NAAQS – How Low Can We Go?
Recent CAA Initiatives

John B. King

NAAQS – How Low Can We Go?
The Costs and Benefits of Achieving Attainment
### NAAQS – Historic Overview
#### 5 ‘Criteria’ Pollutants

<table>
<thead>
<tr>
<th>Year</th>
<th>Ozone (ppm)</th>
<th>SO2 (ppm)</th>
<th>Particulate (24-hour microgram/m³)</th>
<th>CO (ppm)</th>
<th>NOX (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>0.08</td>
<td>0.14</td>
<td>TSP - 260</td>
<td>1-hour - 36</td>
<td>Annual - 50</td>
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<tr>
<td>1979</td>
<td>0.12</td>
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<td>8-hour - 0</td>
<td>Annual - 50</td>
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<tr>
<td>1987</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1997</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>0.075</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>0.070</td>
<td>0.063</td>
<td>1-hour - 75</td>
<td>1-hour - 100</td>
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</tbody>
</table>

Source: EPA [http://www.epa.gov/air/criteria.html](http://www.epa.gov/air/criteria.html)

### NAAQS – Ozone

1-Hour and 1997 8-Hour Standard
2008 8-Hour Standard
2010 Proposal
NAAQS – Ozone
1-Hour Standard and 1997 8-Hour Standard

1978 - Designated as non-attainment (March 3)
1991 - Classified as Serious (Nov. 6)
    Attainment Date of Nov. 15, 1999
1997 - New 8-Hour Standard (July 18)
    0.08 ppm
1999 – Failed to achieve attainment
    EPA Extension Policy – extended attainment date
    Vacated by Fifth Circuit

NAAQS – Ozone
1-Hour Standard and 1997 8-Hour Standard

2003 - ‘Bump-up’ to Severe (1-Hour) (April 23)
    New attainment date of Nov. 15, 2005
    Effective June 23, 2003
    RFG and Section 185 Penalty Fee
2004 - Designated/classified as Marginal (1997 8-Hour) (April 30)
    Created ‘anti-backsliding’ requirements
2004 - RFG to be implemented June 23, 2004
    Stayed by Fifth Circuit days before deadline
NAAQS – Ozone
1-Hour Standard and 1997 8-Hour Standard

2010 - Determined to be in attainment for 1-Hour (Feb. 10)
   Section 185 Penalty Fees addressed separately
2011 - Section 185 Penalty Fees (July 7)
   Termination Determination
   Based on attainment with 1-Hour
   Re-designated to attainment on approval of maintenance plan (Nov. 30)
2012 - RFG (April 23)
   Not a 'covered area' because re-designated under 1997 8-Hour
   Fifth Circuit case finally dismissed

NAAQS – Ozone
2008 8-Hour Standard and EPA Proposal

2008 - New 8-Hour Standard (0.075 ppm) (March 27)
   Based on review begun in 2000
   CASAC Panel had recommended 0.06 to 0.07 ppm
   EPA proposed range of 0.070 and 0.075 ppm
   State of Mississippi - EPA - challenge to rule

2009 - LDEQ recommendations for area designations (March 12)
   Based on 2006 – 2008 data
   EBR, WBR, Livingston, Ascension, Iberville
   Caddo, Jefferson, Lafayette, Lafourche, Pointe Coupee, St. John

2009 - EPA announces it will reconsider the 2008 8-Hour Standard (September 16)
   EPA puts designations under 1997 8-Hour on hold
NAAQS – Ozone
2008 8-Hour Standard and EPA Proposal

2010 - EPA proposes to review 2008 8-Hour Standard (January 19)
   Based on much of the same data
   Why? Because out of range recommended by CASAC
   Concerns that public not sufficiently protected

2011 - EPA chose 0.070 ppm as appropriate standard (July 7)

2011 - President Obama postponed any revision until 2013 (Sept. 2)
   State of Mississippi v. EPA moves forward
   EPA proceeds with designations under 2008 8-Hour Standard

2012 – Designation and classifications under the 2008 8-Hour – Marginal (May 21)
   Based on 2008 – 2010 data

NAAQS – Ozone
2008 8-Hour Standard

[Map of the United States with highlighted areas indicating ozone levels]
NAAQS — Ozone — Regulatory Impact
2008 8-Hour Standard

Benefits $17.08*
Costs $8.88
Net $8.20

*Benefits include ozone and PM2.5 co-benefits (PM2.5 accounts for 42% - 99% of benefits)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
<th>Net</th>
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</thead>
<tbody>
<tr>
<td>42%</td>
<td>50.17B</td>
<td>50.17B</td>
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<tr>
<td>99%</td>
<td>8.88B</td>
<td>8.88B</td>
</tr>
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</table>

Net: $1.06B
$8.63B

Source: Final NAAQS RIA, Section E6.2/Table E5.1 All at 7% discount rate (highest benefit = highest cost).

NAAQS — Ozone — Regulatory Impact
2008 8-Hour Standard

Mortality 260 – 2,300
Acute Myocardial Infarction 890
Upper Respiratory Symptoms 4,900
Lower Respiratory Symptoms 6,700
Chronic Bronchitis 380
Acute Bronchitis 1,000
Asthma Exacerbation 6,100

Source: Final NAAQS RIA, Section E6.2/Table E5.5
NAAQS – Ozone – EPA Proposal
Regulatory Impact - 0.060ppm

Benefits include ozone and PM, co-benefits. Source: Updated RIA, Table 31.1. All at 7% discount rate (highest benefit v. highest cost).

RIA assumes standards achieved “using a mixture of known air pollution control technologies and unknown, future technologies.”
Source: Fact Sheet - Supplement to the RIA for Ozone, January 7, 2010

2010 Study of costs of 0.060ppm
- Annual attainment costs between 2020 and 2030 are $1.013T (5.4% of GDP)
- Present value of those costs are $1.1T
- Employment losses at 7.5M (4.3% of total work force) by 2020
- Marginal cost of attaining standard rises rapidly as standard becomes more stringent
Source: Harnen, J., 2010, for Manufacturers Alliance/MAPI

2007 Study of costs at 0.070ppm
- Present value of costs is $1.1T
Source: McGraw, G. 2007, for Manufacturers Alliance/MAPI
### NAAQS – Ozone – Regulatory Impact
**EPA Proposal**

<table>
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<th>0.070</th>
<th>0.065</th>
<th>0.060</th>
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<td>Mortality</td>
<td>1,500-4,300</td>
<td>2,500-7,200</td>
<td>4,000 – 12,000</td>
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<tr>
<td>Acute Myocardial Infarction</td>
<td>2,200</td>
<td>3,500</td>
<td>5,300</td>
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<tr>
<td>Upper Respiratory Symptoms</td>
<td>19,000</td>
<td>31,000</td>
<td>48,000</td>
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<tr>
<td>Lower Respiratory Symptoms</td>
<td>25,000</td>
<td>41,000</td>
<td>63,000</td>
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<td>Chronic Bronchitis</td>
<td>880</td>
<td>1,400</td>
<td>2,200</td>
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<td>Acute Bronchitis</td>
<td>2,100</td>
<td>3,400</td>
<td>5,300</td>
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<tr>
<td>Asthma Exacerbation</td>
<td>23,000</td>
<td>38,000</td>
<td>58,000</td>
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</table>

Source: Updated RIA, Table S1.2

### NAAQS – SO₂

2010 – New SO₂ 1 Hour Standard at 75 ppb (June 2)
75 Fed. Reg. 35520 (June 22, 2010)

Rule uses ‘hybrid’ of monitoring and modeling for compliance

**Monitoring**
- Need 163 sites nationwide
  - Will need to establish 43 such sites, nationwide
  - Needs to be operational by January 1, 2013

**Modeling**
- Due to localized impact of SO₂
  - EPA to issue guidance on proper modeling
NAAQS – \( \text{SO}_2 \)

- LDEQ designated West Baton Rouge and St. Bernard (May 26, 2011)
  - Based on 2008-2010 monitoring data
- Designations due by EPA in June 2012
  - Has not officially published designations to-date
- For non-attainment areas –
  - SIPs due in February, 2014 with attainment by August, 2017
- All other areas –
  - Submit ‘maintenance’ or ‘infrastructure’ SIPs by June, 2013
- LDEQ Stakeholder’s Group
  - Modeling is ongoing
  - Hoping to show attainment

Recent CAA Initiatives

- Utility MATS
- Cross-State Air Pollution Rule (CASPR)
- Boiler MACT
### Recent CAA Initiatives
Overview of CFR/Federal Register

<table>
<thead>
<tr>
<th>Year</th>
<th>Federal Register Pages</th>
<th>Proposed Rules</th>
<th>Final Rules</th>
<th>CFR, Total Pages</th>
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<td>3,041</td>
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<td>2,636</td>
<td>4,313</td>
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<td>2010</td>
<td>81,405</td>
<td>2,419</td>
<td>3,573</td>
<td>165,494</td>
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</table>

### Recent CAA Initiatives
Overview of CFR/Federal Register

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<th>Final Rules</th>
<th>CFR, Total Pages</th>
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<tr>
<td>2008</td>
<td>79,435</td>
<td>2,475</td>
<td>3,839</td>
<td>157,974</td>
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<td>2009</td>
<td>68,598</td>
<td>2,044</td>
<td>3,603</td>
<td>163,333</td>
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<tr>
<td>2010</td>
<td>81,405</td>
<td>2,439</td>
<td>3,573</td>
<td>165,494</td>
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<td>2011</td>
<td>81,247</td>
<td>2,898</td>
<td>3,807</td>
<td>169,301</td>
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Recent CAA Initiatives – Utility MATS

Summary

Final rule published February 16, 2012, effective April 16, 2012
77 Fed. Reg. 9904 (Feb. 16, 2012)
Affects coal and oil fired electric utility steam generating units (EGUs)
Industry emits 29 TPY of mercury
Local largest source in US
EPA’s rule will reduce emissions by 90% (20 TPY)
Conduct performance testing to demonstrate compliance
Compliance date
  Existing – three years from effective date (April 16, 2015)
  New – at start-up
Lawsuits filed
  Utility Air Regulatory Group v. EPA, D.C. Cir., No. 12-1166
  24 states attorney general filed suit
Partial stay of certain provisions until November 2, 2012 issued on August 2, 2012

Recent CAA Initiatives – Utility MATS

Costs and Benefits

Rule will reduce mercury emissions by 90%
Installing technology to reduce mercury will also reduce PM2.5 and SO2
PM2.5/SO2 benefits are ‘co-benefits’
Not the primary objective of the rule
Costs
  $9.68 in 2015
  Capital investment, compliance, monitoring, and reporting
Monetized health benefits estimated between $338 – $818 (7%)
Great majority of benefits from reductions in PM2.5 related mortality
Mortality
  Pope (2002)  4,200  $308
  Laden (2006)  11,000  $788
Non-Fatal Heart Attacks
  4,700  $0.48
Chronic Bronchitis
  2,800  $1.48
Acute Bronchitis
  6,300  $<0.018
Asthma Exacerbation
  130,000  $<0.018
Recent CAA Initiatives – Utility MATS
Costs and Benefits

Mercury

Natural: 1,400 TPY – 15,000 TPY (U.N.)
Man-Made: Europe – 250 TPY; Asia -1,070 TPY; North America - 210 TPY (U.N.)
All entering global cycle such that half deposited in US is from out of US (EPA)

Benefits of mercury reduction (from Utility MATS Regulatory Impact Analysis) - $4-6M
Calculated by looking at effects from eating 8g/day of recreational freshwater fish
Translated that consumption to IQ loss
Reduced mercury emissions due to MATS in 2016 is an estimated
0.00209 fewer IQ points lost per prenatally exposed child from
self-caught freshwater fish consumption, as opposed to the
2005 base case
Economic value of avoided IQ loss is $4-6M (@3%) or $0.47-1M (@7%)

Other Cost Estimates

Retrofit up to 753 units (North American Electric Reliability Corp.)
Cost up to $261B - $358B for resource costs (US Energy Information Admin., 2005)
Loss of 4.7GW of coal-fired generation
2% of coal fired capacity and 0.05% of all capacity (EPA)
15 GW lost (North American Electric Reliability Corp.)
1.44M jobs by 2020 (Nat’l Assoc. of Manufacturers) (from Utility MACT/CSAPR)
$18B per year to comply (Nat’l Assoc. of Manufacturers) (from Utility MACT/CSAPR)
Recent CAA Initiatives – Cross-State Air Pollution Rule (CSAPR)

Summary

Final rule published August 8, 2011, effective October 7, 2011.
76 Fed. Reg. 48208 (August 8, 2011)
Vocated by DC Circuit on August 21, 2012
CSAPR still in effect

Identifies emissions in 27 states that significantly affect the ability of downwind states to attain and maintain compliance with 1997/2006 PM 2.5 NAAQS and 1997 ozone NAAQS.

Identifies and addresses significant contributions to downwind nonattainment
Used state-specific method to identify emission reductions that must be made
Come up with individual state budgets for emissions reductions from covered units
Budget is what remains after significant contribution is eliminated

Done via Federal Implementation Plans that regulate electric generating units (EGUs) in 27 states

RPs require reductions in SO₂ and NOx

Expect reductions in PM 2.5 and ozone

Recent CAA Initiatives – CSAPR
Costs and Benefits

<table>
<thead>
<tr>
<th>Emission reductions</th>
<th>2012 Base Case</th>
<th>Reductions by 2014</th>
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</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>7Mt</td>
<td>3.0Mt</td>
</tr>
<tr>
<td>Annual NOₓ</td>
<td>1.4Mt</td>
<td>0.2Mt</td>
</tr>
<tr>
<td>Ozone-season NOₓ</td>
<td>0.7Mt</td>
<td>0.1Mt</td>
</tr>
</tbody>
</table>

Costs
$1.858 2012 and $0.838 in 2014 @7%
Costs are the annual incremental electric generation production costs
EPA believes that these costs will be passed on to consumer.

Monetized health benefits estimated between $110B – $250B @ 7%.

Great majority of benefits from reductions in PM 2.5-related mortality:

Mortality**
Pope (2002) 13,000 $9.4B
Laden (2006) 34,000 $24.0B

Non-Fatal Heart Attacks
15,000 $1.3B

Chronic Bronchitis
8,700 $0.4B

Acute Bronchitis
19,000 $0.02B

Asthma Exacerbation
400,000 $0.02B

*Premature deaths from 2014 onward due to reductions in ambient PM 2.5 which are most significantly impacted by SO₂ reduction.

**Between 27 and 120 fewer ozone-related mortalities (from other studies).
Recent CAA Initiatives – CSAPR
Costs and Benefits

 Costs - $120B by 2015 for scrubbers and SCR Units [ALEC]
        $70 - $100B to comply (Utility MATS/CSAPR) [Credit Suisse]

 Electric Generation - 4.8 GW removed by 2014 (EPA)
                      7 - 55 GW [North American Reliability Corp/Brattle Group]

 Report by American Coalition for Clean Coal Electricity (NERA)*
   Retirements of Coal Units – 39GW by 2015 (12% of capacity)
   Costs to comply – $21B/year between 2012-2020; $127B (present value)
   Electricity prices – Up 6.5%
   Employment – 183K/year; 1.65M between 2012-2020
   GDP – loss of $298/year between 2012-2020; $190B cumulative

*Utility MATS/CSAPR/CCR/cooling water intake rule

Recent CAA Initiatives – Boiler MACT
Summary

Published final rule on March 21, 2011, effective May 21, 2011
76 Fed. Reg. 15554 (March 21, 2011) [Major Sources]
76 Fed. Reg. 15608 (March 21, 2011) [Area Sources]

Area sources - Emission standards for control of HAPs (mercury, PM [for non-mercury metals], CO [for organic air toxics]) from industrial, commercial, and institutional boilers

Major sources - Emission standards for control of HAPs (mercury, dioxin, PM [for non-mercury metals], HCL [for acid gases], CO [for non-dioxin organic air toxics]) from industrial, commercial, and institutional boilers and process heaters

EPA announced on same day that it was convening a proceeding to reconsider aspects of the rules (March 21), then delayed effective date until judicial review finalized or reconsideration completed (May 18), then proposed the reconsideration (Dec. 23)

The delay was vacated by the district court (Jan. 19, 2012)

No Action Assurance letters issued by EPA for certain aspects of the rules
Effective until December 31, 2012
Recent CAA Initiatives – Boiler MACT
Area Source – Costs and Benefits

<table>
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<th>Emission reductions</th>
<th>Mercury</th>
<th>97 pounds per year</th>
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<tbody>
<tr>
<td></td>
<td>PM</td>
<td>2,480 TPY</td>
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<tr>
<td></td>
<td>Non-Mercury Metals</td>
<td>320 TPY</td>
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<tr>
<td></td>
<td>PMH</td>
<td>9 TPY</td>
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</table>

Costs: $335M per year in 2014
Includes installing controls, tune-ups, energy assessments, and implementing testing and monitoring requirements.

Monetized health benefits estimated between $190M to $470M (9%)
Does not include any HAP reduction benefits; solely based on monetized benefits of PM 2.5 reductions in mortality.

<table>
<thead>
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<th>Mortality</th>
<th>Page (2003)</th>
<th>24</th>
<th>$150M</th>
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<tr>
<td></td>
<td>Lens (2006)</td>
<td>61</td>
<td>$470M</td>
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<tr>
<td>Non-Fatal Heart Attacks</td>
<td>40</td>
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<tr>
<td>Chronic Bronchitis</td>
<td>17</td>
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<tr>
<td>Acute Bronchitis</td>
<td>38</td>
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<tr>
<td>Asthma Exacerbation</td>
<td>420</td>
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Source: March 21, 2011 Federal Register, pp. 15579-15582; RIA, Feb., 2011, Tables 7-3, 7-5, 7-7

Recent CAA Initiatives – Boiler MACT
Major Source – Costs and Benefits

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<th>Emission reductions</th>
<th>Mercury</th>
<th>1.4 TPY</th>
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<td></td>
<td>PM</td>
<td>47,500 TPY</td>
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<td></td>
<td>Non-Mercury Metals</td>
<td>2,700 TPY</td>
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<tr>
<td></td>
<td>SO2</td>
<td>442,000 TPY</td>
</tr>
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<td></td>
<td>HCL</td>
<td>30,000 TPY</td>
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<tr>
<td></td>
<td>VDC</td>
<td>7,000 TPY</td>
</tr>
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</table>

Costs: $5.18 in capital expenditures and $1.88 in annual costs.

Monetized health benefits estimated between $208 to $408 (9%)
Does not include any HAP reduction benefits; solely based on monetized benefits of PM 2.5 reductions in mortality.

<table>
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<th>Mortality</th>
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<th>2,500</th>
<th>$208</th>
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<tr>
<td></td>
<td>Lens (2006)</td>
<td>6,500</td>
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<tr>
<td>Non-Fatal Heart Attacks</td>
<td>4,000</td>
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<tr>
<td>Chronic Bronchitis</td>
<td>1,600</td>
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<tr>
<td>Acute Bronchitis</td>
<td>3,700</td>
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<tr>
<td>Asthma Exacerbation</td>
<td>41,000</td>
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Source: March 21, 2011 Federal Register, pp. 15649-15653; Fact Sheet; RIA, Feb., 2011, Tables 7-2, 7-4, 7-6
Recent CAA Initiatives – Boiler MACT
Costs and Benefits

Council of Industrial Boiler Owners (August, 2010)

- Analysis of proposed rule
- Every billion spent on MACT upgrades and compliance costs puts 16,000 jobs at risk and reduces US GDP by $1.2B
- Cost of upgrades at $20.7B, across 24 industry subsectors
- Jobs at risk: 70K, directly tied to affected industries/facilities
- 338K total, including indirect and induced impacts
- Up to $15.2B in employee compensation potentially forfeited

Questions?

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