Section 812 Second Prospective Health Benefits

HES Review
December 15, 2009

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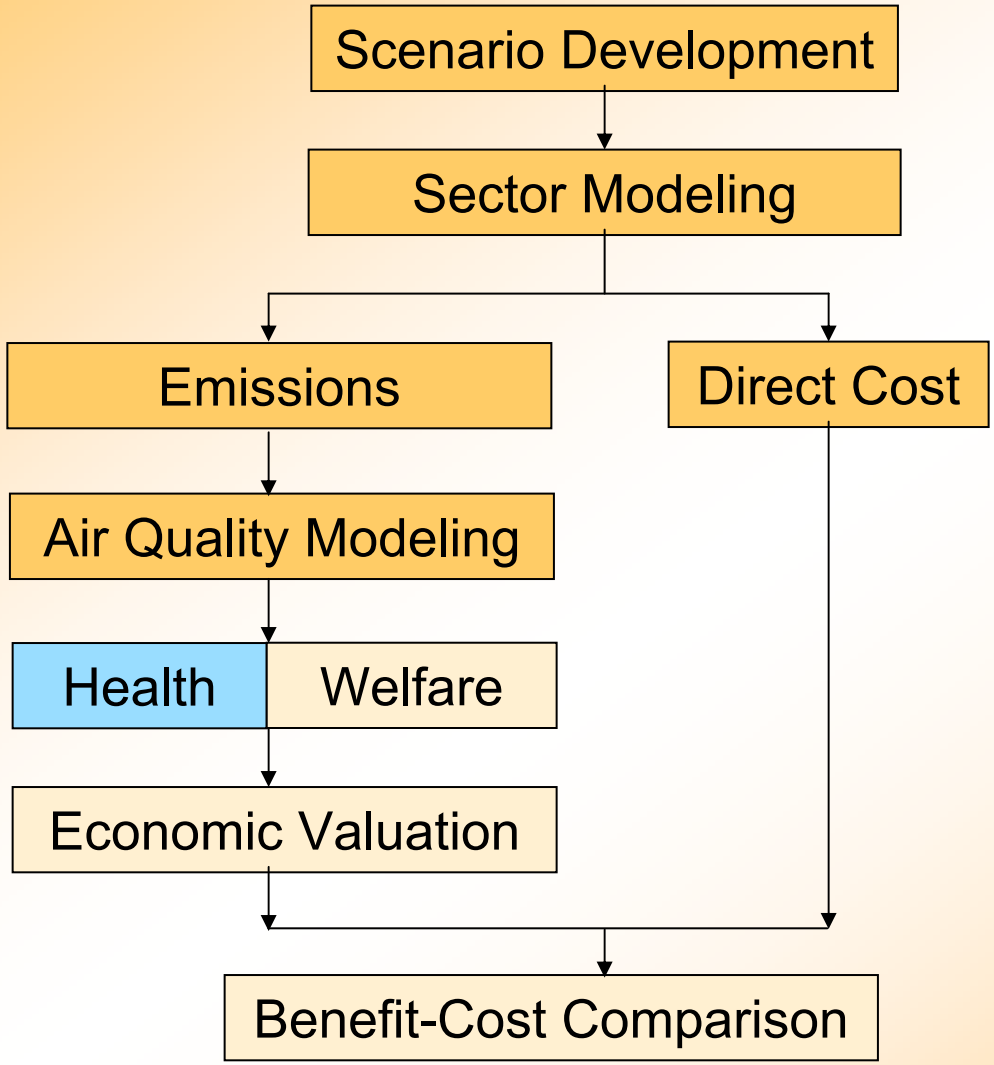
Project Team Presentations

- Jim DeMocker, EPA
  - Overall study goals, status
  - Diagnostics for five-fold increase in health benefits
  - Principle on configuration of 812 primary estimates
  - Merits of combining elicited expert judgments
  - Health effect inputs to macroeconomic modeling
- Neal Fann, EPA
  - Jerrett and Krewski approach for PM, ozone
- Henry Roman, IEc
  - Copula method for combining EE CRFs
- Jim Neumann, IEc
  - Dynamic population approach

Goals and Uses of the 812 Studies

- Stated Goals
  - Support CAA and related legislative efforts
  - Capture interaction effects between programs
  - Improve analytical methodologies for OAR, EPA
  - Help identify program and research priorities

- Anticipated Uses
  - Add refined perspective on value of CAA programs *per se* and co-benefits of GHG control
    - Example: better foundation for energy externalities work
  - Input to EPA strategic planning processes
  - Methods development laboratory
    - Examples: use of EE results, dynamic pop, CGE
  - Data and tools for other researchers, States



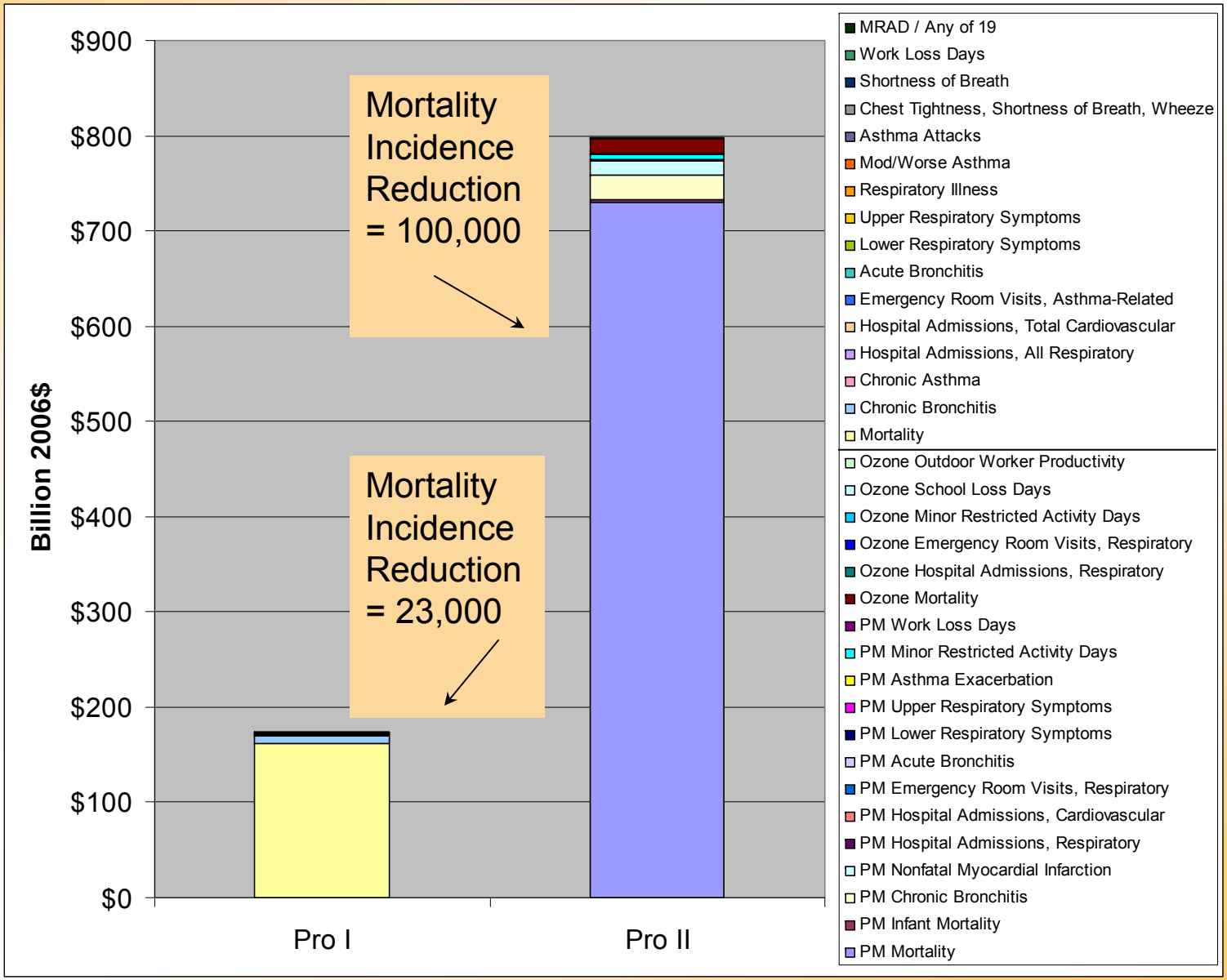
Scenarios:
Core
Hi Econ Growth
Lo Econ Growth
Marginal Changes

Supplemental Analyses:

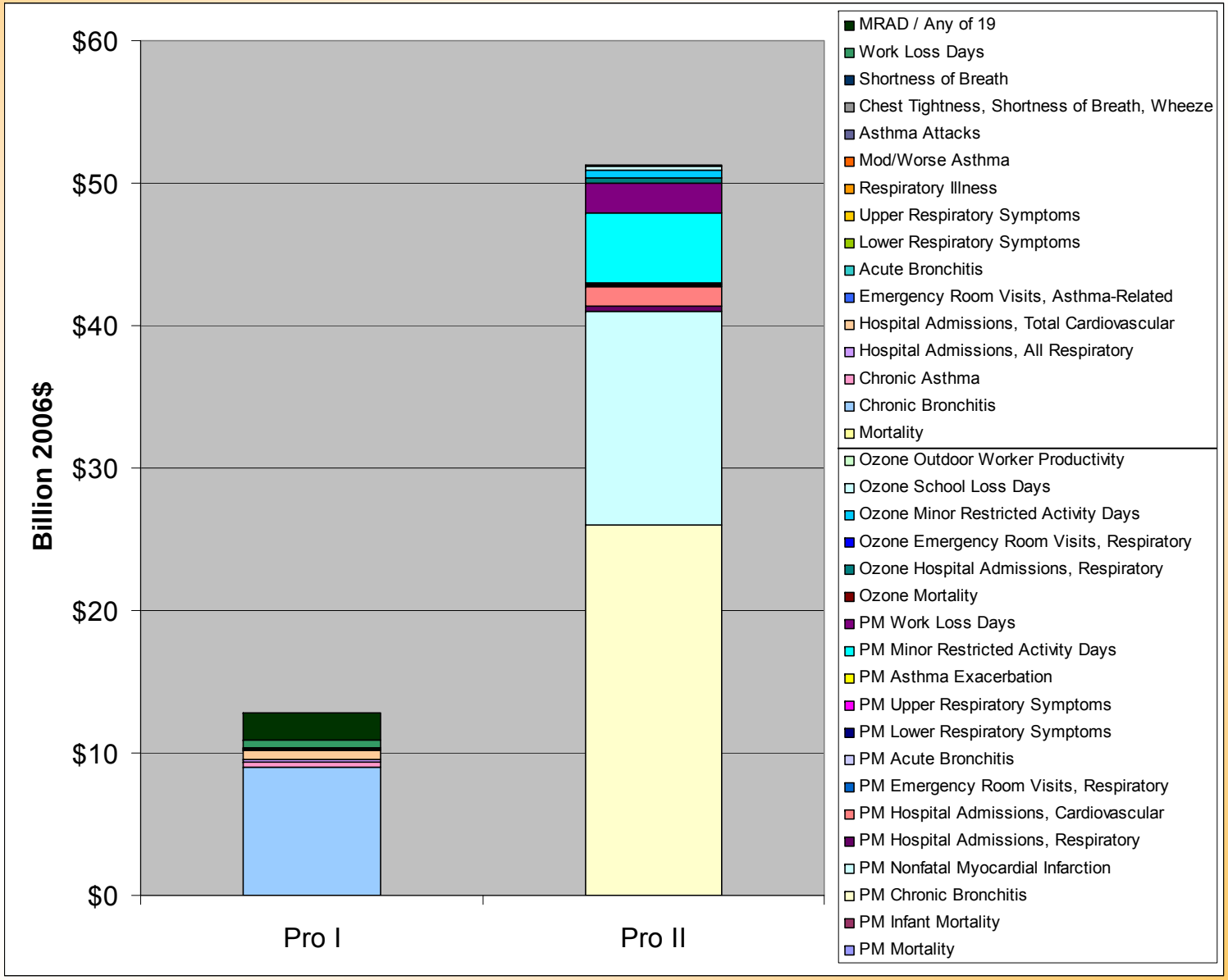
- HAP case study
- Eco lit review
- Eco case study
- ~~Title VI reanalysis~~
- Uncertainty
- CGE modeling

Final | *Draft Final* | *In Progress*

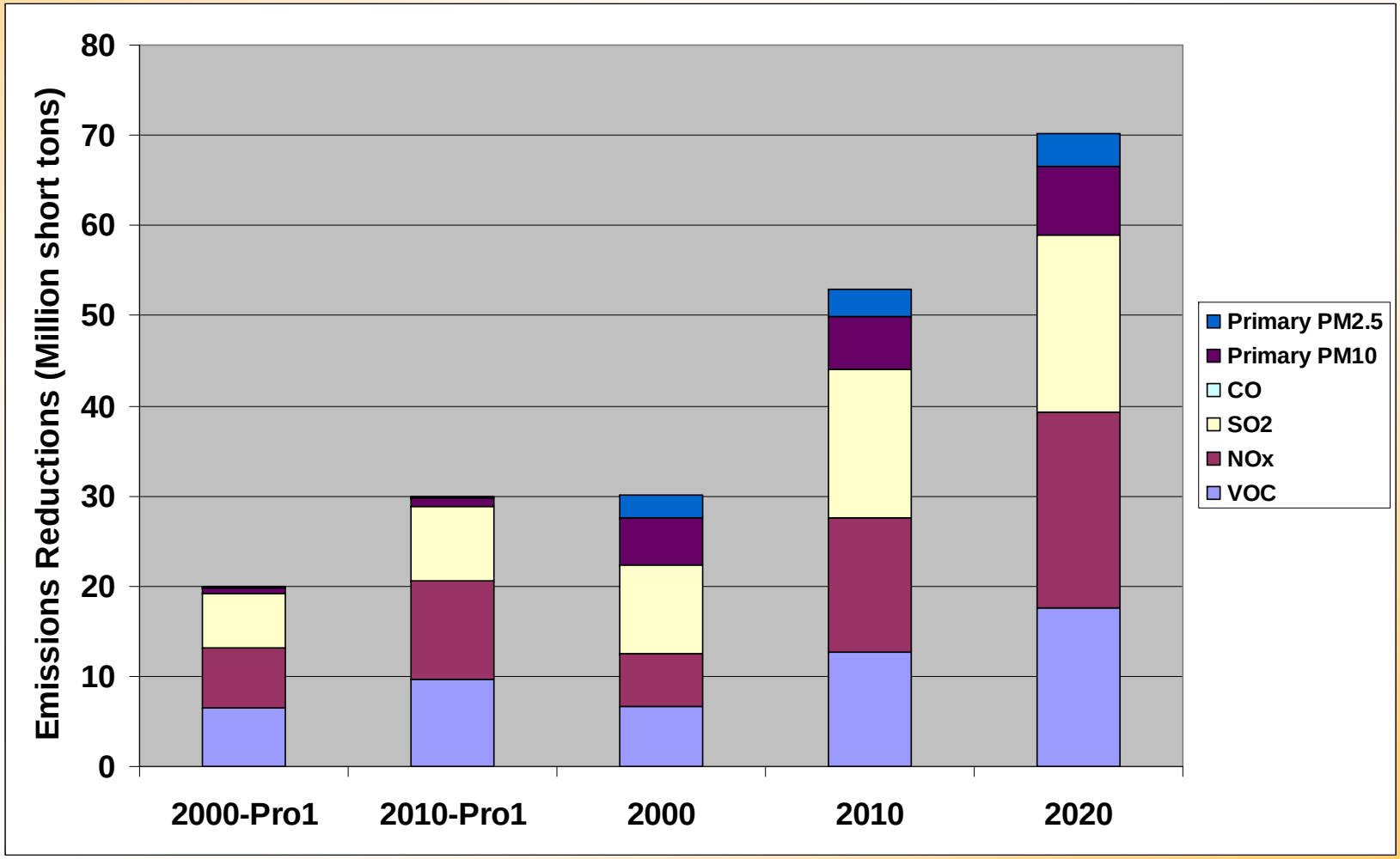
Pro I vs Pro II Monetized 2010 Health Benefits By Health Endpoint – Billions of 2006$



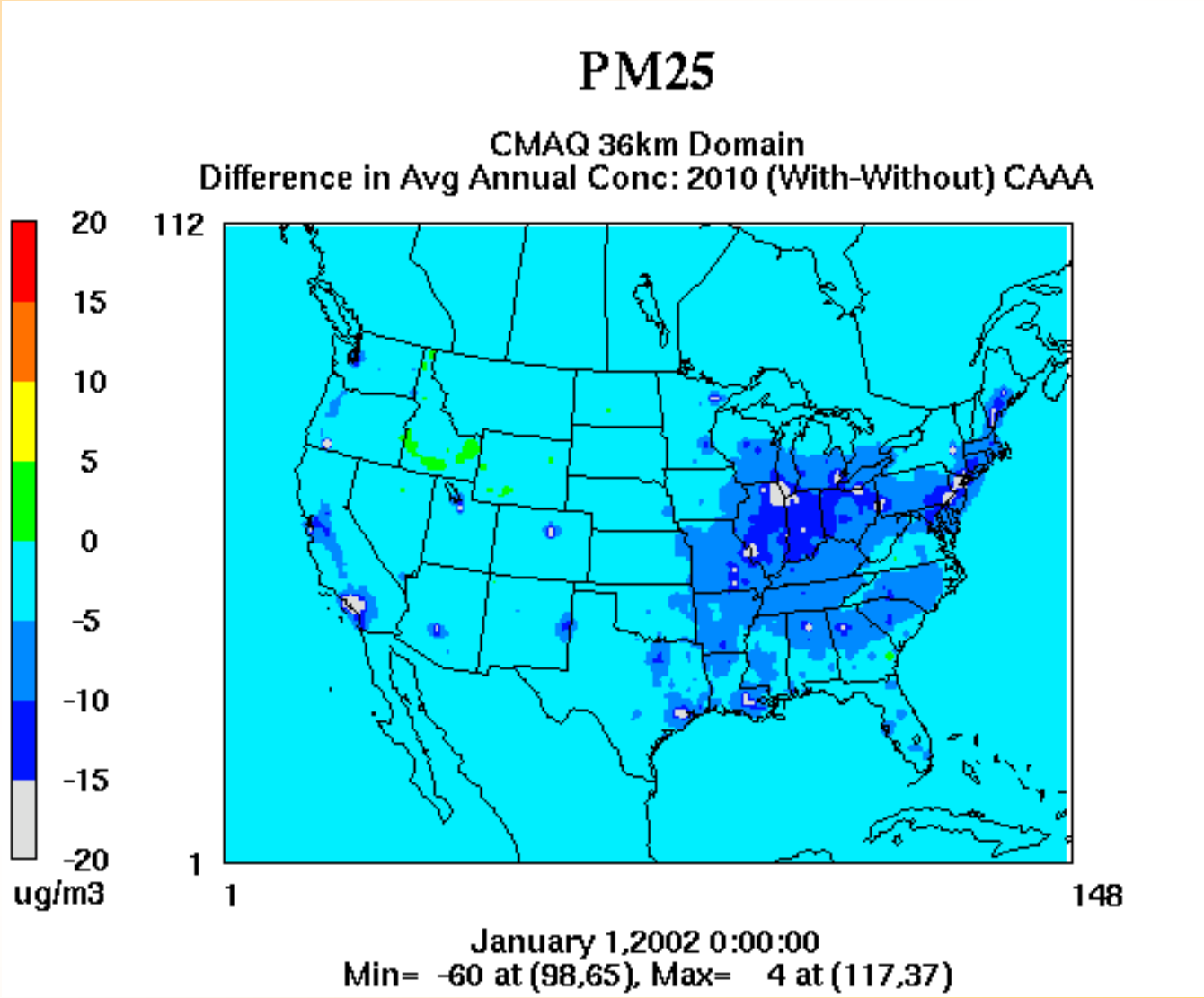
Pro I vs Pro II Monetized 2010 Health Benefits - Morbidity Only By Health Endpoint – Billions of 2006$



Pro I vs Pro II Emissions Reductions [excluding CO]



Pro I vs Pro II Air Quality Modeling
PM2.5 Ambient Concentration Changes 36km CONUS - 2010



Pro I vs Pro II Air Quality Modeling

- Project Team's Assessment
  - Differences in models, model configuration may be factors
    - Grid resolution, simulation period, met data, baseline concentrations
    - More complete coverage of particle species may be key
  - Core model formulation changes probably don't contribute significantly to differences
    - Chemistry, advection schemes
  - Monitor interpolation method to estimate baseline concentrations between monitors is also countervailing
    - Pro II (MATS) narrows modeled concentration changes relative to Pro I method (eVNA)
  - Richness of baseline PM2.5 monitor data may be a major factor
    - Pro I relied on cross estimation from PM10
    - Pro II employed much more extensive and valid PM2.5 monitor data
- Loss of Pro I grid-level data precludes full and effective comparative analysis of Pro I vs Pro II

Pro I vs Pro II Concentration-Response

- Pro I PM Mortality CRF:
  - Pope et al (1995) / 50 U.S. cities / single pollutant model
  - PM2.5 β = 0.006408
  - ΔPM2.5 = change in annual <u>median</u> concentration
    - Across 1979-1983 period
- Pro II PM Mortality CRF:
  - Pope et al (2002) / 51 U.S. cities / single pollutant model
  - PM2.5 β = 0.005827
  - ΔPM2.5 = change in annual <u>mean</u> concentration
    - Averaged across 1979-1983 and 1999-2000
  - Double the follow-up time of Pope et al (1995)
- Contribution of CRF to Pro I vs Pro II differences is small

Key Factors Driving Pro I vs Pro II Differences

- Scenario Changes ↑
  - CAIR, CAVR, CAND, HDDV, Tier II, etc in Pro II
- Emissions ↑
  - Greater reductions in direct PM2.5 and precursor emissions
  - Reductions apparently better targeted to population
- Air Quality Modeling ↑
  - Improved AQM captures previously omitted species
  - PM2.5 monitor data replaced PM10 cross estimation
- Concentration-Response Function for PM Mortality ↔
  - Move from Pope et al (1995) to Pope et al (2002)
- Morbidity Endpoints ↑
  - Addition of AMI

Defining Primary Estimates in 812

- Traditional 812 approach follows BCA principles
  - BCA focus on expected value outcomes + acknowledgement of uncertainties
  - 812 reports have provided "Primary Estimates"
    - Distribution: "Primary Central" with 5% "Primary Low" and 95% "Primary High"
    - Supplemented by "Alternative Estimates" and sensitivity analyses
- Competing trend in some recent RIAs
  - Some recent RIAs have employed multiple "primary estimates"
    - 3% versus 7% discount rate "alternative primaries"
    - Pope et al (2002) plus Laden et al (2006) "alternative primaries"
  - "Proliferation of answers" more problematic in 812 context
    - Large number of benefit and cost endpoints to be addressed
    - Many uncertain or controversial factors are unimportant to bottom line
    - Multiple answers or ranges based on extreme observations arguably not helpful
- Where Project Team has been told studies or estimates cannot be validly combined, single basis for Primary Estimate has been adopted
  - For PM mortality, Primary Estimate based on Pope et al (2002), Laden et al (2006) presented as Alternative Estimate
  - For ozone mortality, Primary Estimate based on pooling of Schwartz (2005) and Bell et al (2004) NMMAPS studies focused on non-accidental death

Combination of Elicited Expert Judgments

- Reasons not to combine
  - PM EE Study not designed to yield expert consensus function
  - Combined function obscures experts' individual judgments
  - Combined function may obscure extent of uncertainty, variability
  - Best use of this "limited poll of experts" is to gauge uncertainty by reporting 12 individual estimates
  - May not be important to combine unless used for primary estimate

- Reasons to combine
  - Presentation of 12 separate estimates is challenging
  - Combination would reflect considerable agreement among interviewed experts
  - SAB said EE range reported in the PM NAAQS was misleading
  - Combining occurs implicitly, at least at the policy step, so better to approach systematically than *ad hoc*

- <u>If</u> combination is reasonable, what are technical options?
  - Technical proposal from IEc based on copula function approach
  - Other options are available, such as simulation approach
    - This is approach applied for other factors such as VSL

CGE "Benefits-Adjusted Run" Inputs for 2010

Endpoint	Change In Incidence	Change in Prevalence[1]	Workdays Gained
PM			
Acute Myocardial Infarction	142,000	581,000	23,029,000
Chronic Bronchitis	59,000	590,000	19,299,000
Hospital Admissions, Cardiovascular	49,000	n/a	351,000
Hospital Admissions, Respiratory	24,000	n/a	219,000
Emergency Room Visits, Respiratory	87,000	n/a	19,000
Work Loss Days	14,104,000	n/a	14,104,000
Ozone			
School Loss Days	3,212,000	n/a	2,340,000
Worker Productivity	n/a	n/a	1,323,000
Hospital Admissions, Respiratory	19,000	n/a	48,000
Emergency Room Visits, Respiratory	7,000	n/a	2,000

Next Up

- Neal Fann, EPA
  - Jerrett and Krewski approach for PM, ozone
- Henry Roman, IEc
  - Copula method for combining EE CRFs
- Jim Neumann, IEc
  - Dynamic population approach