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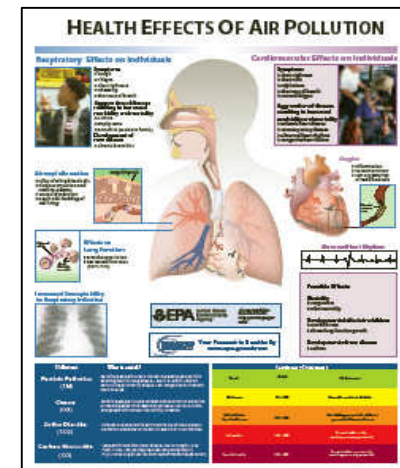
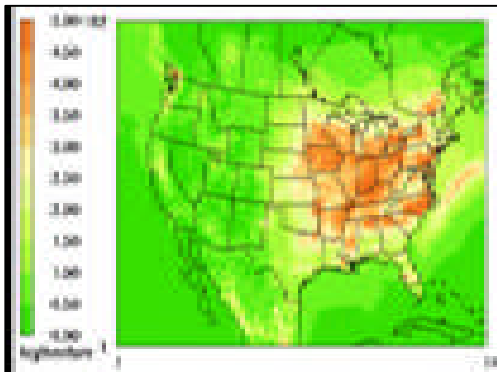
CLEAN AIR RESEARCH PROGRAM

BUILDING A SCIENTIFIC FOUNDATION FOR SOUND ENVIRONMENTAL DECISIONS

Clean Air Research Program

Introduction to the BOSC

Dan Costa, Sc.D., DABT
National Program Director
May 21, 2009



Goals of this Briefing



- Our approach to this program review
 - Provide the subcommittee with targeted & informative materials
 - Gain insights & an overall evaluation valuable in shaping our future
- A perspective of the 2009 Clean Air Research Program
 - EPA context – where does the Air program fit in?
 - Air pollution science leads to public health benefit
 - Historical context ► Today
 - The program vision - reoriented & restructured
 - Evolving: Source to health-outcomes / multipollutant sciences
 - Current Air program operations...
 - Integration & leveraging to achieve program goals
 - Program performance
 - Existing measures – “hierarchy of sources”
 - Validating useful measures of performance

The 2009 BOSC Program Review

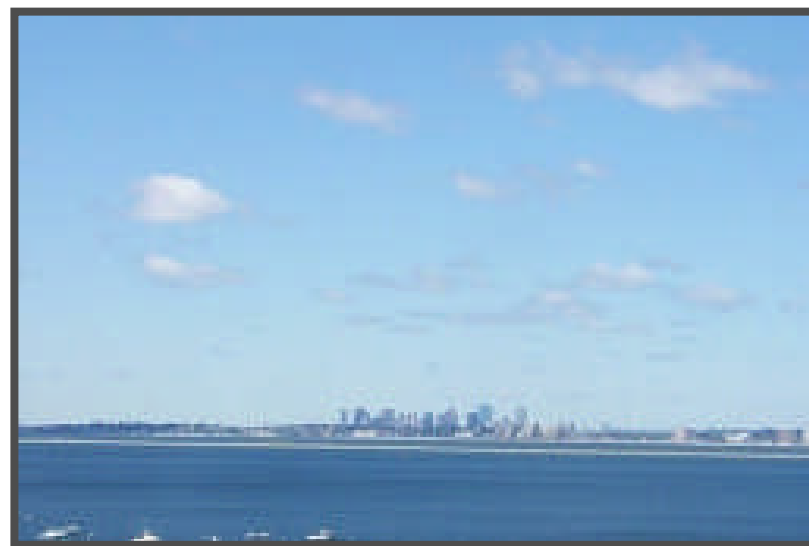
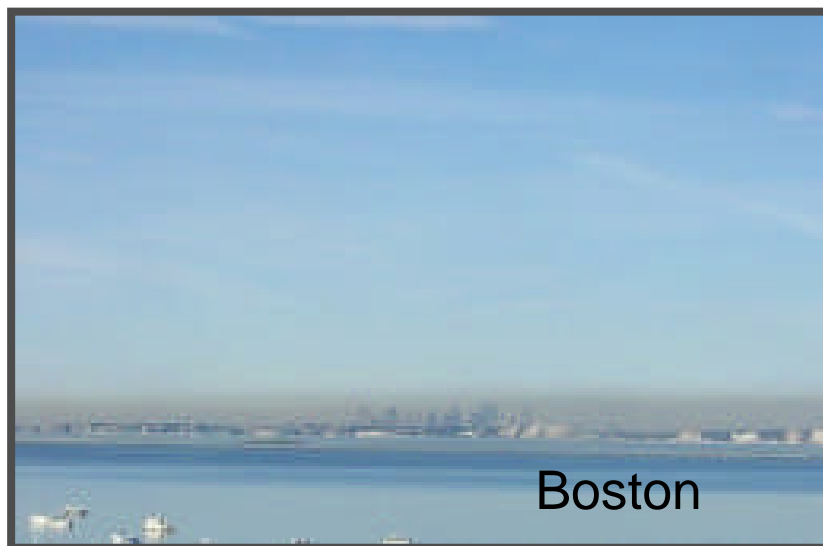
- Two conference calls
 - May 21: intro to the Air program
 - May 29: program & session overviews
- June 8-10: poster discussions
 - Focus 1: Program design
 - Right direction?
 - Right shift: Multipollutant?
 - Appropriate integration?
 - Focus 2: Program performance
 - Science / Program balance?
 - Quality, Relevance, Performance?
 - Meeting stakeholder needs?
 - Making a difference?
 - Enhancing public health?



Accomplishments Report 1998-2003

Accomplishments Report 2003-2008 (in draft)

The Clean Air Research Program is a multidisciplinary, problem-oriented research program that relies on coordinated and leveraged science to better understand and reduce the risks associated with air pollution.



A Brief History of the Program

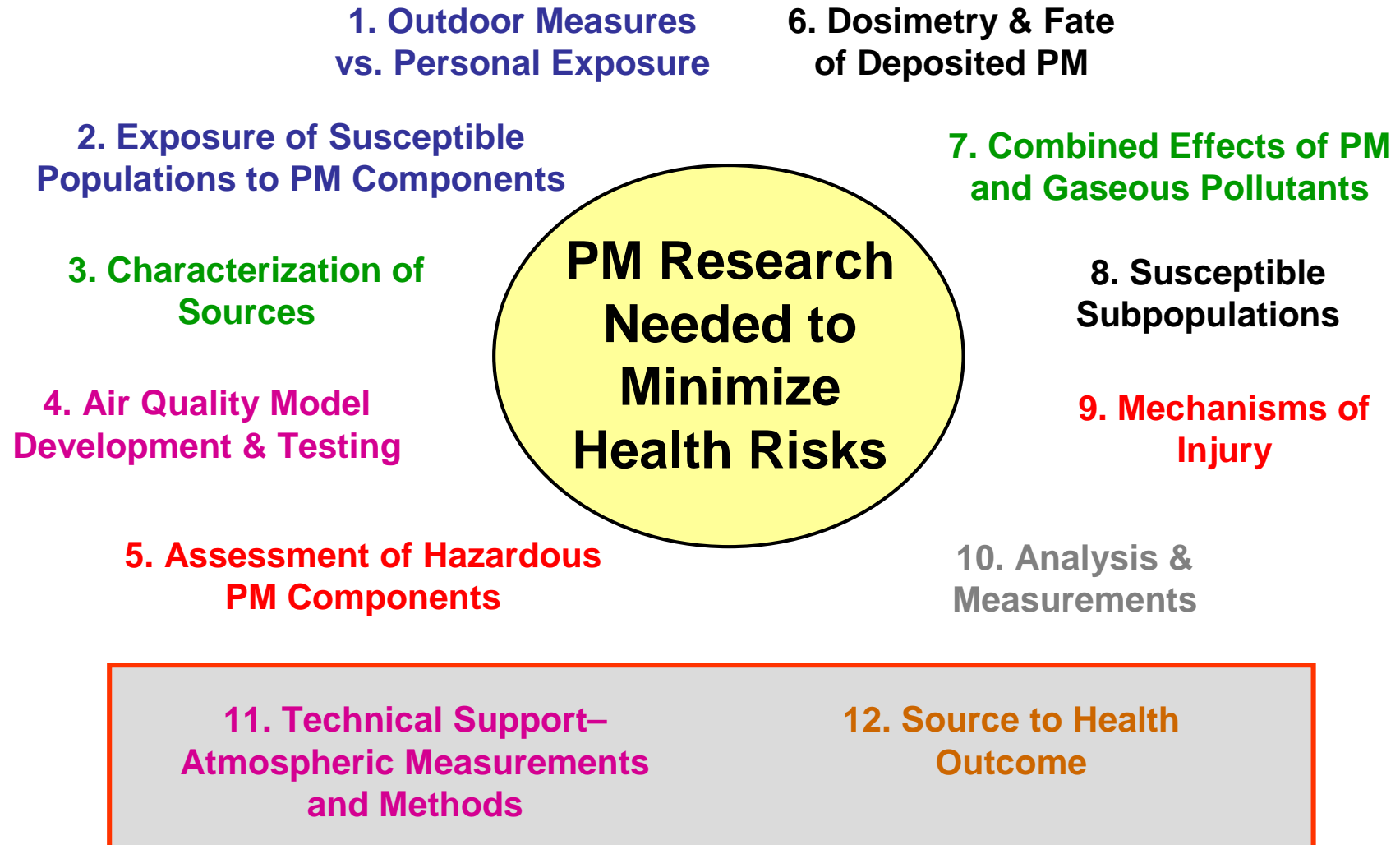
- **Pre-1998 ORD's Gases & Particles Program (GAP)**
- **1998 – New Emphasis on PM**
 - Congress added \$22.4 M/yr to EPA's PM Research Program:
 - Redirect & expand intramural program
 - Establish NAS / NRC expert panel on research priorities
 - Expand STAR PM Grants Program (5 Centers & RFAs)
 - Coordination across federal agencies
- **2005 – PM and O₃ Programs combined (1st BOSC)**
 - A shift in emphasis to 'pollutant sources'
- **2007 – PM/O₃ combined with Air Toxics (mid-cycle BOSC)**
- **2008 – Clean Air Research Program – multipollutant shift**

NRC Reports: Research Priorities for Airborne Particulate Matter

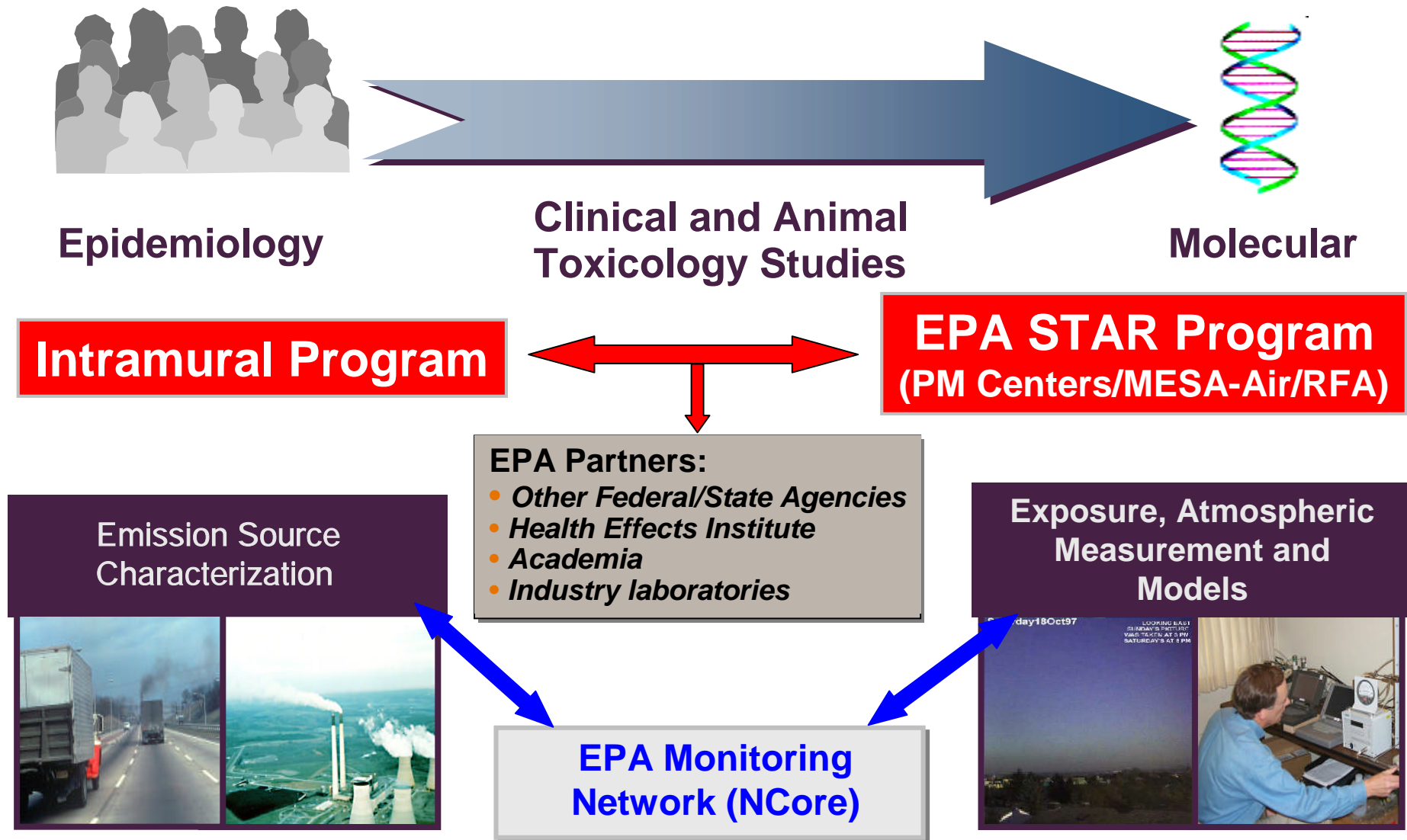
- Important research needs identified
- Recommended a multi-year portfolio of the highest priority research topics



NRC PM Research Priorities - 2005



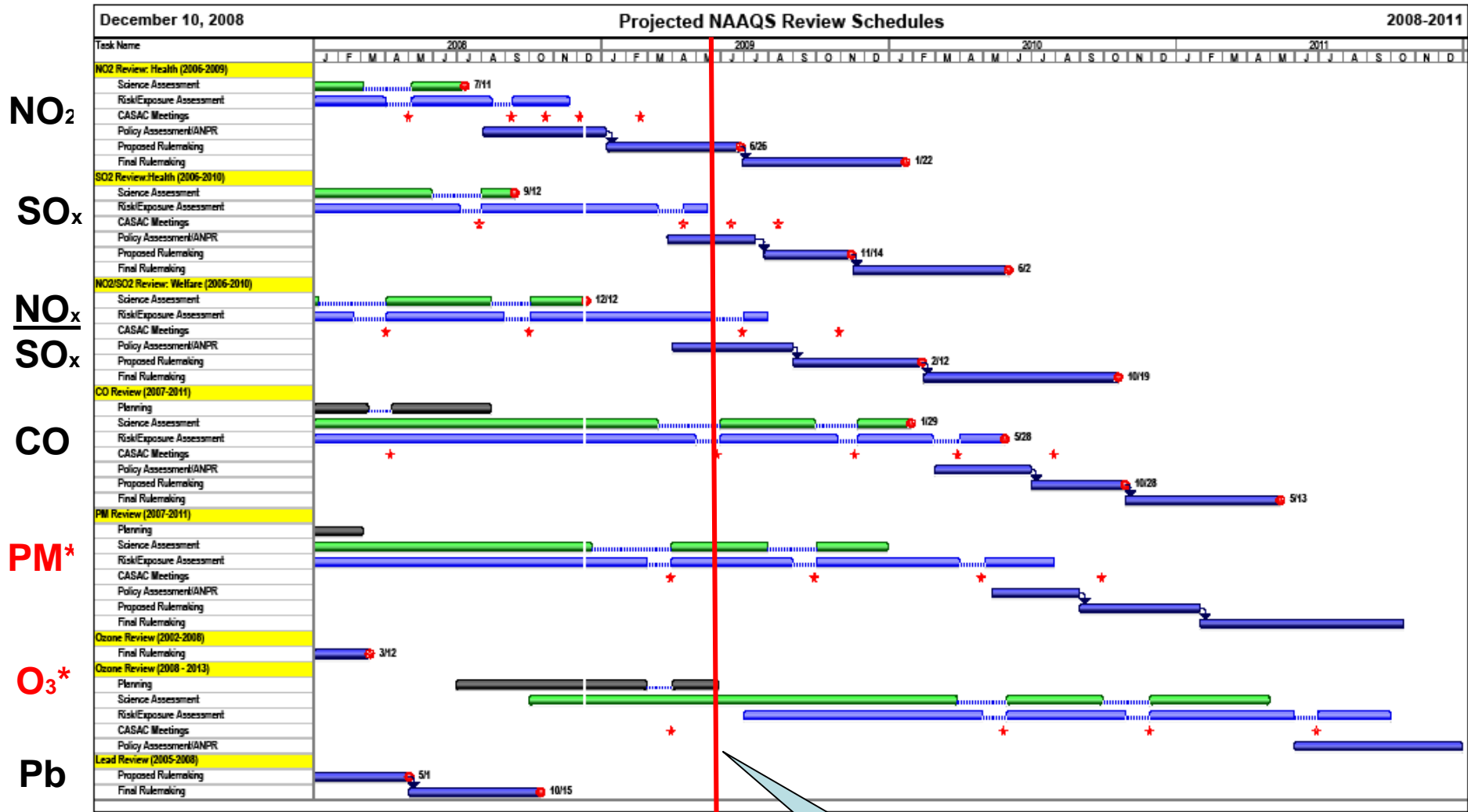
The Clean Air Research Program



How are Our Priorities Established?

- **NRC subcommittees** – two primary groups
 - PM Res. Priorities: 1998-2004
 - Air Quality Mgmt: 2004 (CAAAC Response: 2004)
- **Research Coordination Team** – representing clients
 - Office of Air & Radiation – OAQPS; OTAQ; ORIA; OAP
 - Nat'l Center for Environmental Assessment
 - Integrated Science Assessments (NAAQS); IRIS
 - Regions – member contributions and NPD visits
- **SAB, BOSC, Lab / Center reviews**
- **Science Leaders** – emerging issues
 - Sr. Mgrs & staff; nat'l / internat'l meetings
- **Public** – generally reflected in Regional input
 - Occasional Congressional input

The NAAQS Reality as of Dec 2008



*Schedule may change

Today

The Program Science Reality: Why is Air Pollution a Significant Health Hazard and What Can We Do?

- Is it the PM size and / or composition? (Hazardous Attributes)
- How does PM exposure lead to mortality? (Causality)
- Are there chronic effects attributable to PM? (Life-shortening)
- Do co-pollutants have singular or interactive roles? (Mixtures)
- Are ozone's effects underestimated? (Dose-effects & Mortality)
- Who is at risk of adverse effects? (Susceptibility – disease, age, SES)
- Are there host factors? (Disability; Gene-Environment)
- Is there a source hierarchy for PM toxicity? (Relative Toxicity)
- Are there other environmental factors? (Indoor Exposures; Climate)
- How do we assess risk? (Exposure, Source Attribution, Atmos. Models)
- How do we mitigate risk? (Tools, Models, Control, Interventions, Alternatives)
- How best do we manage air quality? (Sources-to-Health Outcome)

2008 Revised Multi-Year Plan

- PM, O₃ & Air Toxics integrated into one *Clean Air MYP*
- Emphasis on program integration and leveraging
- Emphasis on multidisciplinary science approaches
- Emphasis on developing a multipollutant research theme
- Communicating results
- Regulatory support with public health outcome



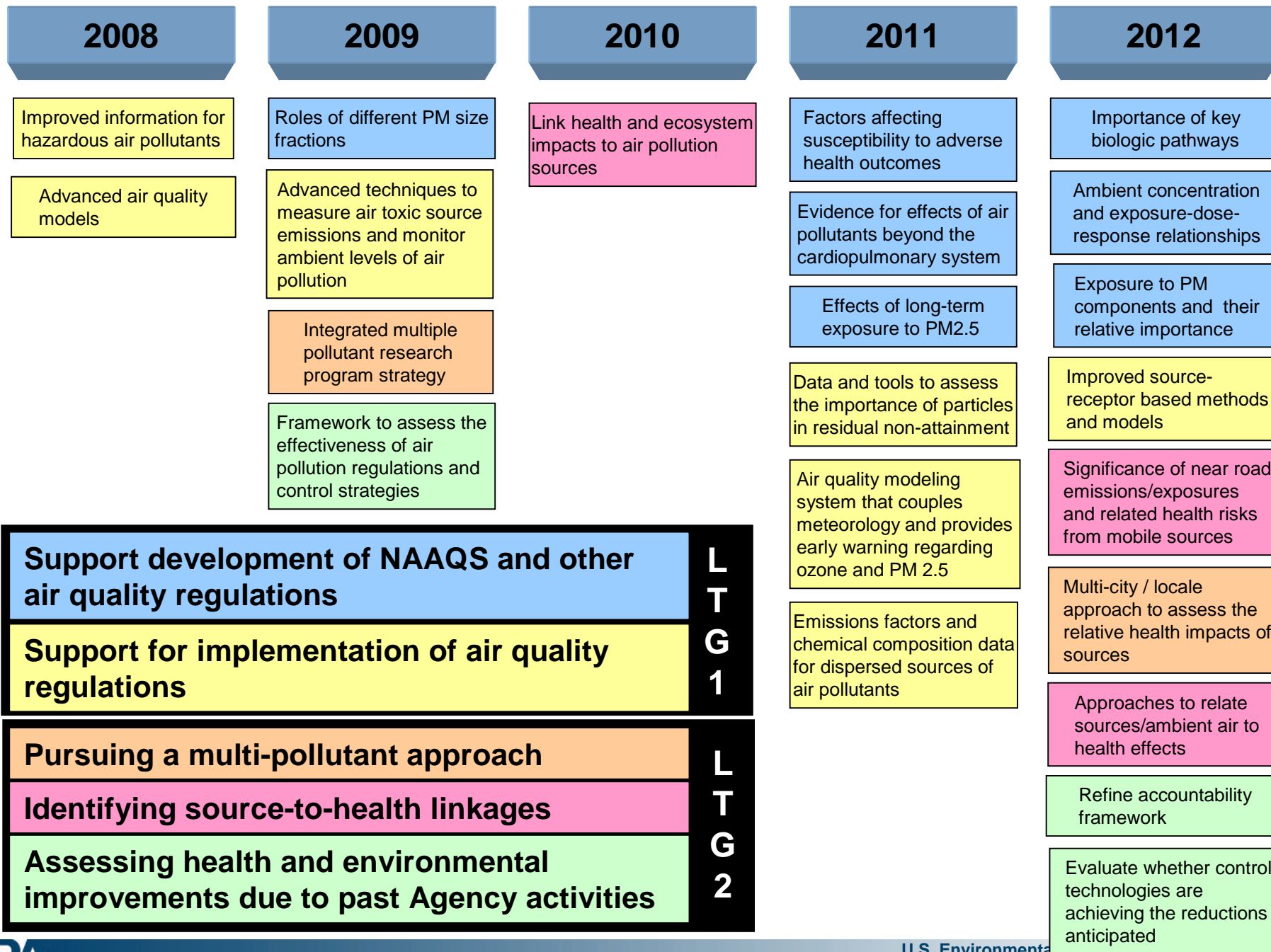
Long Term Goals

LTG 1 - Reduce uncertainty in the science that supports standard setting and air quality management decisions.

- Inform regulatory decision-making (NAAQS, AT)
- Support implementation of regulations (with tools, methods & models) and information to OAR, regions, states, tribes.

LTG 2 - Reduce uncertainties in linking health and environmental outcomes to air pollution sources.

- Launch a multipollutant research program
- Identify specific source-to-health linkages, with initial emphasis on “near roadway” impacts
- Demonstrate effectiveness of the science and its dependent policy decisions (accountability)
- Look to the future: air quality-climate interactions

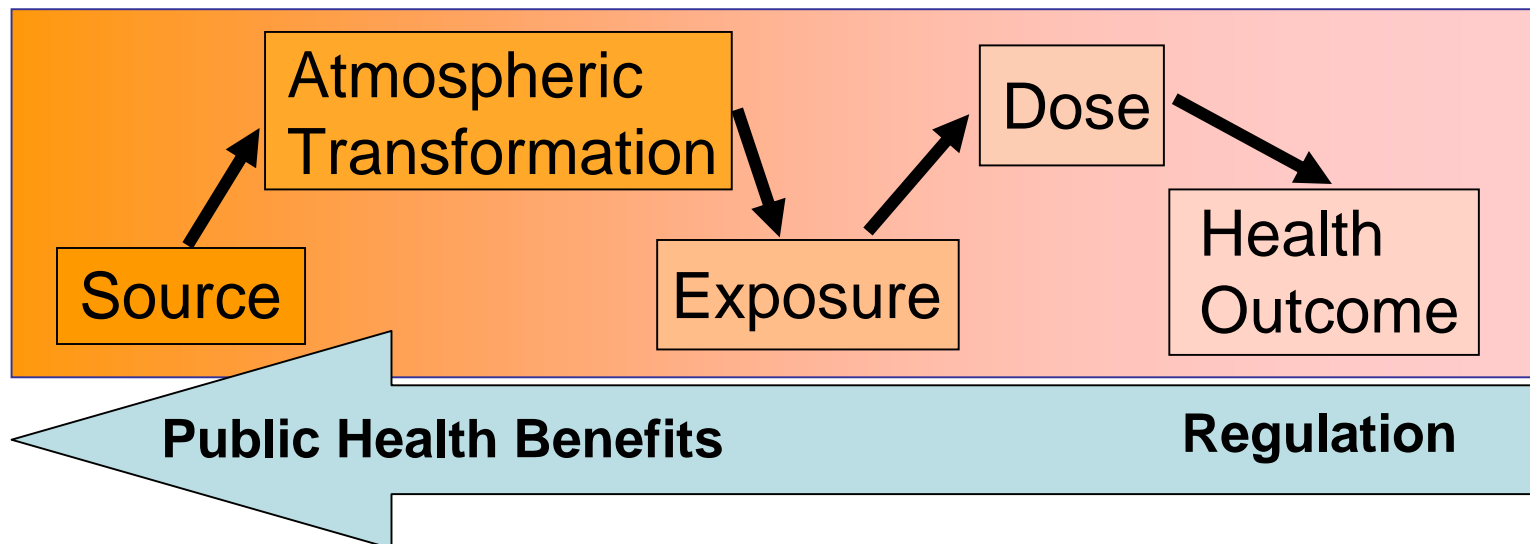


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Why Source-to-Health Outcomes?

Source to Health Outcome approach recognizes health outcomes are linked to sources via interconnected biological, chemical, and physical behaviors



- Greater degree of integration across disciplines
- Improved understanding of entire problem
- Yield efficient and effective regulation
- Link to public health outcomes

Prototype Source to Health-Outcome Approach: Near Roadway Studies

Pressing Program and Regional Need with PM and Air Toxic Implications



- Asthma
- Birth defects
- CV effects
- Cancer

- What do we really know about exposure?*
- Health Implications?
- Interventions exist – value?

**Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects – Health Effects Institute (May, 2009)*

Draft Near Roadway Action Plan Overview

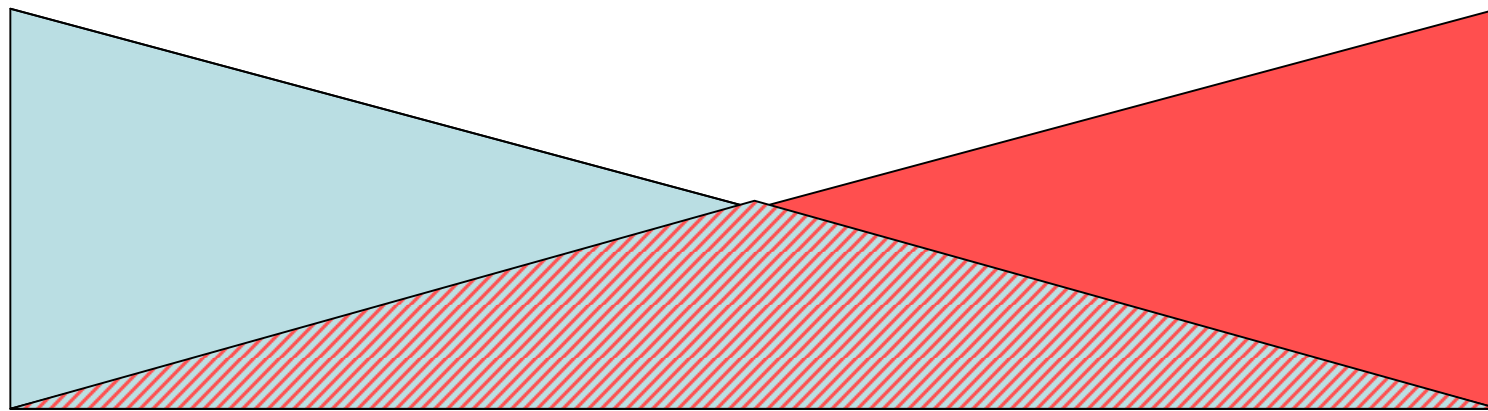
- **Source / Emissions** – characterization (combustion and mechanically generated); source apportionment; impact of traffic conditions (e.g., volume, speed, fleet mix)
- **Air Quality** – spatial and temporal variability; atmospheric processes; impact of environmental conditions (e.g., topography, meteorology)
- **Exposure Assessment** – gradients; source apportionment
- **Model Development** – local variations, barriers
- **Health Effects** – source apportionment; tox and epi panel study (Univ. Mich. Coop. for Detroit Study)
- **Indoor Micro-environments** – source impacts; mitigation

Near Roadway Research - Levels of Emphasis

NR Source Characterization
Atmospheric assessments



Exposure assessments
Health Outcomes



2008

- Partners:
- Fed. Highways
 - Regions / States
 - NIEHS?
 - Amer. Petrol. Inst.?

2013


Coordination with Partners

EPA coordinates and leverages its activities:

- Committee on the Environment and Natural Resources - Air Quality Res Subcommittee (co-chair)
- Health Effects Institute – strategic planning
- NHLBI – MESA funding base for MESA-Air
- NIEHS – co-funded cardiology grants (2004, future?)
- Fed. Highway Admin. – near-road program
- NOAA – atmospheric modeling / climate
- Funders Group – research coordination and opportunities
- Research Database – under development

Air Research Inventory | US EPA | Web Guide | US EPA

U.S. ENVIRONMENTAL PROTECTION AGENCY

PM Research 

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Air Research Inventory

Introduction

How Air Research Data is Categorized

Air Research records are sorted by views based on a data field or fields. The following sorted views are provided in the Air Research Inventory database:


- [by Research Institution](#)
- [by Pollutants](#)
- [by Atmospheric Science Studies](#)
- [by Emission Sources](#)
- [by Health Studies](#)
 - [Epidemiology](#)
 - [Toxicology](#)

Once you display a view you may view a particular Air Research record by clicking on a hot link provided in the view.

Searching the Air Research Inventory

Two methods are provided for finding Air Research records. A Free Form Text Search box and an Advanced Field Search form allow users to form generic text searches or searches more specific to air research field values.

The [Advanced Field Search](#) allows users to choose or fill in search criteria matching Air Research field data. Selection fields are "ANDed" on a particular search. However checkboxes within a particular search field are "ORed".

A Principle Investigator search link  [Search](#) is also provided in each Air Research record. When clicked, all records are returned for that Principle Investigator.

[PM Research Home](#) | [Research & Development Home](#)

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Last updated on Thursday, April 23rd, 2009.
<https://yosemite.epa.gov/ord/ari.nsf/HomePage?ReadForm>
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[https://yosemite.epa.gov/ord/ari.nsf/HomePage?ReadForm\[5/14/2009 12:58:15 PM\]](https://yosemite.epa.gov/ord/ari.nsf/HomePage?ReadForm[5/14/2009 12:58:15 PM])

Development of a Research Inventory

Air Research Inventory | US EPA | Web Guide | US EPA

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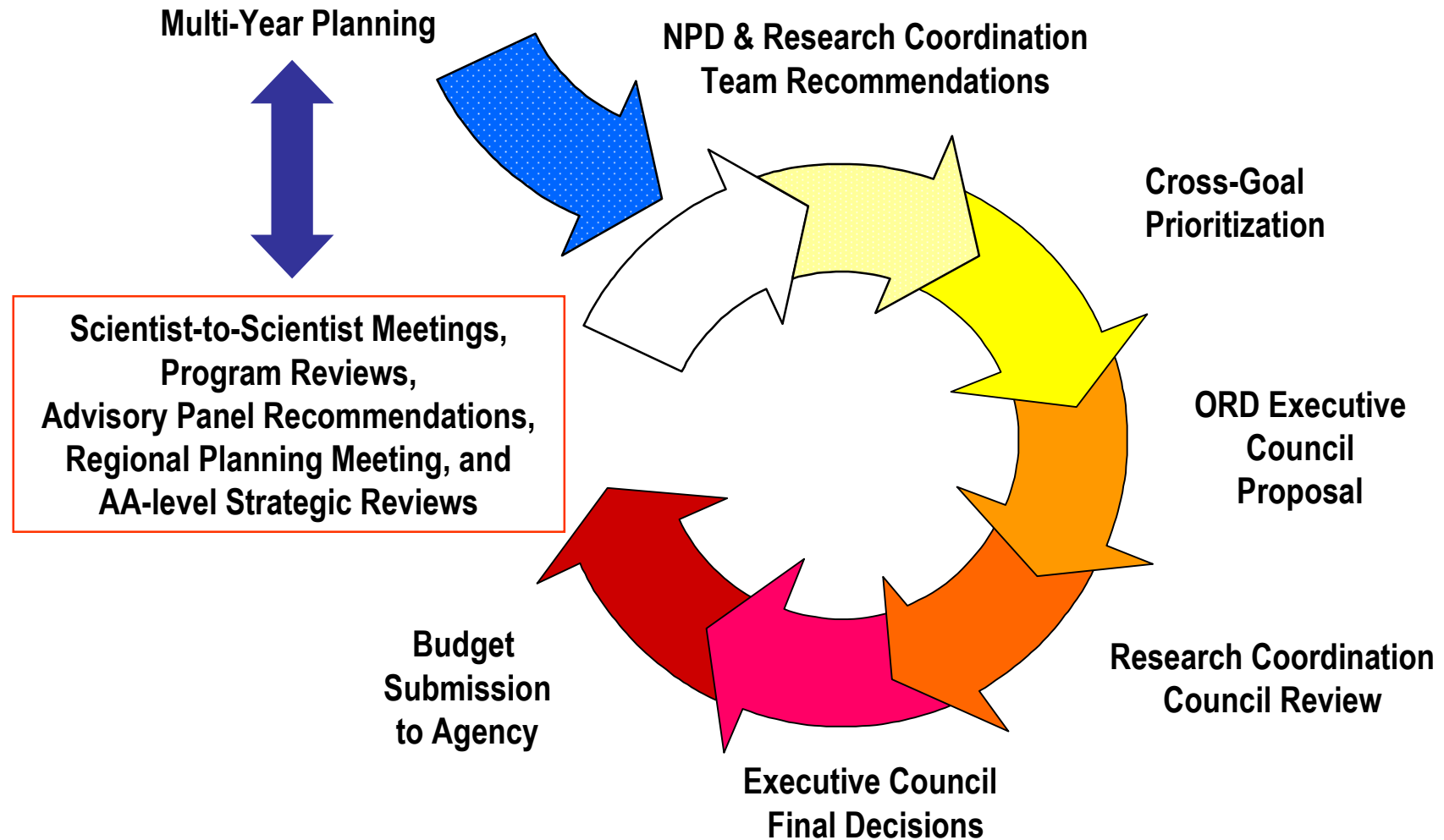
Air Research Inventory

You can make a request for values not currently in the Research Institution and Keyword lists by submitting a [Data Request Form](#).

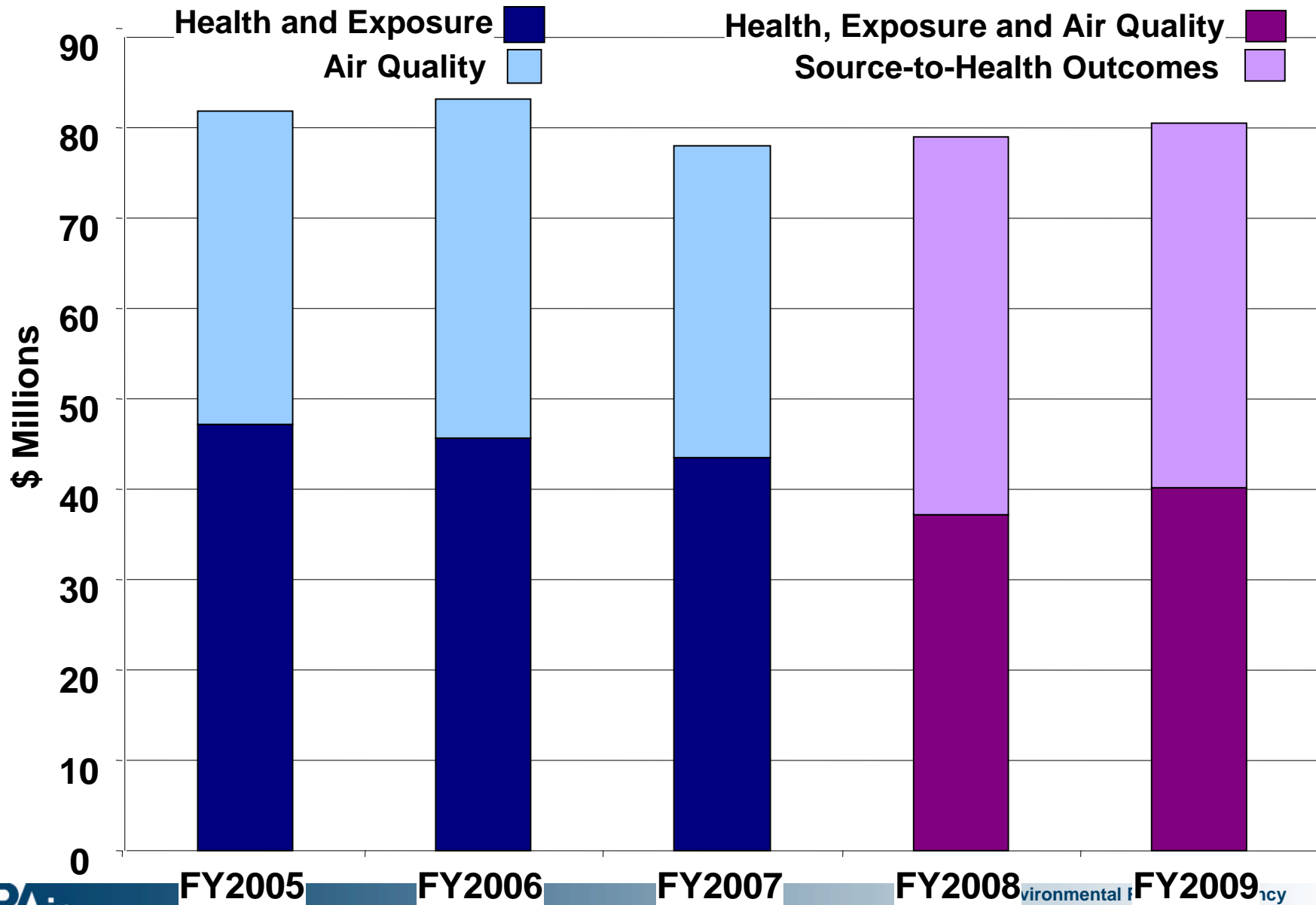
<p>Funding Organization</p>	<p>American Petroleum Institute (API) California Air Resources Board (CARB) Committee on Environment and Natural Resources Research (CENR) Electric Power Research Institute (EPRI) Environmental Protection Agency (EPA) Health Effects Institute (HEI) National Institute of Environmental Health Sciences (NIEHS) North American Research Strategy for Tropospheric Ozone (NARSTO) Northeast States Coordinated Air Use Management (NESCAUM)</p>
<p>Funding Organization Contact</p> <p>First Name</p> <p>Last Name</p> <p>Telephone</p> <p>E-mail</p>	
<p>RFA/Project Identifiers</p>	
<p>Research Institution</p>	<p>AER, Inc. Clarkson U sub to U of Rochester Clarkson University Colorado State College Desert Research Institute EOHSI EPA - National Center for Environmental Assessment (NCEA) EPA - National Exposure Research Laboratory (NERL) EPA - National Health and Environmental Effects Research Laboratory (NHEERL) EPA - National Risk Management Research Laboratory (NRMRL) EPA - Office of Air and Radiation (OAR) Forschungszentrum für Umwelt und Gesundheit Harvard Particle Center Harvard School of Public Health Johns Hopkins Johns Hopkins Particulate Matter Research Center King's College of London Lovelace Respiratory Research Institute</p>

[https://yosemite.epa.gov/ord/ari.nsf/AirData?OpenForm\[5/14/2009 12:59:54 PM\]](https://yosemite.epa.gov/ord/ari.nsf/AirData?OpenForm[5/14/2009 12:59:54 PM])

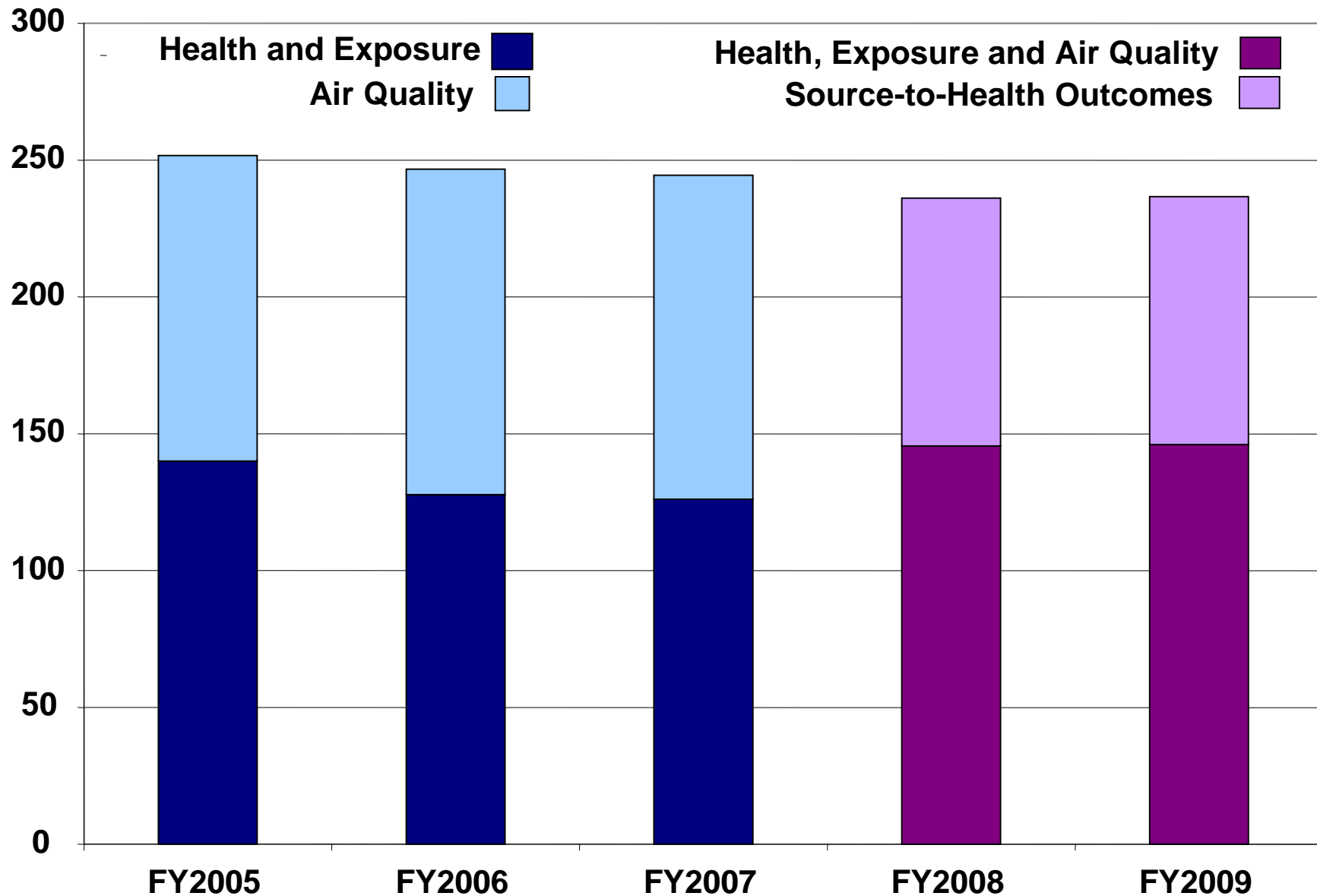
Synthesizing Research Priorities & Planning



Clean Air Research Enacted Budget



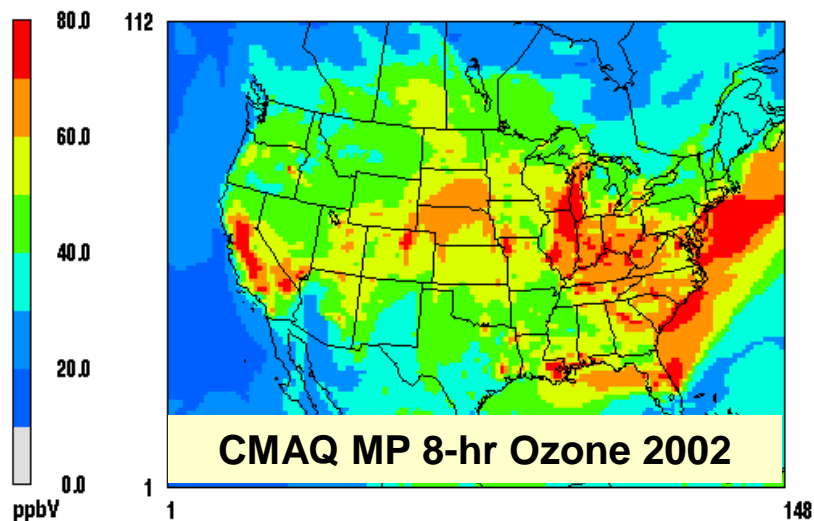
Clean Air Research FTEs



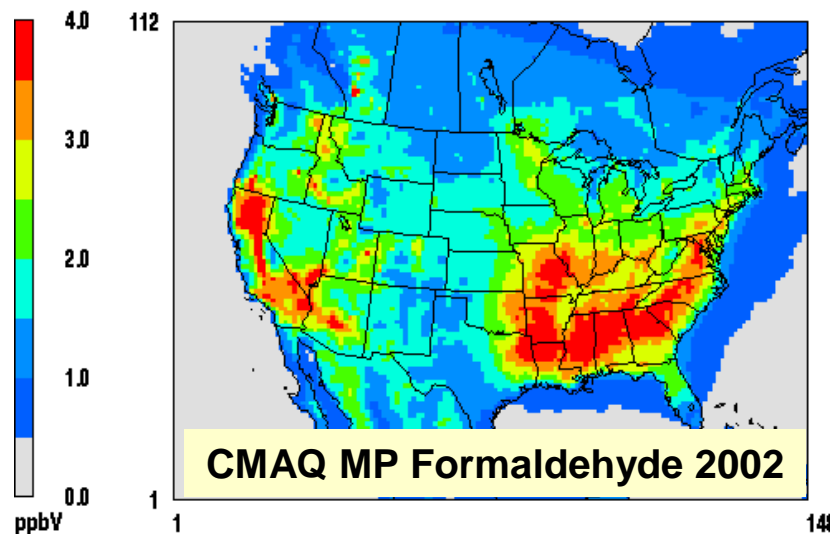
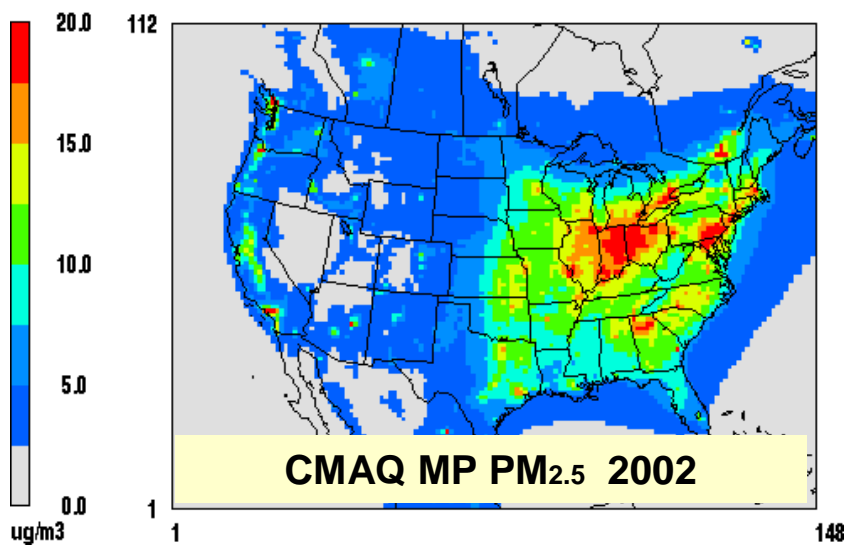
What's New: LTG-2 Vision

- Develop Multipollutant Program in coordination with OAR.
 - Build around the *Source to Health-Outcome* paradigm
 - Climate – air pollution interactions
 - Shift LTG-1:LTG-2 resource ratio from 60:40 to 40:60 by 2012
- Develop framework for Air Accountability
 - Build upon a platform of pilot projects to develop and advance broader approaches and systems to evaluate progress toward air quality management goals
 - Input/experiences from various sources: OAR collaboration, NCER HH grants, HEI, NARSTO report

Expanding the Application of AQ Models



- Development of MP Models
- Regional to Local
- Explore refined exposure estimates through the use of source-apportionment and AQ models linked to population data



Performance Measures: Assessing Annual and Long-Term Progress Toward Program Goals

Summary of Program Performance Measures

- Long-Term Measures:
 - BOSC assessments of progress toward each long-term goal (methodology based on a cross-ORD approach)
 - Percentage of program outputs that appear in the OAQPS PM NAAQS Staff Paper
- Annual Measures:
 - Percent of program publications deemed “highly cited” in bibliometric analyses
 - Percent progress toward completion of a hierarchy of air pollutant sources based on the risk they pose to human health
 - Percent of planned actions completed toward the long-term goal of reducing uncertainty in the science that supports standard-setting and air quality management decisions
- Efficiency Measure:
 - Percent variance from planned cost and schedule (methodology based on a cross-ORD approach)

Measuring Progress Toward LTG 1

- Assessing the reduction of uncertainty in standard setting and implementation
 - BOSC rating of progress toward the long-term goal provides important long-term measurement data.
 - In the past, a second long-term measure assesses the percentage of program products that are cited in the OAR Staff Paper. However:
 - OAQPS has migrated to a *Policy Assessment* document with the bulk of science now included in the *Integrated Science Assessment (ISA)* and *Risk & Exposure Assessment* document.
 - There may be yet more changes but plan is to use *Risk & Exposure Assessment* document.

Challenges: Measuring Progress LTG 2

- Evaluating progress in assessing “source to health-outcome” linkages
 - New BOSC rating of progress toward the long-term goal provides important long-term measurement data.
- Currently, the program has the long-term goal:
 - “percent progress toward a hierarchy of air pollutant sources based on the risk they pose to human health.”
 - Hierarchy - difficult to quantify and therefore measure, the program continues to work on a modification of this measure.

Proposal: Measuring Progress LTG 2

Identify ~5-10 source categories (with OAR) and develop two sub-measures that track in parallel as technology and indicators allow

- Source to Air Quality: Reduce uncertainty in characterizing relationships between Source Emissions and Air Quality.
 - Enhanced emission characterization, atmospheric process measurement and modeling, and source apportionment techniques
 - Focus on indicators – what to measure; how to handle uncertainty reduction in multiple sources with a single index?
- Air Quality to Health: Reduce uncertainty in characterizing relationships between Air Quality and Health Outcomes
 - Enhanced exposure assessment and application of toxicology and epidemiological approaches
 - Source attributable health impacts
 - Indicators? Metrics?

Better reflects NRC & CAAAC reports on Air Quality Management

ORD Research Provides the Foundation for EPA's Decision-Making

EPA / ORD Clean Air science leadership is recognized worldwide

- Most highly cited publications among environmental sciences

EPA's PM research has significant regulatory benefits and impacts.

PM NAAQS - protect public health

- OMB - account for 63-88% of all benefits attributable to regulation
- OMB - \$63 to \$430 billion annual savings for 1996 to 2006 (emergency room / hospitalizations, lost workdays, premature deaths)
- Costs – \$25-28 billion

