the nonattainment problem
- Adopt rules for reasonably available measures (RACM/RACT) for area to attain “as expeditiously as practicable”
- Presumption: attain within five years (early 2015 based on 2012-14 data)
 - If cannot show area will attain in 5 years, request for attainment date up to 10 years is possible as part of SIP submittal
- RFP plan needed if have attainment date exceeding five years

Pollutants to Address in Attainment Plans

- Direct PM_{2.5} and SO₂: must be evaluated for control measures in each area
- NO_x: Sources of NO_x must be evaluated for control measures in each area, unless the State and EPA provide a technical demonstration showing that NO_x emissions from sources in the State do not significantly contribute to PM_{2.5} concentrations in a specific area
- VOC and ammonia: Sources of VOC and ammonia are not required to be evaluated for control measures in each area, unless the State or EPA provide a technical demonstration showing that emissions from sources in the State significantly contribute to PM_{2.5} concentrations in a specific area
- Rule provides basic guidance on potential analyses for technical demonstration; weight of evidence approach.



Fine Particle Composition

Emission Inventories

- Statewide inventory every 3 years per CERR (e.g. 2008, 2011)
 - Direct PM (incl. condensable PM), NO_x, SO₂, VOC, ammonia, CO
- Inventories for attainment planning
 - Base year (2008?) and projection year (2014?) inventories
 - Seasonal inventories may be appropriate for certain areas
 - Based on ambient monitoring data and other analyses, more highly resolved emissions estimates are needed for which key categories?
 - Organic carbon: wood smoke, mobile sources, industry
 - Ammonium nitrate: mobile sources, industry, ammonia sources?
- Tools for estimating emissions
 - MOVES and NONROAD models for mobile sources
 - EPA wood stove and fireplace emissions calculator
<http://www.epa.gov/burnwise/resources.html#air>
 - PM emissions inventory resource center
<http://www.epa.gov/ttn/chief/eiip/pm25inventory/index.html>

Reasonably Available Control Technology (RACT) / Reasonably Available Control Measures (RACM)

- For nonattainment areas, States need to adopt all reasonably available control measures (including RACT) needed to attain the standards as expeditiously as practicable and to meet reasonable further progress requirements
 - Collective analysis; demonstrate that there are no additional measures that are reasonably available and would enable the area to attain at least one year earlier
- Guidance in rule
 - Identify technically and economically feasible measures
 - Estimate improvement in air quality with modeling or other technique
 - Select RACT/RACM and adopt enforceable regulations
- Area-specific flexibility
 - No tonnage threshold; evaluate smaller sources for areas with more severe problem
- Preamble includes list of specific measures that States should consider as a starting point for RACT/RACM assessment

Example Emission Reduction Measures

- New or improved direct PM and precursor controls on stationary sources
- Diesel retrofits (trucks, school buses, stationary engines)
- Diesel idling (trucks, trains, port equipment, etc.)
- Programs to reduce emissions from poorly maintained vehicles
- Year-round operation of seasonal stationary source NOx controls
- Year-round measures to reduce vehicle miles traveled (carpooling incentives, etc.)
- **Programs to reduce emissions from residential wood combustion, outdoor wood boilers, and back yard barrel burning**
- **Open burning laws and better enforcement**
- **Smoke management plans**
- Reducing emissions of volatile aromatic compounds (surface coatings, gasoline, solvents, etc.)

More information available at
<http://www.epa.gov/pm/measures.html>

EPA Guidance: Strategies for Reducing Residential Wood Smoke (October 2009)



- Public education
 - Burn as cleanly as possible: right wood, right way, right appliance
 - AIRNow real-time data and forecasting
- Wood Stove/Fireplace Changeouts and Removal
 - Changing out one old, dirty inefficient wood stove is equivalent to the fine particle pollution reduction of taking five diesel buses off the road.
 - www.epa.gov/burnwise
- Wood burning curtailment programs - examples
 - Sacramento: <http://www.sparetheair.com/burncheck.cfm>
 - Puget Sound: <http://www.pscleanair.org/airq/burnban/default.aspx>
- Outdoor wood boiler ordinance / regulation
- Guidance document available at:
<http://www.epa.gov/ttncaaa1/t1/memoranda/strategies-doc-8-11-09.pdf>¹⁷

Attainment Demonstration

- Analysis demonstrating that the area will attain as expeditiously as practicable based on best emissions estimates and control measure information available
 - Areas with substantial amount of secondary PM_{2.5} (e.g. nitrate) are recommended to use regional grid model; perhaps in combination with dispersion model for direct PM_{2.5} sources
 - Areas dominated by direct PM_{2.5} emissions – recommend use of dispersion model, or other approaches
 - For 24-hour standard, focus on days at high end of distribution
 - Unmonitored area analysis
- Identify attainment date for the area
- Ozone, PM_{2.5}, and Regional Haze Modeling Guidance
<http://www.epa.gov/ttn/scram/guidance/guide/final-03-pm-rh-guidance.pdf>

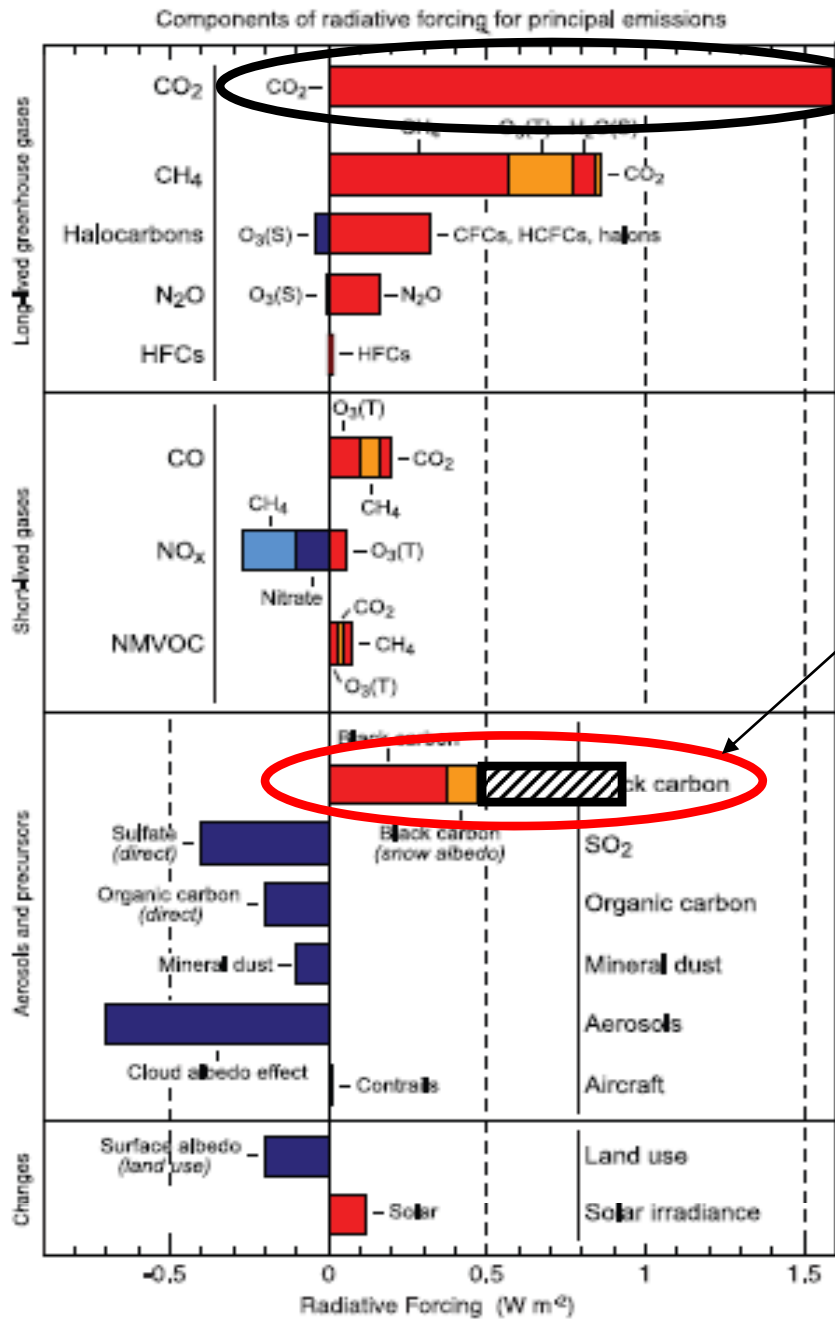
Reasonable Further Progress (RFP)

- RFP: annual incremental reductions in emissions for purpose of ensuring timely attainment
- RFP plan is due with attainment demonstration
 - If attainment date is no later than 5 years from designations (up to 2014), RFP is met by attainment demo
 - For areas proposing an attainment date more than 5 years from designations, the State must establish emission reduction milestones for 2014 (and 2017 if applicable) showing “generally linear” progress from the base year through the attainment year
 - Alternate reductions amounts by pollutant are possible if they would achieve equivalent air quality improvement
 - Base year for RFP inventory should be same as for attainment demo
- Mid-course review due in 2016 for areas with attainment date in year 9 or 10 from designations (2018 or 2019)
 - Evaluate progress in terms of emission reductions, ambient air quality, and implementation of measures
 - Adopt new strategies as necessary

Contingency Measures

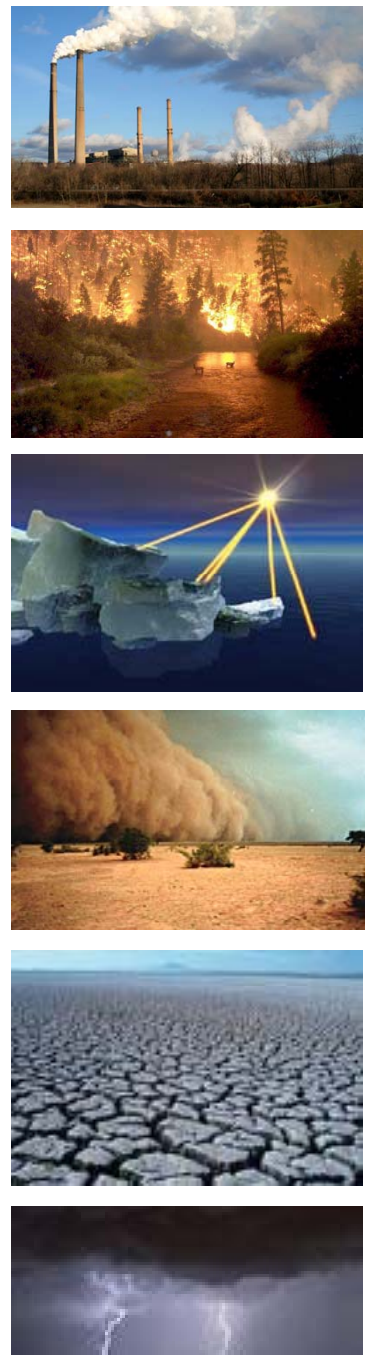
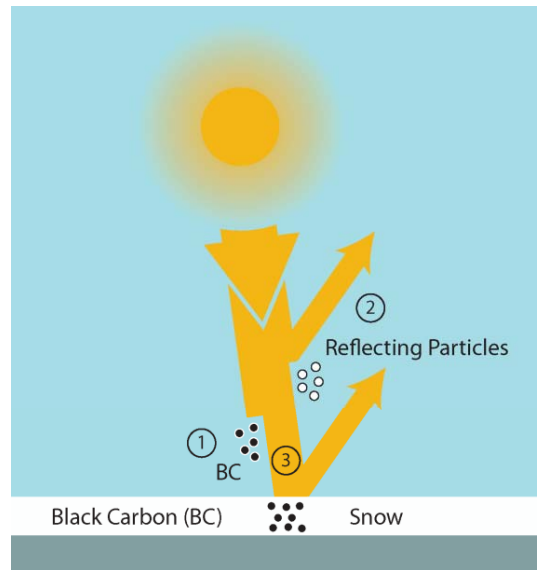
- Measures to be implemented without further action if area fails to attain by its attainment date or fails to meet RFP requirements.
- Need to be measures other than those required for attainment or to meet RFP
- Level of reductions: equal to one year's worth of reductions needed to show attainment for the area
 - Example: if base year is 2008 and attainment year is 2014, then contingency measures should be equal to one-sixth of reductions (by pollutant) needed to show attainment, or provide for one-sixth of air quality improvement needed for attainment

Black Carbon and Climate Change



**** Recent estimates indicate that the global warming impact of black carbon may be larger than any GHG other than CO₂**

Sources: IPCC 2007; Ramanathan and Carmichael, 2008.



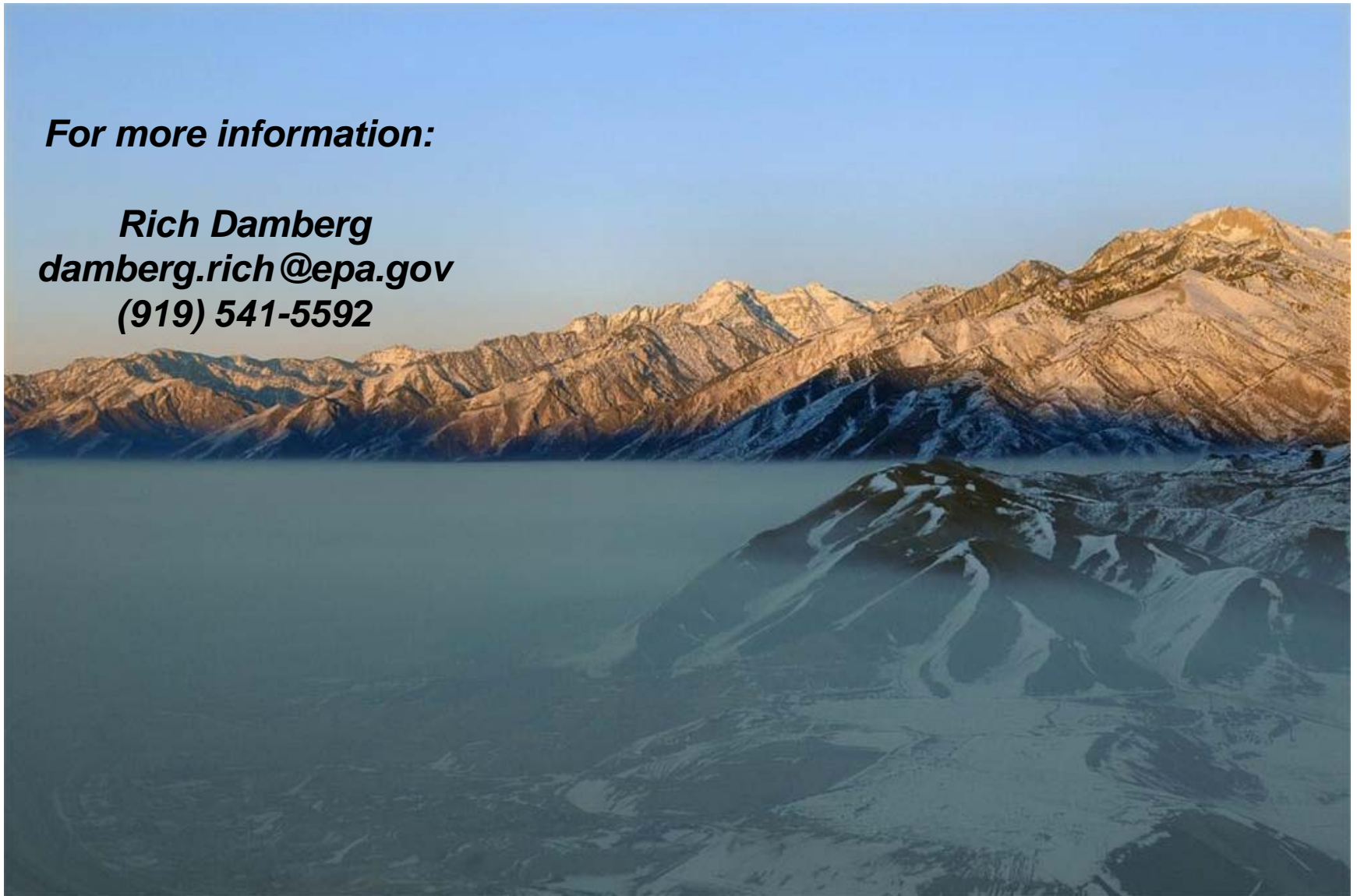
Black Carbon and Climate Change

- Important climate co-benefits can be achieved (particularly in regions with snow and ice) with reductions of conventional air pollutants (such as black carbon, methane, and ozone) to address public health concerns
- EPA Report to Congress on Black Carbon (mid-2011)
- UNEP Integrated Assessment of Black Carbon and Tropospheric Ozone - Summary for Decision Makers (issued 2/17/11)
See: www.unep.org/gc/gc26/download.asp?ID=2197
- UN Convention on Long-Range Transboundary Air Pollution
- Arctic Council



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Near Salt Lake City, 11/17/09, 35 ug/m3