US Experience with Advancing Vehicles Standards

Fifty-second Session of the Working Group on Strategies and Review
Geneva, Switzerland
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Common Transportation Challenges

• Growing Car and Truck Fleets

• Regional and Urban Air Quality

• Energy Security and Oil Consumption

• Economic Growth and Environmental Protection
U.S. Vehicle Emissions History

- U.S. was regulatory pioneer in 1970s
  - Major experiment sought to push the envelope on standards
  - Congress gave EPA “technology forcing” powers
  - Many feared economic risk and industry collapse

- EPA’s principles
  - Identify practical and cost-effective technology
  - Set performance standards to drive innovation and allow flexible compliance
  - Allow lead time to not disrupt investment cycles
U.S. Clean Air Act: A Public Policy Success Story

• Cars cleaner and better
  – New cars are 98% cleaner
  – Monetized public health benefits far exceed the costs, often by 10:1 or more
  – Standards drove innovation, producing better vehicle quality, reliability, and durability

• Lower ambient pollution levels despite near tripling of U.S. GDP since 1970
Comparison of Growth Measures and Emissions 1990-2012

- Gross Domestic Product: 133%
- Vehicle Miles Traveled: 92%
- Population: 38%
- Energy Consumption: 27%
- CO₂ Emissions: 19%
- Aggregate Emissions (Six Common Pollutants): -67%
Snapshot of Health Benefits of Clean Diesel and Clean Car Programs in the last 15 years

- Premature deaths
- Hospital admissions
- Lost work days (x100)

# prevented annually

0 10,000 20,000 30,000 40,000 50,000 60,000
## Air Quality Benefits of EPA Mobile Standards by 2030

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</thead>
<tbody>
<tr>
<td>NOx (tonnes)</td>
<td>2,540,117</td>
<td>299,371</td>
<td>2,358,680</td>
<td>669,502</td>
<td>721,212</td>
<td>1,088,622</td>
<td>7,674,783</td>
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<tr>
<td>PM2.5 (tonnes)</td>
<td>32,659</td>
<td>7,167</td>
<td>98,883</td>
<td>120,656</td>
<td>24,494</td>
<td>143,000</td>
<td>413,676</td>
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<td>VOC (tonnes)</td>
<td>363,781</td>
<td>154,221</td>
<td>104,362</td>
<td>27,216</td>
<td>39,009</td>
<td>0</td>
<td>688,553</td>
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<tr>
<td>SOx (tonnes)</td>
<td>254,919</td>
<td>11,793</td>
<td>128,820</td>
<td>340,194</td>
<td>0</td>
<td>1,179,340</td>
<td>1,914,160</td>
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<tr>
<td>Total Cost (billion)</td>
<td>$5.3</td>
<td>$1.5</td>
<td>$4.3</td>
<td>$2.1</td>
<td>$0.7</td>
<td>$3.1</td>
<td>$17</td>
</tr>
<tr>
<td>Net Monetized Benefits (billion)</td>
<td>$25</td>
<td>$9.2</td>
<td>$66</td>
<td>$83</td>
<td>$11</td>
<td>$110</td>
<td>$304</td>
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<tr>
<td>Avoided Premature Mortality</td>
<td>4,300</td>
<td>960</td>
<td>8,300</td>
<td>12,000</td>
<td>1,300</td>
<td>13,000</td>
<td>40,000</td>
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<tr>
<td>Avoided Hospital Admissions</td>
<td>3,000</td>
<td>1,500</td>
<td>7,100</td>
<td>8,900</td>
<td>1,130</td>
<td>12,400</td>
<td>34,000</td>
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<tr>
<td>Avoided Lost Work Days</td>
<td>680,000</td>
<td>81,000</td>
<td>1,500,000</td>
<td>1,000,000</td>
<td>120,000</td>
<td>1,400,000</td>
<td>4,800,000</td>
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Notes: Totals may not sum due to rounding. All PM-related avoided premature mortality estimates based on the American Cancer Society cohort study and subsequent updates. For rules that include ozone-related premature mortality estimates (Locomotive & Marine, Ocean Vessel Strategy, and Light Duty Tier 3), an average across the range of mortality estimates was used. All rule-specific monetized values are presented in the dollar year in which they were estimated in their respective Regulatory Impact Analyses.
STRATEGIC APPROACH & LESSONS LEARNED
Three Point Strategy to Reduce Vehicle Emissions (GHGs & Air Quality)

1. **Clean Vehicles** - Develop technology-forcing performance standards for cars, buses, trucks, and nonroad engines, such as construction equipment, boats, lawn and garden equipment, and locomotives.

2. **Clean Fuels** - Develop reformulated gasoline, diesel fuel, and nonpetroleum alternatives. Use of low sulfur fuels is critical to enable advanced vehicle technology as well as for the direct emissions benefits.

3. **Clean Transportation Alternatives** - Develop strategies to encourage efficient transportation alternatives.
Lessons Learned from U.S. EPA Experience

- Our regulatory programs designed to promote innovation – well-formulated standards can be “win-win” for the economy and the environment.

- Predictable long term policies with clear measureable targets are critical for enabling industry to plan for and invest in advanced technologies.
  - Phased approaches achieve early reductions and long-term reductions

- Dialogue and Collaboration with stakeholders (industry, state/provincial governments, civil organizations) is critical to successful win-win policy.
Lessons Learned from U.S. EPA Experience

• Using a systems approach produces best results
  – Low sulfur fuel needed for advanced vehicle technologies & complete optimization.
  – Vehicle performance-based standards achieve the most cost-effective emissions reductions.

• A robust compliance regime is critical to achieving real-world benefits.

• Regulatory flexibilities and voluntary partnerships play important roles in reducing emissions and fuel consumption. They equitably reward technology leaders and early technology adopters.
KEY VEHICLE PROGRAMS
Light-Duty Vehicle/Tier Gasoline Sulfur Program: Tier 2, 2004+

• First time SUVs/pickups/vans subject to same standards as cars
• First time treating vehicles and fuels as a system
• Vehicles are 77% to 95% cleaner (depending on vehicle size), compared with model year 2003 and earlier
• Reduced sulfur in gasoline (from avg. 300 ppm to 30 ppm annual average)
• Equivalent to removing 164 million cars from road
• Health/environmental benefits of $25 billion vs. $5 billion in cost
Tier 3 Vehicle and Gasoline Sulfur Standards

• In March 2014 we finalized even tighter “Tier 3” standards for vehicles and gasoline sulfur which take effect in 2017
  – Part of comprehensive approach to create cleaner, more efficient vehicles
    • Coordinated with timing of vehicle greenhouse gas standards
    • Harmonized with California’s standards
Tier 3 Vehicle and Gasoline Sulfur Standards

• Tighter tailpipe standards for NMOG+NOx, PM
• Tighter evaporative emissions standards
• Lower gasoline sulfur to 10 ppm annual average
  – Sulfur even at current levels (30 ppm average) degrades the performance of vehicle catalytic converters
  – Lower sulfur enables the tighter Tier 3 vehicle standards
  – Lower sulfur also immediately reduces NOx and VOC emissions from the existing fleet
Heavy-Duty Diesel Program Overview

Applied new NOx and PM standards to large trucks and buses

• 90%+ emission reductions—gasoline-like levels
• Based on high efficiency emission control devices (like passenger vehicle catalysts)
• Phased-in of NOx standards 2007-2010
• Offered incentives for early technology introduction

Reduced diesel fuel sulfur levels nationwide

• Enabled use of advanced emission control technology
• Highway diesel fuel sulfur cap of 15 ppm
  – Phased in 80% by 2006
  – 100% by 2010
In summary ... Our experience...

Low Sulfur Fuel Programs Yield Huge Benefits

– Immediate improvement in air quality
  • Reduction of NOx, PM and HCs

– Public health benefits
  • Avoided hospital visits
  • Avoided premature mortality

– Ability to utilize emerging pollution control technologies
  • Diesel particulate filters
  • Advanced NOx technologies