

# Envisioning the Future:

## *Developing the HEI Strategic Plan 2010 - 2015*

*HEI Annual Conference*

Portland, Oregon

May, 2009



# *Envisioning the Future 2010-2015*

- *How have we done? (The Plan 2005 – 2010)*
  - The Air Pollution Mixture
    - PM and Gases
    - Air Toxics
  - Accountability
  - Emerging Technologies
  - An International Perspective
- *Looking Ahead: What should be on the agenda for 2010-2015?*



# The HEI Strategic Plan 2005 - 2010

## Topics for Consideration

### Major Opportunities

- Air pollution mixture
  - PM and gases
  - Components research
  - Air toxics
    - Exposure and health research
    - Review and synthesis
  - Diesel
- Emerging technologies
  - ACES
  - Special reviews
- Accountability
  - Research
  - Development of long-term methods, and studies
- Enhanced international perspective

### Other Possibilities

- Sensitive populations
- Reproductive effects
- Gases
- Health effects of climate change
- Innovative methods

## Planning Process and Selection Criteria

### Input from

- Sponsors
  - EPA
  - Motor vehicle industry
  - California Air Resources Board
  - Oil and chemical industry
- Scientific community
- Environmental community
- International agencies
- Others

### Selection Criteria

- Importance to public health
- Importance to regulation, technology (short and long term)
- Importance to science
- Work of others
- Possibility of a scientific contribution

## HEI Strategic Plan 2005-2010

*Infusing innovation and validation in all HEI science*

### Priority Research Areas

- Air pollution mixture (PM components/gases and their sources, and air toxics)
- Emerging technologies
- Accountability
- Enhanced international perspective

### Special Reviews

- PM Perspectives
- Air toxics
- Traffic and health
- Key fuels, fuel additives, technologies

### Cross-Cutting Issues

- Susceptible populations (elderly, children, others)
- Mechanisms
- Extrapolation

### Lower-Priority Items (to be monitored)

- Health effects of climate change
- Diesel signatures
- Single pollutants

# *Implementing the Plan 2005-2010*

- By early next year we will have:
  - Published , completed, and initiated *over 80 studies* on priority topics
  - Completed *3 major reviews*: air toxics, traffic, Asia
  - Launched *two major new initiatives* on:
    - Assessing the toxicity of components of the PM Mixture:
      - The HEI National Particle Component Toxicity Initiative (NPACT)
    - Testing emissions and health effects of latest diesel technology:
      - The Advanced Collaborative Emissions Study (ACES)
  - Initiated *web-access data sets* in PM and gases data; air toxics exposure, and the Asian literature



# *HEI Studies, Critical Reviews, Websites*

## *(At 4 years into a 5-year plan)*

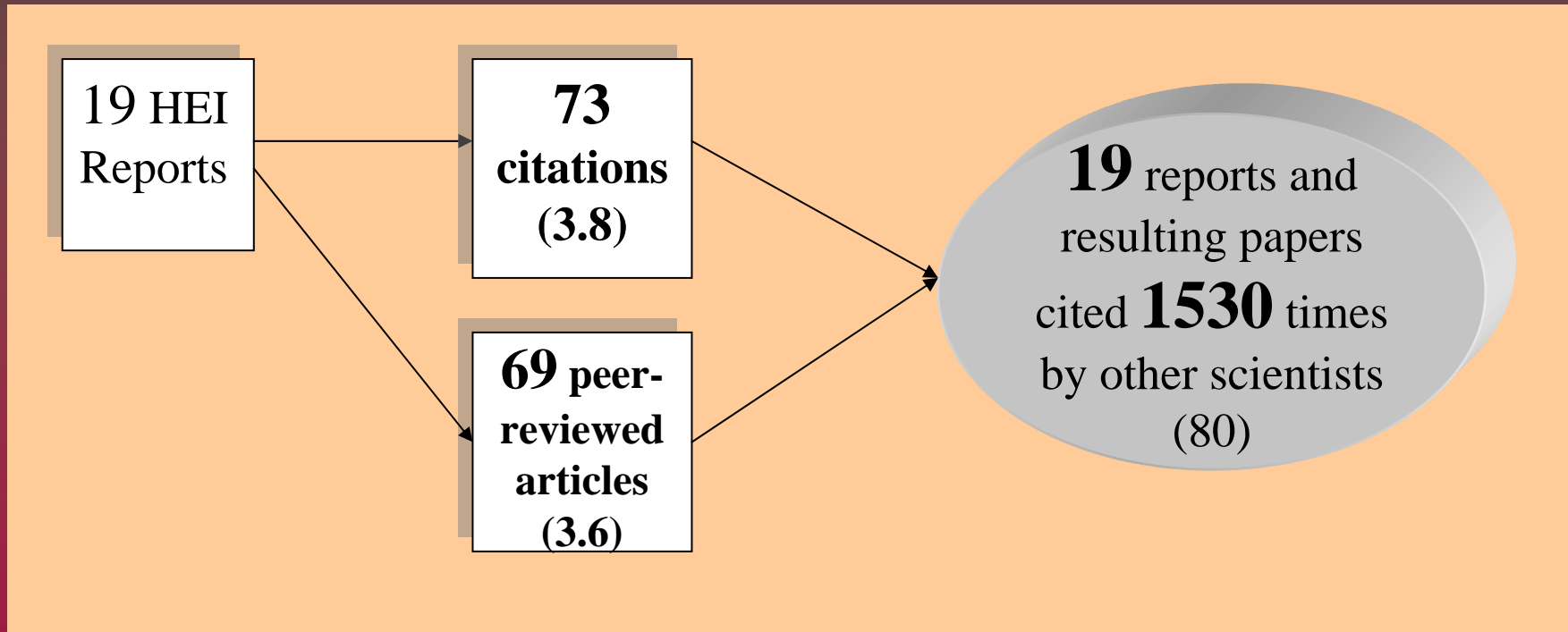
**Table 1: Number of HEI Studies and Publications 2005-June 2009**

|                             | <b>Studies*</b> | <b>Review</b> | <b>Published**</b> | <b>Special reports</b> | <b>Data Websites</b> |
|-----------------------------|-----------------|---------------|--------------------|------------------------|----------------------|
| <b>Air Poll Mixture</b>     |                 |               |                    | <b>1</b>               |                      |
| <b>PM and Gases</b>         | <b>25</b>       | <b>4</b>      | <b>9</b>           |                        | <b>1</b>             |
| <b>Air Toxics</b>           | <b>2</b>        | <b>9</b>      | <b>4</b>           | <b>1</b>               | <b>1</b>             |
| <b>Diesel</b>               | <b>5</b>        | <b>4</b>      | <b>5</b>           |                        |                      |
| <b>Emerging Tech., Fuel</b> |                 |               |                    |                        |                      |
| <b>ACES*</b>                | <b>1</b>        | <b>0</b>      | <b>0</b>           |                        |                      |
| <b>Accountability</b>       | <b>7</b>        | <b>4</b>      | <b>1</b>           | <b>1</b>               |                      |
| <b>International</b>        | <b>3</b>        | <b>8</b>      | <b>0</b>           | <b>2</b>               | <b>1</b>             |
| <b>TOTAL</b>                | <b>43</b>       | <b>29</b>     | <b>19</b>          | <b>5</b>               | <b>2</b>             |

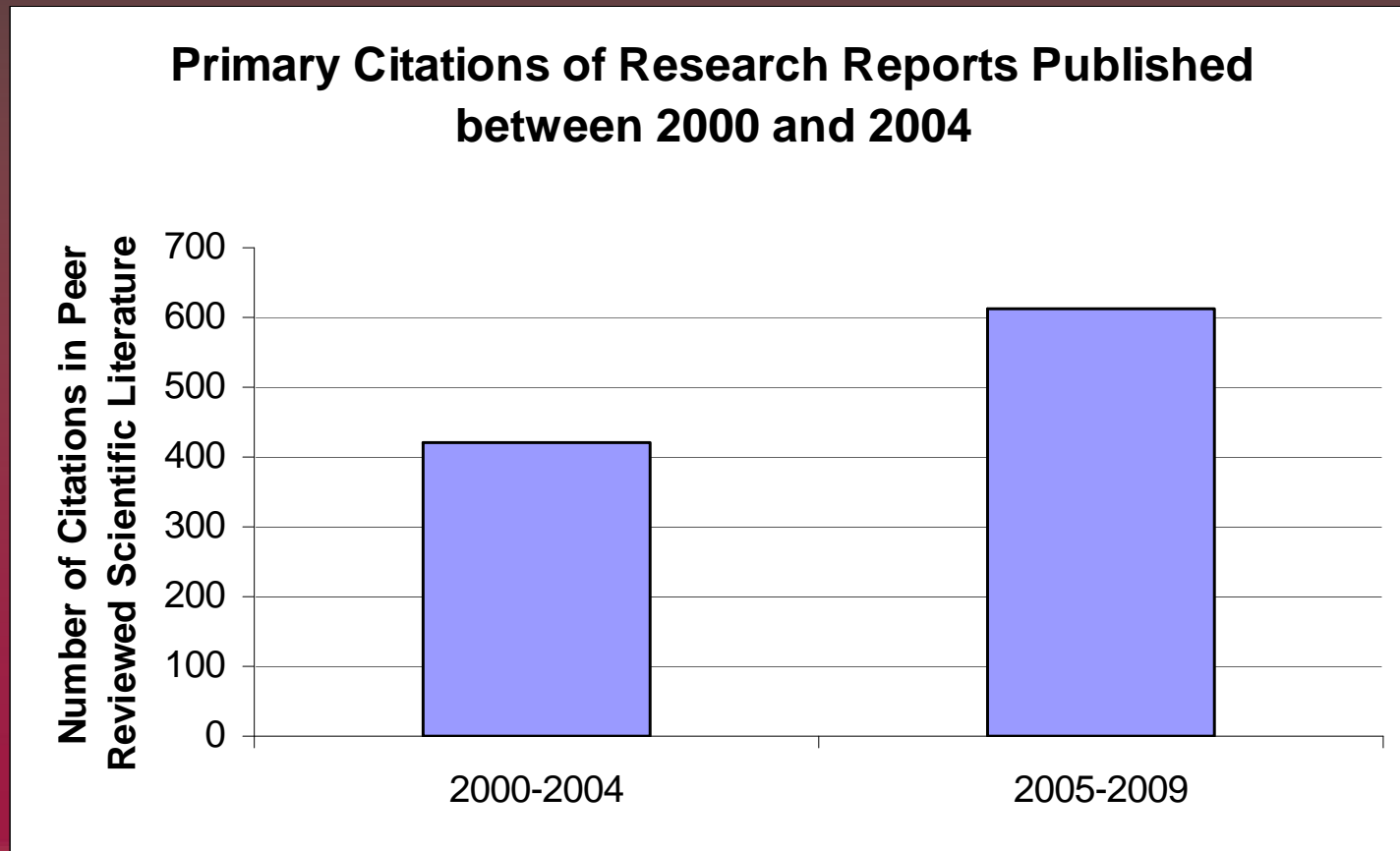
\* 5 adjunct ACES studies, not yet included here, will be underway in Summer 2009 \*\* Excluding 17 pilot reports and 4 unpublished reports

# *HEI Reports Cited Widely in the Scientific Literature*

*(Some 80 citations on average for each HEI Research Report and its Papers)*

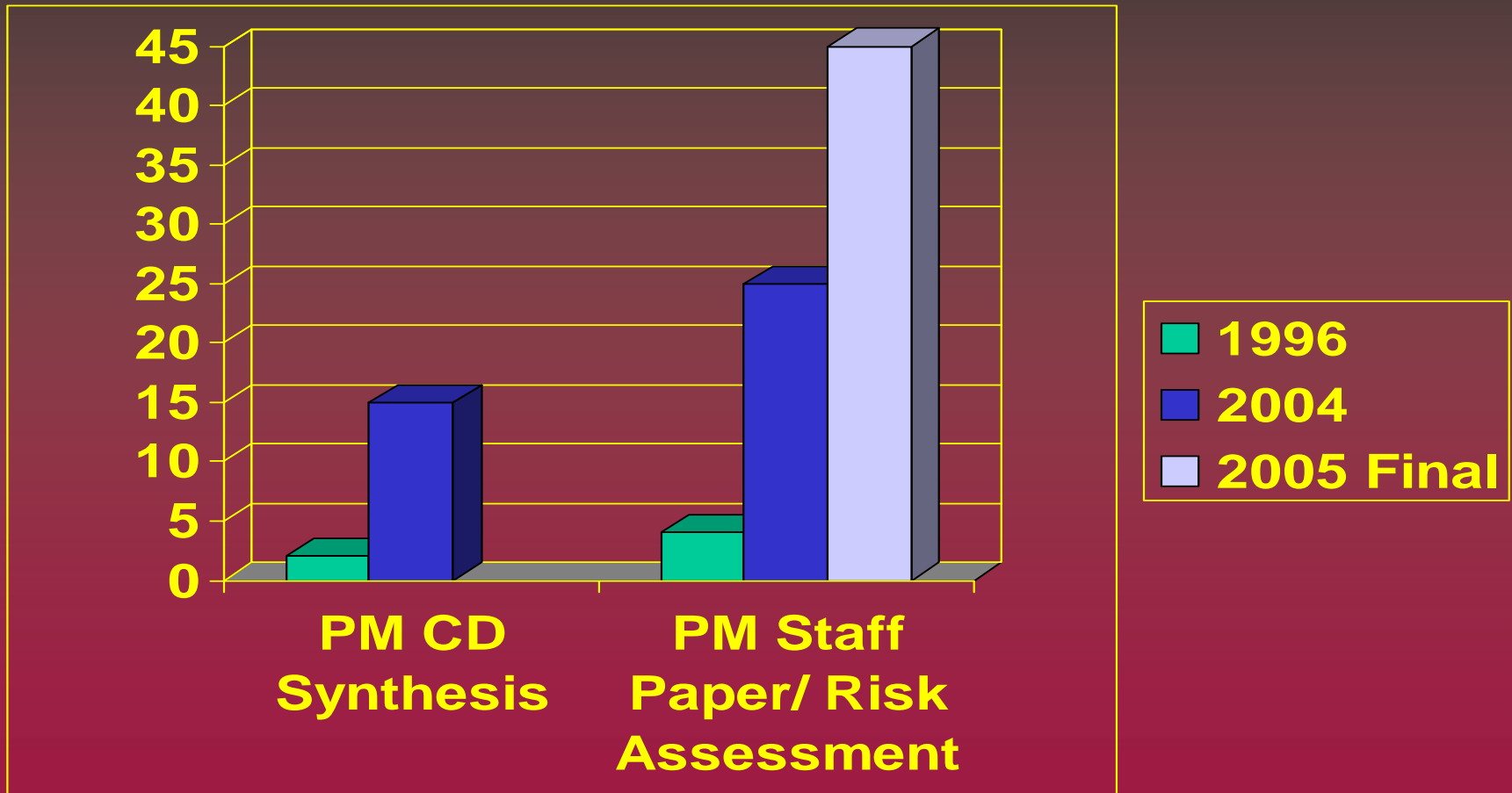


# *Older HEI Reports Continue to be Cited Widely in the Scientific Literature*



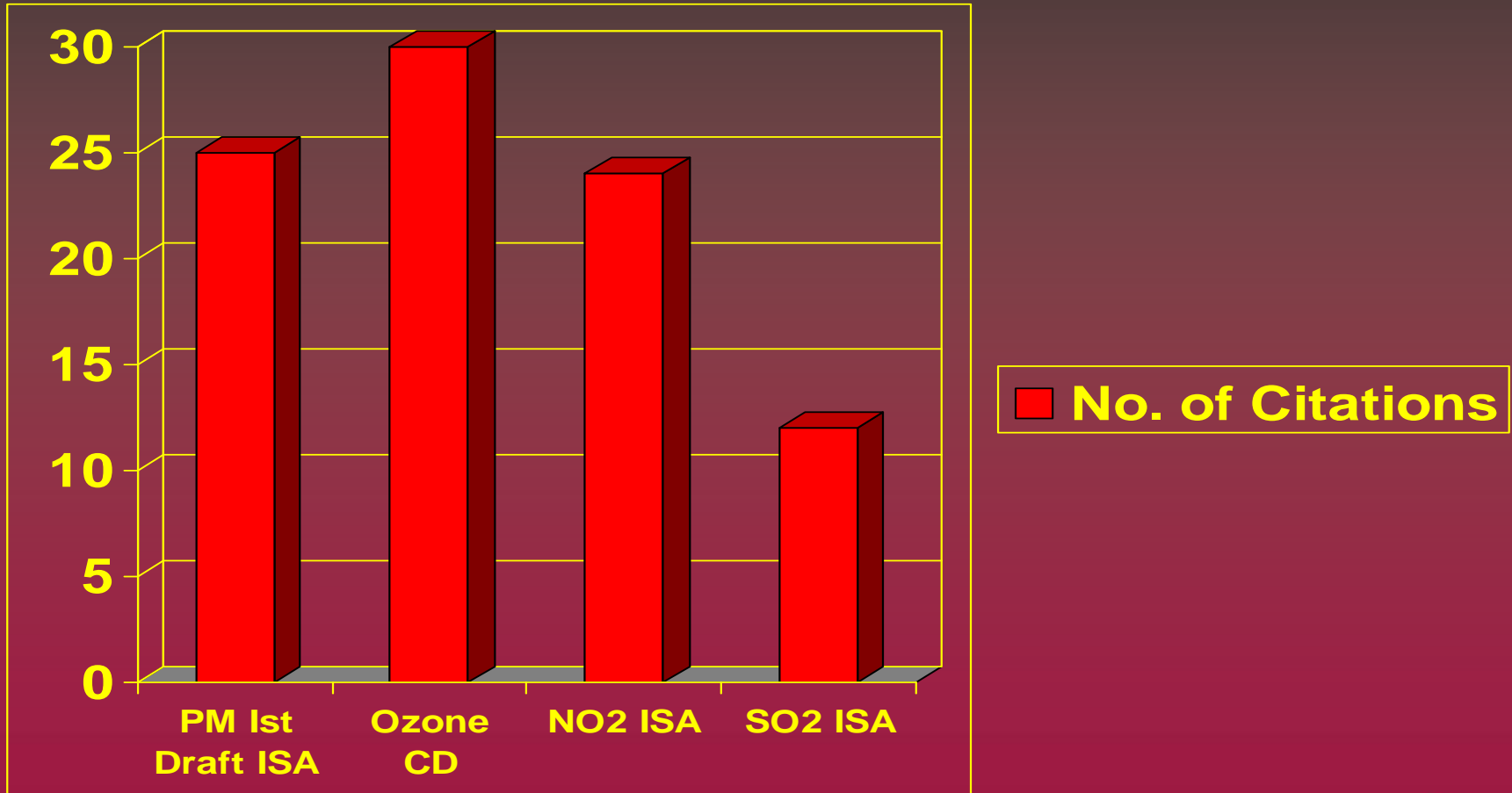
# Regulatory Impact: 2006 PM NAAQS

(Number of HEI Reports cited in U.S. EPA PM NAAQS Documents)



# Impact in a Number of NAAQS

(Number of HEI Reports cited in U.S. EPA NAAQS Documents)



# *I. Anticipating The Challenges Ahead:*

## **The Regulatory Challenges**

### In the US,

- NAAQS for NO<sub>2</sub>(2009), PM(2011), Ozone (2013?);
- Potential new CalLEV 3 and Tier 3 auto emission standards;
- Greenhouse Gas Emission Standards (Cal, US EPA)
- Renewable Fuels; low carbon fuel standards
- Revised interstate regulations for SO<sub>2</sub>, NO<sub>2</sub> and mercury (CAIR);
- others;

### In Europe,

- Clean Air for Europe Program (CAFÉ) review by 2013,
- EURO 6 standards for vehicles (including particle no. limits),
- Nanoparticle rules, and others

### In Asia, Worldwide

- Revision of Air Quality Standards in Asian countries,
- WHO World Air Quality Guidelines



# *I. Anticipating The Challenges Ahead:*

## *Scientific Challenges and Opportunities*

- Multi-pollutant approaches
- Toxicity of PM components, sources
- Long-term effects of Gases, PM
- Enhanced toxicology approaches

## *Emerging Technologies and Fuels (for climate, AQ)*

- Extensive new fuels development
- Hybrid and Electric Vehicles
- Gasoline direct injection, other fuel efficiency technology

*The increasingly global nature of air pollution*



# *Building a New Strategic Plan*

Jan – Apr: *Gaining Input*

The Web: [www.healtheffects.org](http://www.healtheffects.org)

May- Jun: *Reviewing a Draft Plan*

*Special Session HEI Annual  
Conference (Portland, May 5)*

*Written Comments by June 19, 2009*

Jun – Sep: *Revised Plan*

*Review by Sponsors*

*Winter 2010 Plan adopted by HEI Board*



# Future Opportunities and Challenges

## *PM and Gases*

- Complete the NPACT Studies to answer continuing key question: “Whose particle is it?”
- Initiate and complete studies from RFA 09-01
  - Innovative statistics for the air pollution mixture
- Implement a new program of human studies on PM and Ozone at relevant levels
- Consider also:
  - Follow-on studies on traffic (from HEI Traffic Review)
  - Review, at conclusion of NPACT, of all PM components studies
  - Review of exposure to and health effects of ultrafine particles



# Future Opportunities and Challenges

## *Air Toxics*

- Near Term
  - Complete studies on mechanisms of toxicity of 1,3-butadiene and acrolein
  - Complete studies in ‘hot spots’ of toxics
- Medium Term:
  - Additional analysis of the RIOPA data set – RFA 08-1
  - Assessing health effects of m mixtures – RFA 09-1
- Potential Opportunities Longer Term:
  - Health effects studies in high exposure settings (e.g., heavy traffic)
  - Targeted studies of health effects of priority MSATs
  - New Methods for toxicity testing
  - Studies or review of non-cancer end-points
  - Studies in susceptible populations



# Future Opportunities and Challenges

## *Emerging Technologies and Fuels*

- Completion of the Advanced Collaborative Emissions Project (ACES)
  - Phase 2 – 2010 emissions
  - Phase 3 – health testing
- Work with Special Committee on Emerging Technologies (SCET) to identify important topics, e.g.
  - Use of GDI and other technologies and ultrafines: emissions, exposures, and health effects
  - Alcohol fuels and their impact
  - NO<sub>x</sub> aftertreatment for advanced diesels, and their impact
  - Tools for screening of potential health effects
  - Lubricants and additives (including metals)
  - Electric and hybrid vehicles
  - Life-cycle issues of new fuels and technologies
- In many cases, need for review and synthesis of literature



# Future Opportunities and Challenges

## *Accountability*

- Maintain and strengthen commitment to Accountability research
  - Complete suite of initial accountability studies
  - Critically evaluate and document results and limitations
  - As field leader, publish new accountability monograph defining updated approaches and methods for the next generation of accountability research
- Potential New Research
  - Further methods development to assess difficult challenges inherent in evaluation of large national regulatory programs (e.g. NAAQS)
  - Seek to systematically initiate new research concurrently with the adoption of major new regulatory initiatives, e.g.
    - Significant national measures (e.g. increased use of alternative fuels)
    - Deepened commitment to study a specific area of intervention (e.g. ports, traffic, major recurring events)
  - Keep research application window open for *selected* time sensitive and or innovative proposals
- Expand relationship with CDC, state and national level tracking programs



# Future Opportunities and Challenges

## *International*

- Continue to competitively fund broadly relevant international research (Brunekreef, APHENA, Krewski, Zhang)
- Leverage research with European research partners (e.g, DG Environment, CONCAWE)
- Participate in key science oversight groups for highly relevant studies (ESCAPE, WHO Air quality guidelines)
- With supplemental funding,
  - provide quality studies to inform decisions in the emerging markets of Asia (e.g. fuel sulfur)
  - Complete original PAPA studies
  - Initiate carefully selected studies on topics with major public health implications (e.g. air pollution and acute lower respiratory infection, reproductive effects)
  - Maintain and update HEI databases of existing Asian studies as a key resource for decision makers and scientists (e.g. PAPA-San)
- Enhance distribution\impact of HEI research products
  - Provide Japan, European sponsor briefings on more frequent basis
  - Maintain HEI's credibility to provide science in key international forums



# Future Opportunities and Challenges

## *The Nexus of Climate and Air Quality*

- Growing attention to climate
  - And its complex links to air quality
- Potential areas for HEI:
  - Rapid assessment of health aspects of climate-driven emerging fuels and technologies
  - Targeted research on air pollutants that are also climate agents: identifying potential co-benefits
  - Investigate intersection of temperature, air pollution, and health
  - Health effects of climate change itself?
  - Other possible roles?



# Future Opportunities and Challenges: *Other Topics and Crosscutting Issues*

- *Susceptible Populations, e.g.*
  - Health effects of *children*
  - A possible focus on *senior citizens*
- *Nervous system and infectious disease effects of exposure to air pollutants*
- *Gaseous pollutants, particularly nitrogen dioxide and ozone*
- *Enhance exposure assessment*
  - *E.g. biomarkers, geographic information systems (GIS), microenvironments*
- *Incorporation of more innovative methods or new types of endpoints into HEI studies*
  - ranging from better utilizing new genomic and proteomic methods to continued enhancement and validation of statistics.



# Future Opportunities and Challenges: *Potential Special Reviews*

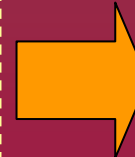
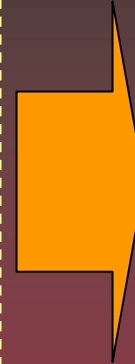
- ***Toxicity of PM Components***
  - A broader critical review of the literature including NPACT results
- ***Exposure and Health Effects of Ultrafines***
  - Systematic review of the literature, including potentially links to nanomaterials
- ***New Testing Techniques for Emerging Fuels and Technologies***
  - A review of what works and what is needed for rapid assessment
- ***Potential New Technology Reviews***
  - Use of GDI and other technologies and ultrafine emissions, exposures, and health effects
  - Alcohol fuels and their impact
  - NO<sub>x</sub> aftertreatment for advanced diesels, and their impact
  - Lubricants and additives (including metals)
  - Electric and hybrid vehicles
  - Life-cycle issues of selected new technologies and techs.
- ***Other Topics?***



# Choosing the Future 2010 - 2015

## Major Opportunities

- **The Air Pollution Mixture**
  - PM and Gases
  - Components research
  - Air Toxics
  - Exposure and health research
  - The Larger Mixture
- **Climate and Air Quality**
  - Climate, AQ, and Health
- **Emerging Fuels, Technologies**
  - ACES
  - Assessments of Fuels and Technologies
- **Accountability**
  - Research
  - Development of Long Term methods, studies
- **An International Perspective**
- **Other Possibilities**
  - Sensitive populations
  - Non-cancer effects
  - Enhanced Exposure science
  - Innovative statistical and biological methods



## *Strategic Planning Process*

### Input from:

- Sponsors
  - EPA
  - Motor vehicle industry
  - CARB
  - oil and other industries
- The Scientific Community
- The Environmental Community
- International Agencies
- Others

### Selection Criteria:

- importance to regulation/technology (short and long term)
- importance to public health
- importance to science
- work of others
- possibility of a significant scientific contribution

## The HEI Strategic Plan 2010 – 2015



## Lower Priority Items (To Be Monitored)

