Presenter's Guide for the

Idle Reduction and Clean School Bus Curriculum

For Drivers and School Officials

An Education and Action Project Developed by the:

Utah Clean Cities Program
National Energy Foundation
Environmental and Energy Study Institute

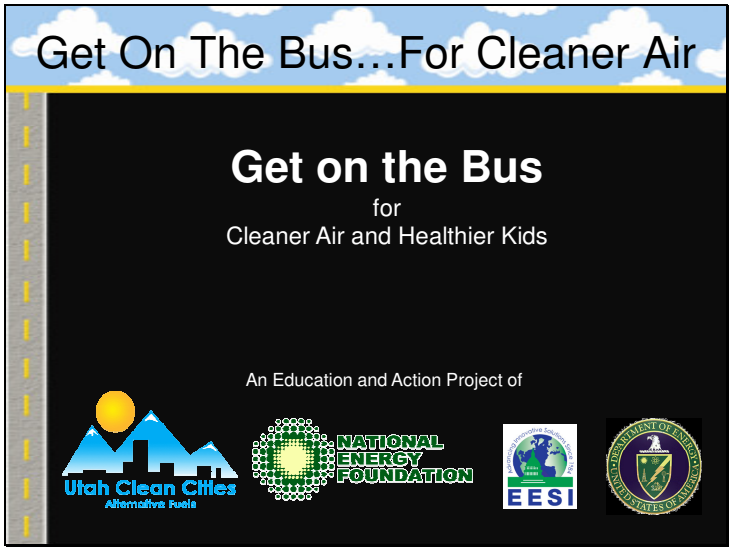
This Presenter Guide is intended to accompany the Microsoft PowerPoint file *Idle Reduction and Clean School Bus Curriculum Package*. All of the information found here in the Presenter Guide is also embedded in the PowerPoint file itself, but is also provided in this format for the convenience of workshop presenters and other users.

The *Curriculum Package* contains all the materials and information needed to conduct an idle reduction workshop for school bus drivers and school officials and initiate a district or school-wide idle reduction program, including:

1. **Information on how to prepare to deliver an idle reduction workshop and curriculum**
2. **A complete slide show presentation, which can be customized if desired for individual school districts**
3. **Essential information to provide to workshop participants during the slide presentation and workshop.**
4. **Additional supporting information to provide presenters with a solid background on idle reduction and clean school bus issues.**
5. **Implementation tips, follow-up suggestions, and other resources**

The information in this guide is arranged to correspond to individual slides in the curriculum package

Slide 1



This is the title slide of the slide show presentation.

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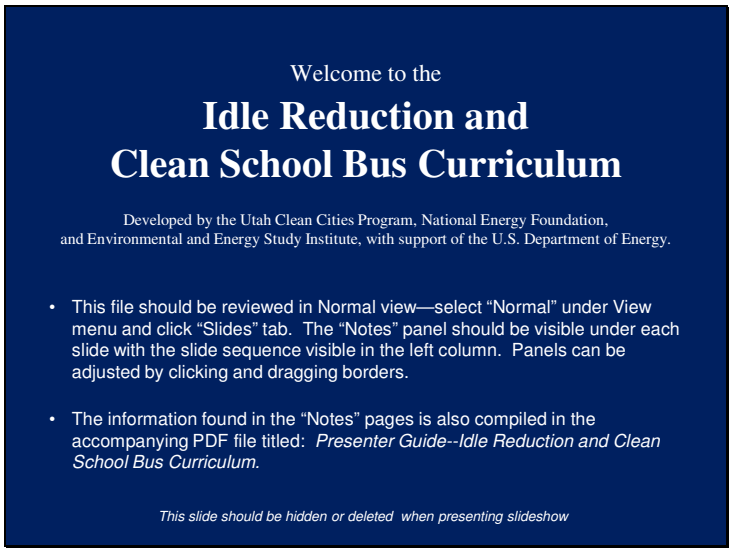
Slide 2



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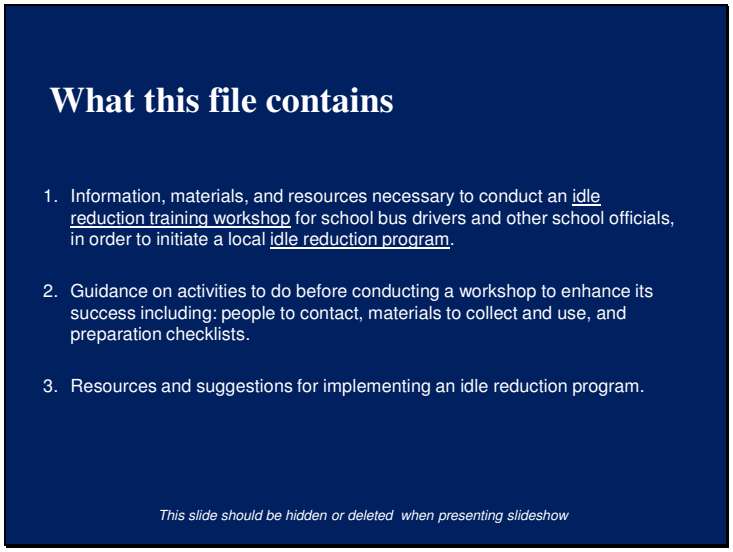
Welcome to the
Idle Reduction and Clean School Bus Curriculum

Developed by the Utah Clean Cities Program, National Energy Foundation,
and Environmental and Energy Study Institute, with support of the U.S. Department of Energy.

This file should be reviewed in Normal view—select "Normal" under View menu and click "Slides" tab. The "Notes" panel should be visible under each slide with the slide sequence visible in the left column. Panels can be adjusted by clicking and dragging borders.

The information found in the "Notes" pages is also compiled in the accompanying PDF file titled: *Presenter Guide--Idle Reduction and Clean School Bus Curriculum.*

Slide 3



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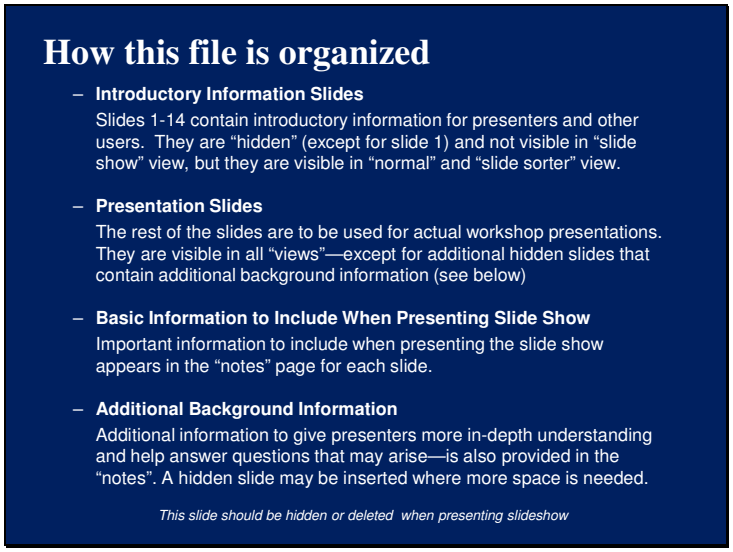
What this file contains

- Information, materials, and resources necessary to conduct an idle reduction training workshop for school bus drivers and other school officials, in order to initiate a local idle reduction program.
- Guidance on activities to do before conducting a workshop to enhance its success including: people to contact, materials to collect and use, and preparation checklists.
- Resources and suggestions for implementing an idle reduction program.

Slide 4



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How this file is organized

Introductory Information Slides

Slides 1-14 contain introductory information for presenters and other users. They are "hidden" (except for slide 1) and not visible in "slide show" view, but they are visible in "normal" and "slide sorter" view.

Presentation Slides

The rest of the slides are to be used for actual workshop presentations. They are visible in all "views"—except for additional hidden slides that contain additional background information (see below)

Basic Information to Include When Presenting Slide Show

Important information to include when presenting the slide show appears in the "notes" page for each slide.

Additional Background Information

Additional information to give presenters more in-depth understanding and help answer questions that may arise—is also provided in the "notes". A hidden slide may be inserted where more space is needed.

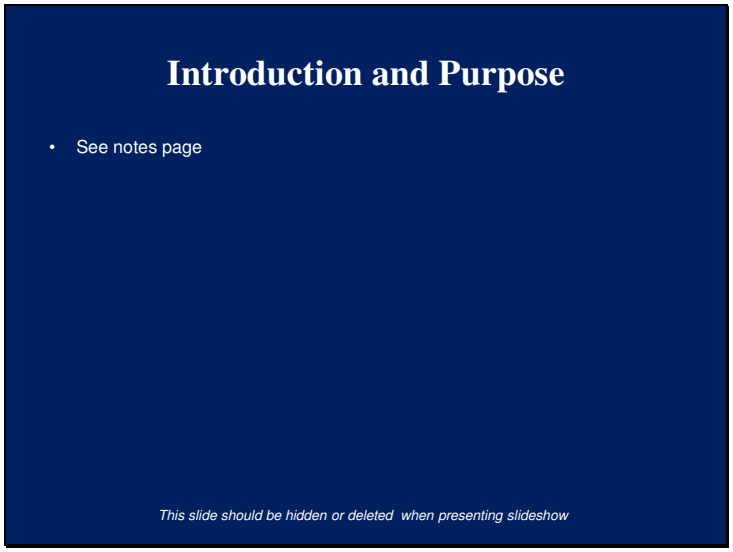
Slide 5

These notes repeat the instructions shown on this slide. This slide should be hidden or deleted when presenting slideshow.

Before you go any further…
This Microsoft PowerPoint template file creates a new unnamed and unsaved document when it is opened. We suggest you name and save this file before editing it to suit your needs.

You may also want to check the “AutoRecover” settings in Microsoft Powerpoint to avoiding losing work by accident. Under “Tools”, go to “Options” and click the “Save” tab.

Slide 6



Introduction

A national campaign is currently underway to reduce diesel exhaust pollution from both on and off-road sources. National, state, and local governments have begun to enact legislation that reduce pollution from diesel exhaust; and public and private organizations are being encouraged to take voluntary steps towards reducing diesel engine emissions.

Numerous recent studies have revealed that diesel exhaust adds many toxic chemicals into the air we breathe, and that long-term exposure to diesel fumes may be harmful, particularly to children.

Approximately 25 million children in the United States are transported to and from school by school bus every day and a significant portion of these buses are powered by diesel engines. Looking at the big picture, school buses actually reduce air pollution and conserve gasoline by more efficiently transporting a large number of students to and from school. Unfortunately, diesel engines contribute more than their fair share of harmful pollutants into the air. Reducing diesel emissions and the exposure of children to these emissions should be a high priority for all school transportation professionals.

The materials and information in this binder are designed to facilitate a 45-minute idle reduction training workshop for school bus drivers about practices that reduce diesel exhaust and the exposure of bus riders to this exhaust. It is anticipated that the training would be the “kick-off” activity for a school district interested in joining the national effort to reduce diesel engine pollution and its harmful effects.

Purpose

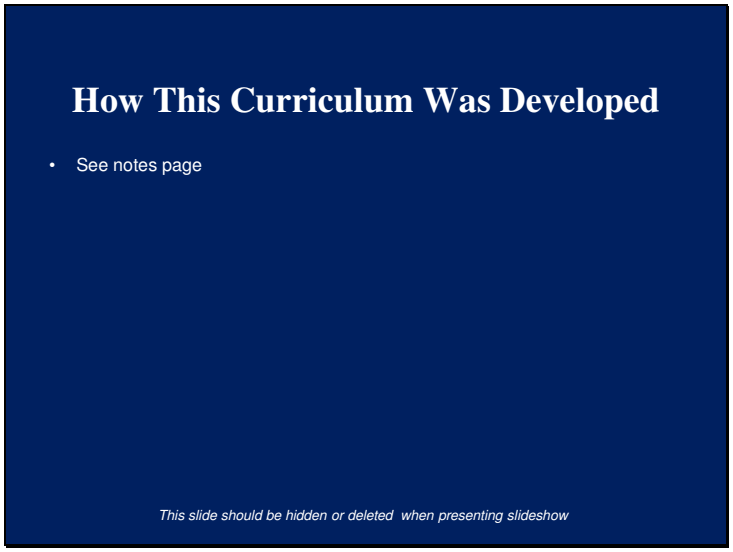
The purpose of the curriculum is to show school transportation officials and other members of the local school community how easy, effective, and beneficial implementing an idle reduction program can be.

Primary goals and benefits of the curriculum are:

- Reduce ground-level air pollution and protect health of school communities, especially schoolchildren who are most vulnerable to negative health impacts of exposure to diesel exhaust
- Reduce fuel consumption and fuel costs, as well as vehicle maintenance costs, for school districts
- Reduce regional air pollution levels, including greenhouse gases

More broadly, the curriculum is intended to communicate a strong “Clean Air Fuel Savings” message—i.e. the reality that clean air does not cost money, it saves money--to school teachers, staff, students, parents, and other stakeholders.

Slide 7



How This Curriculum Was Developed

This curriculum was developed through a joint project of **Utah Clean Cities** ,the **National Energy Foundation**, and the **Environmental and Energy Study Institute** with the support of the **U.S. Department of Energy** and the assistance of the **National School Board Association**.

Utah Clean Cities and the National Energy Foundation, both based in Salt Lake City, supervised the development of the curriculum and implemented it in several school districts in Utah and Nevada, including six pilot study areas where results were more closely studied. The Environmental and Energy Study Institute (EESI), based in the Washington DC, helped disseminate the curriculum nationally and, with the assistance of the National School Boards Association (NSBA) and its state affiliates, provided outreach to school-related organizations nationwide.

The project was developed based on earlier work by the U.S. Environmental Protection Agency showing the huge potential for cost savings, fuel savings, and significant health benefits for school children, both those who travel to school by bus and others who attend schools with bus service.

The project was made possible by a grant from the U.S. Department of Energy.

Sponsoring Organizations

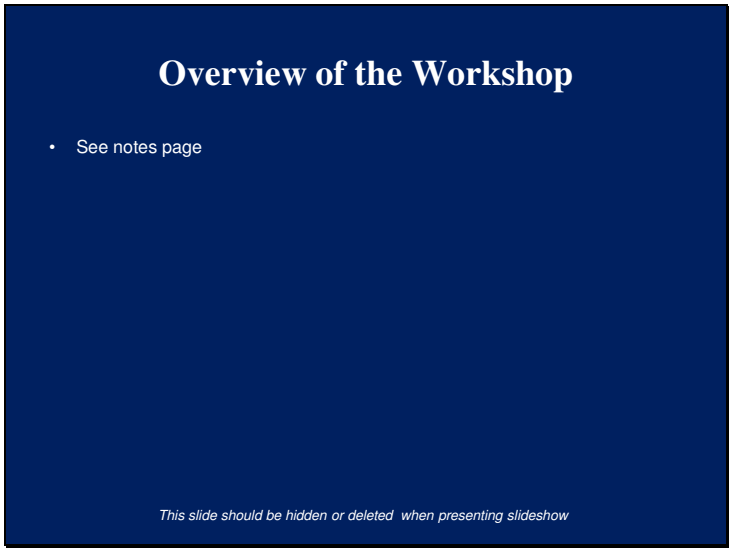
Utah Clean Cities Coalition is one of 85 coalitions around the country that are part of the U.S. Department of Energy's strategy to reduce America's dependence on imported foreign oil. Founded in 1994, Utah Clean Cities has grown into an independent, non-profit organization made up of approximately 65 governments and private organizations. The coalition promotes the multiple

strategies to increase energy efficiency and reduce oil consumption in the transportation sector including: improved fuel economy, alternative fuel vehicles (AFVs), hybrid electric vehicles, and idle reduction. Utah Clean Cities works primarily with alternative fuels such as compressed natural gas, propane and, to a lesser degree, ethanol and biodiesel.

National Energy Foundation (NEF) is a nonprofit educational organization dedicated to the development, dissemination, and implementation of programs and resources to enhance teaching and learning related to energy, water, natural resources, science and math, technology, conservation, and the environment. NEF recognizes the importance and contribution of natural resources to our economy, national security, environment, and quality of life. NEF has more than two decades of experience in building effective educational partnerships with the support and collaboration of the education community, businesses, government agencies, and non-profit organizations.

The Environmental and Energy Study Institute (EESI) was founded in 1984 by a bipartisan group of Congressional Members dedicated to finding innovative environmental and energy solutions. EESI provides credible, timely information and advances innovative policy ideas through research and analysis, coalition building, media outreach, and policymaker education on issues of energy efficiency and renewable energy, transportation, smart growth, agriculture and global climate change.

Slide 8



Overview of the Workshop

It is recommended that the Idle Reduction Training Workshop include the following five sections:

- Explanation of the general purpose and format of the training
- Brainstorming current school transportation practices
- Computer slide show or overhead transparency presentation
- Video: Reducing School Bus Idling (6 minutes)

5) Development of an idle reduction implementation plan

1. **Explanation of the General Purpose of the Training and Overview of What It Will Include**
General Purpose: This workshop is part of a national campaign to reduce diesel exhaust emissions. The Environmental Protection Agency has set a goal to reduce diesel pollution 45% by the year 2017. In support of this campaign, the federal government has established and is implementing regulations applying to diesel engines and diesel fuel. States are also passing legislation designed to reduce diesel emissions; and both public and private organizations as well as individuals are voluntarily making efforts to curtail diesel exhaust. A number of recent studies have solidified the evidence that diesel exhaust contributes to many health problems and that young children are especially vulnerable.

It needs to be stressed, however, through out all activities, that school officials and school bus drivers are part of the solution and not the source of the problem. Pollution and fuel consumption would be significantly higher without school buses, as noted in the presentation. School bus drivers provide the invaluable service of getting kids to school safely. In addition, parents would spend much more time driving kids to school were it not for school buses.

• **Current Idling Practices in the School District**
Ask participants to brainstorm the times when school buses may be idling (these could include everything from idling at stop lights to idling while waiting for students to board at school). Write

down each of the examples, so that the ideas are visible to all. When the list is complete, thank participants for their ideas and indicate that there will be further discussion about idling practices later.

• **Slide Show or Transparency Presentation**
Present the PowerPoint slide show or overhead transparency presentation. Use the basic and additional supporting information in the notes pages accompanying each slide in the notebook to elaborate on the points as appropriate.

• **Show the video "Reducing School Bus Idling: The Key to a Healthier Ride"**

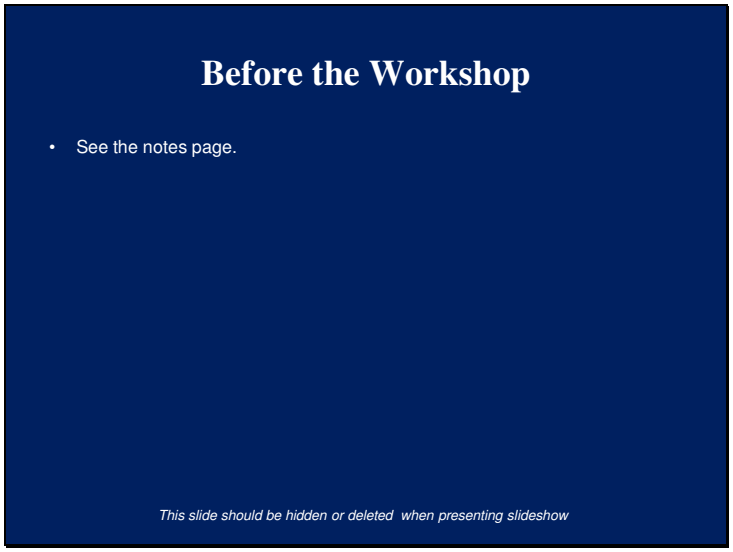
• **Implementation Steps for the School District**

Ask participants to now re-visit the brainstormed list and for each idling example, determine if it is a necessary or unnecessary idling practice and how, through technology or a change in procedure, this idling practice could be reduced or eliminated.

Present the steps that the Transportation Department is considering to reduce idling and other practices that unnecessarily expose children and drivers to diesel exhaust (see Implementation Suggestions).

NOTE: The steps taken to reduce diesel emission for school buses in any given school district depend on many variables and must be determined by the department administrator and others in authority. These steps can range from policy implementation and enforcement to voluntary compliance.

Slide 9



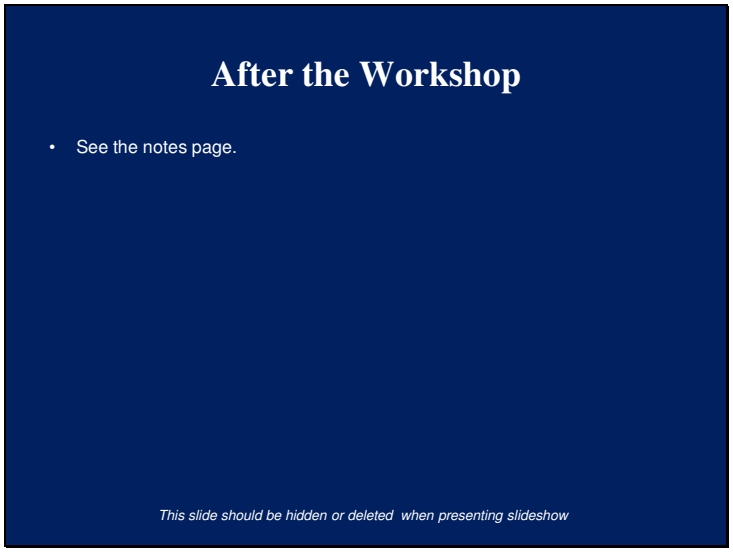
Before the Idle Reduction Training Workshop

The Idle Reduction Training Workshop will be most successful when the trainer is familiar with the materials in this notebook, has browsed the additional identified resources, and has considered potential measures and practices to reduce diesel emissions specifically for an individual school district (see implementation suggestions on next slide/note page "After the Workshop").

The following materials will be needed to successfully conduct the training:

- Training Notebook
- PowerPoint slide show or overhead transparency presentation
- Any one of these: flip chart/white board/blackboard/overhead projector (for recording ideas and comments)
- An LCD projector and laptop w/Microsoft PowerPoint or equivalent software, or an overhead projector
- Campaign publicity and outreach supplies (posters, brochures, fact sheets, stickers—see Promotional and Information Materials")
- Copies of relevant local policies, regulations, and guidelines

Slide 10



After the Workshop

The following are some suggestions for implementing an idle reduction program that may be used independently or in conjunction with each other.

1) **Develop a departmental campaign to reduce unnecessary school bus idling**

- Place idle reduction posters in conspicuous places in the transportation department
- Place idle reduction reminders (stickers etc.) in proximity to the driver in each school bus
- Place stickers on the rear exterior of the bus identifying its participation in an idle reduction program/campaign
- Invite bus drivers to sign pledge cards to reduce idling
- Publicize idle reduction efforts in school district and transportation department communications (web site, newsletters, memos, etc.)
- Frequently communicate and reinforce the importance of the idle reduction program

2) **Create and enforce an idle reduction policy or guidelines** (see example)

- Make the policy clear to bus drivers and school officials by integrating into regular communications and prominently display notices of policy
- Recognize bus drivers who comply with the policy
- Require re-training for individuals who continue harmful practices

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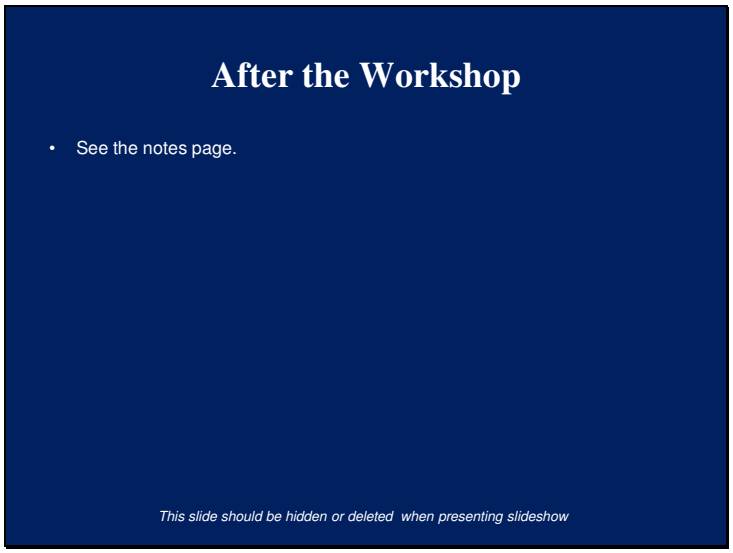
Slide 11

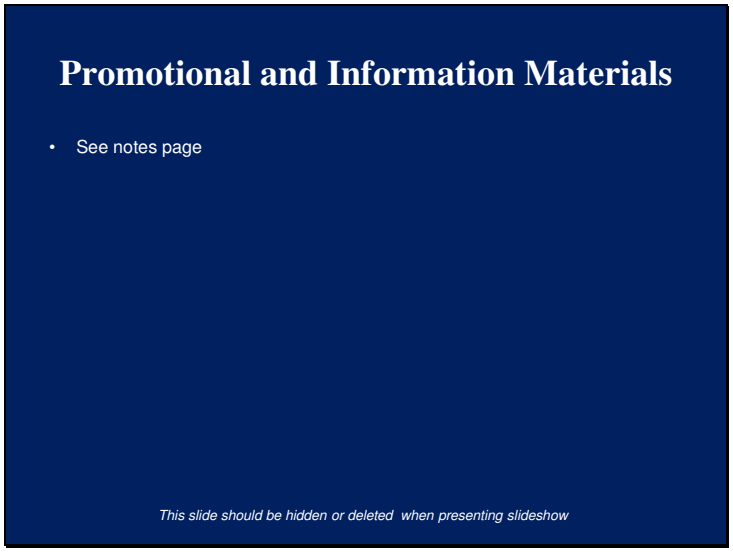


After the Workshop (cont'd)

4) **Recognize bus drivers who make an exemplary effort to reduce idling and follow other practices to reduce exposure to diesel exhaust**

- Create an award program—e.g. "Idle Reducers of the Year", certificates, medals etc.—for high achievement in idle reduction.
- Publicize progress in idle reduction and notable efforts by drivers in school and other communications.

Slide 12



Promotional and Information Materials

Fact Sheets

What You Should Know About Diesel Exhaust and School Bus Idling
Clean School Bus USA Fact Sheet (PDF, 4 pages, 177K) (November 2003, EPA 420-F-03-038)
http://www.epa.gov/otaq/retrofit/documents/f03021.pdf

Clean and Green School Buses: Reducing Fuel Use and Exposure to Diesel Exhaust
EESI Fact Sheet, http://www.eesi.org/102108_school_buses

Brochures and Posters

Clean School Bus USA Brochure: *Tomorrow's Buses for Today's Children*
(PDF, 8 pages, 880K) (October 2003, EPA 420-F-03-039)
http://www.epa.gov/otaq/schoolbus/documents/420f03039.pdf.
Discusses strategies available to your school district for reducing exposure to diesel exhaust.

Clean School Bus USA Idle-Reduction Brochure:
There are 25 Million Reasons Why It's Important to Reduce Idling
(PDF, 6 pages, 406K) (April 2006, EPA 420-F-06-018).
http://www.epa.gov/otaq/schoolbus/documents/420f06018.pdf
Provides a basic overview of the Idle-Reduction Campaign. The brochure comes complete with a tear out Idle-Reduction Pledge Card, which school bus drivers can sign, as a way to make a commitment to limiting idling time; turning off the engine whenever possible; and learning more about implementing idle-reduction programs in the school district.

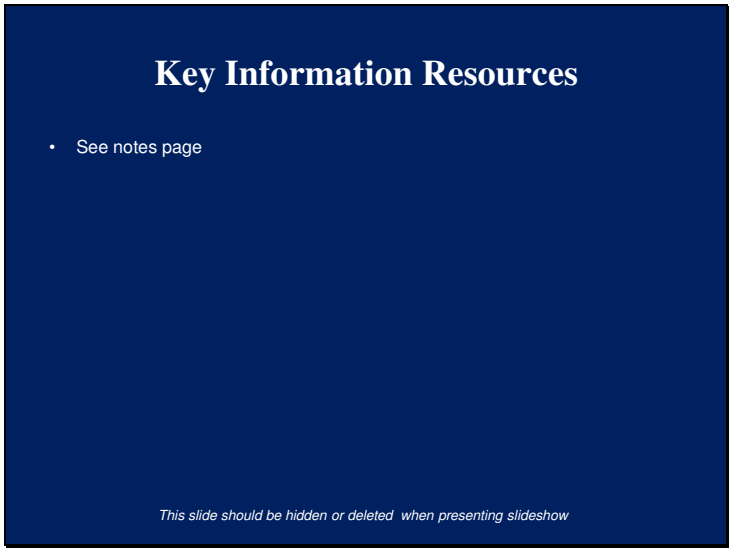
Clean School Bus USA Poster: ***Reduced Idling = Cleaner Air***
(PDF, 1 page, 2.7M) (December 2005, EPA 420-H-06-001)
http://www.epa.gov/otaq/schoolbus/documents/420h06001.pdf
Provides a visual reinforcement of how the program can benefit kids and the community, together with a teacher's guide for structured classroom learning.

Logo and Certificate

Clean School Bus Idle Reduction Certificate (PDF, 1 page, 884K)
http://www.epa.gov/otaq/schoolbus/documents/csb-ir-certificate.pdf
Provides official recognition from the U.S. Environmental Protection Agency for schools, school districts and/or drivers.

Clean School Bus Logo (PDF, 1 page, 260K)
http://www.epa.gov/otaq/schoolbus/images/csb-logo.pdf
For making decals and other uses

Slide 13



Key Information Resources

Environmental Protection Agency: www.epa.gov/cleanschoolbus/antiidling
This site provides considerable information about the national campaign to reduce school bus emissions. Included is an idling calculator (to determine fuel savings from reduced idling), idling kit ordering information, and other idling reduction information.

Union of Concerned Scientists: ucsusa.org/clean_vehicles/.../clean-school-bus-pollution.html
This site provides a school bus pollution report card for each of the 50 states. Each state received a grade according to the amount of school bus pollution.

National Resources Defense Council: www.nrdc.org/air/transportation/qbus.asp
This site answers 11 questions that parents of students riding school buses should be asking.

Asthma Regional Council: www.asthmaregionalcouncil.org/about/_BusToolkit.htm
This site provides a toolkit for reducing diesel emission including a section on school bus idling.

MA Dept of Environmental Protection: www.mass.gov/dep/air/community/sbusbmps.htm
This site provides suggestions for implementing an school bus idle reduction program in a school district.

Public Research Works: www.publicresearchworks.org/diesel%20report.htm
This site provides a concise summary of the dangers of diesel exhaust.

National Clean Diesel Campaign: www.epa.gov/cleandiesel/index.htm
This site provides information on the national effort to reduce diesel pollution from all sources.

Hamilton County Environmental Resources: www.hcdoes.org/airquality/Anti-Idling/BusAntiIdle.htm
This site provides excellent summary information and links regarding idling reduction programs.

Slide 14

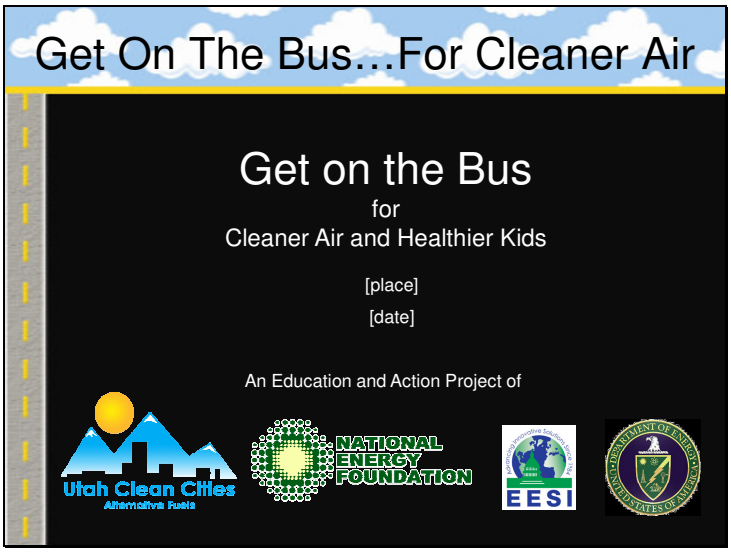
Key Contacts

Utah Clean Cities,www.utahcleancities.org
Contact: Robin Erickson, robin.erickson@slcgov.com, 801-535-7736

National Energy Foundation, www.nef1.org
Contact: Marilyn Clark, 801-450-3227

Environmental and Energy Study Institute, www.eesi.org
Contact: Jan Mueller, EESI, jmueller@eesi.org, 202-662-1883

Slide 15



Slide show presentation begins here

Basic Presentation Information

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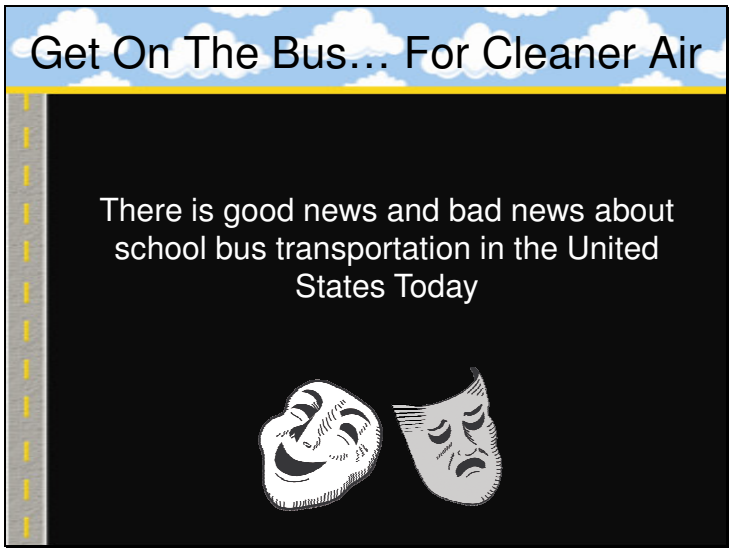
Slide 16



Basic Presentation Information

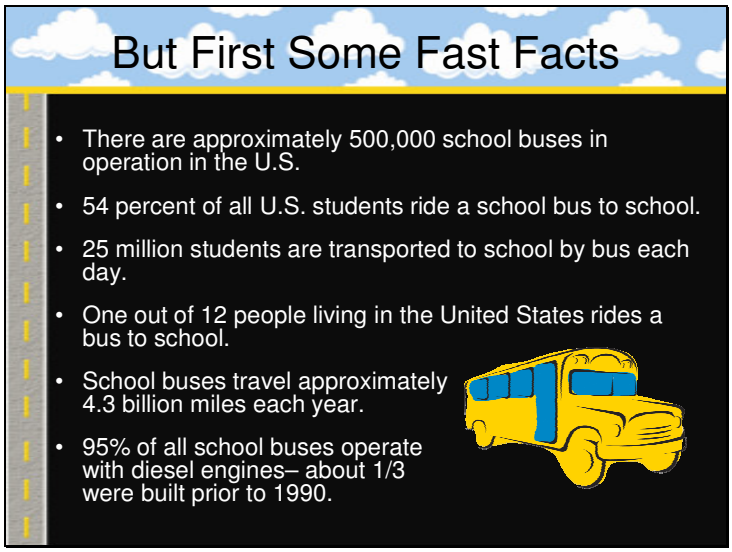
"Get on the Bus for Cleaner Air," the title for this presentation, refers to the fact that:

- School buses currently reduce significant amounts of air pollution by eliminating vehicles from the road that would otherwise have to transport students to school
- Additional steps can be taken by school bus transportation professionals to reduce diesel exhaust and the exposure of students and bus drivers to its harmful effects. The presentation is designed to encourage participation in the national campaign to reduce school bus emissions.

Additional Background Information

No additional notes accompany this slide

Slide 17



Basic Presentation Information

It would be easy to underestimate the magnitude of school bus transportation in the United States. The statistics are important because even a small change in the operational practice of a large number of bus drivers can have a substantial effect on:

- Total amount of diesel exhaust pollution
- Human exposure to diesel exhaust, especially schoolchildren
- Fuel consumption
- Maintenance costs

School buses travel approx. 4.3 billion miles each school year, equivalent to 20 round trips to the sun.

About 1/3 of all school buses that operate with diesel engines were built prior to 1990 when the standards for diesel exhaust emissions were much lower. Buses built before 1990 are allowed to emit 60 times more toxic soot and 30 times more smog-forming nitrous oxides than today's school bus models.

Sources

1) 500,000 buses, School Bus Pollution Report Card
2) 54% of students, School Transportation News
3) 25 million students, Environmental Protection Agency
4) 1 in 12 Americans, U.S. Census Population Statistics
5) 43 billion miles, School Transportation News

Additional Background Information

According to National Highway Traffic Safety Administration, http://www.nhtsa.dot.gov

School buses are one of the safest forms of transportation in the United States. Between 35,000 and 40,000 people are killed in traffic crashes on U.S. roads every year; on average, six school-age children (throughout the U.S.) die in school bus crashes as passengers annually. Every year, approximately 450,000 public school buses travel about 4.3 billion miles to transport 23.5 million children to and from school and school-related activities.

How safe are school buses compared to other motor vehicles?
School buses are approximately seven times safer than passenger cars or light trucks. The school bus occupant fatality rate of 0.2 fatalities per 100 million vehicle miles traveled (VMT) is considerably lower than the fatality rates for passenger cars or light trucks (1.44 per 100 million VMT). The relative safety of school buses was addressed in 2002 by the National Academy of Sciences (NAS) in "The Relative Risks of School Travel: A National Perspective and Guidance for Local Community Risk Assessment." It found that there are about 815 fatalities related to school transportation per year. Only 2 percent are associated with official school transportation, compared to 22 percent due to walking/bicycling to or from school, and 75 percent from passenger car transportation to or from school.

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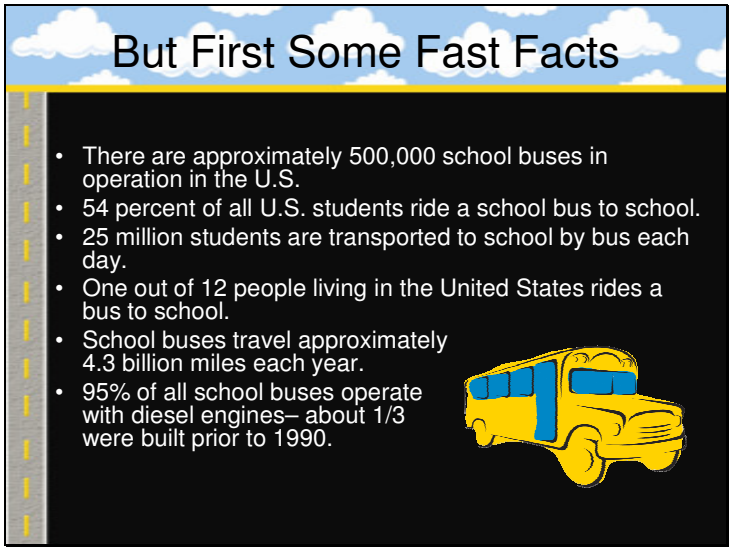
Slide 18



Additional Background Information (continued)

What is the cause of most school bus-related fatalities?
Pedestrian fatalities account for the highest number of school bus-related fatalities. There are about 17 such fatalities per year, two-thirds of which involve the school bus itself and the rest involving motorists illegally passing the stopped school bus. In its 1989 report, the NAS stated that since children are at "greater risk of being killed in school bus loading zones (i.e., boarding and leaving the bus) than in the bus. A larger share of the school bus safety effort should be directed to improving the safety of school bus loading zones."

According to School Transportation News, http://www.stnonline.com

Is school transportation a large enterprise?
There are more than 450,000 yellow school buses on U.S. roads and about 70,000 in Canada. The industry spends more than $15 billion annually, most in the form of reimbursement to school districts for state-supported transportation costs

And how many children ride school buses?
In the United States, about 23,500,000 children ride school buses to school, and then return home on school buses. That's about 55 percent of the K-12 population. When you multiply the daily ridership times the number of school days school buses provide the United States with an estimated 10 billion student rides annually. (Other school bus users brings estimate closer to 25 million).

What about fatalities?
School bus fatalities do occur! On average, about 25 school children are killed each year in school bus accidents. One third of these are struck by their own school bus in the loading/unloading zone, one third are struck by motorists who fail to stop for the school bus, and one third are killed as pedestrians approaching or departing the school bus stop. Very few are killed inside the bus.

The most common fatality involving a school bus is a motorist who hits the bus. There are about 120 Americans killed annually in this type of fatality.

Slide 19

Basic Presentation Information

School transportation professionals should know that the benefits of school bus transportation far outweigh the disadvantages. It has been said that one of the worst things that could happen, in light of the recent research findings on diesel exhaust, is for parents to react and pull their children off the bus and drive them to school in their cars. If the parents of students who ride the bus to school were to drive their children there would be a significant increase in:

- Air pollution from exhaust
- Fuel consumption
- Child (and adult) injuries
- Automobile traffic

Additional Background Information

According to School Transportation News updated 11/11/08

Nearly 500,000 yellow school buses provide transportation service daily nationwide.

Approximately 26 million elementary and secondary school children ride school buses daily throughout the United States, twice a day.

That's more than 52 million student trips daily -- before adding an estimated 5 million for daily extracurricular activity roundtrips.

This equals more than 10 billion individual student rides, annually, when national estimates for activity trips, Head Start transportation, summer school, and child care transportation are included.

School buses travel approximately 4.4 billion miles each school year across the United States. To put this in perspective, the U.S. Department of Transportation publishes figures that show Americans drive nearly 3 trillion miles on U.S. highways each year.

Approximately 53 percent of all K-12 students in the country ride yellow school buses.

The average school bus transports 54 student passengers. An average of 1.5 students are transported per car if a school bus is not available. The number of cars needed to transport students currently riding on one school bus is 36. (*Source: American School Bus Council.*)

According to the National Safety Council, the national school bus accident rate is 0.01 per 100 million miles traveled, compared to 0.04 for trains, 0.06 for commercial aviation and 0.96 for other passenger vehicles.

The National Safety Council estimates school buses to be about nine times safer that other passenger vehicles during the normal school commute.

The National Highway Traffic Safety Administration reports that 96 percent of the estimated 8,500 to 12,000 children injured in school bus accidents annually are considered minor (scrapes, bumps, bruises, etc.).

Continued next slide/page

Slide 20

Additional Background Information (continued)

NHTSA calculated that 4 percent of the school bus-related injuries to children -- about 350 to 475 annually -- are serious (i.e. broken bones or worse) based on the medical community's widely accepted AIS or Abbreviated Injury Scale.

An average of six children are fatally injured inside school buses annually.

About 16 children are fatally injured as pedestrians in the loading & unloading zone around school buses annually. That's better than 200 percent improvement from 75 school bus fatalities in 1975; but it is still not good enough.

During the seven years between 1989 and 1996, 9,500 school-age children were killed during school hours **while riding in all kinds of motor vehicles.**

According to data gathered for NHTSA's Fatal Analysis Reporting System, about 600 school age children are killed annually riding to and from school in motor vehicles other than school buses. These fatalities occur during school transport hours (7 to 9 a.m. and 3 to 5 p.m.), on school days (Monday through Friday) only, and during the typical 180 day school year, to children riding to and from school, mostly in automobiles.

More than $6 billion in state funding is spent each school year for all public school K-12 transportation.

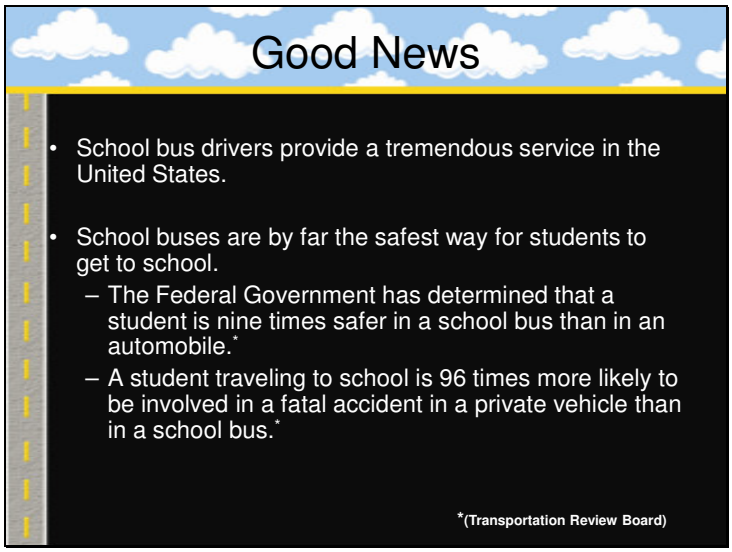
U.S. school districts spend an average of $520 per regular student passenger per year for transportation.

U.S. school districts spend an average of $2,400 per special needs child for transportation annually.

Nearly 40,000 school buses were manufactured during the 12 months of the 2006-07 school year.

Every five years, pupil transportation delegates appointed by the chief school officer in each state meet for a week-long conference to review and rewrite minimum standards and specifications for safe school bus operation. The next National Congress on School Transportation is scheduled for May 2010 at the University of Central Missouri in Warrensburg, Mo.

Slide 21



Basic Presentation Information

First and foremost, bus drivers get students to school safely. In fact, school buses are the safest form of transportation in the United States. Trains, airplanes, city buses, and private vehicles all have higher rates of injury and fatality than do school buses. School buses are considered to be safer because:

- Drivers are properly trained
- Buses are constructed to withstand serious impact without affecting student safety
- Buses are properly maintained

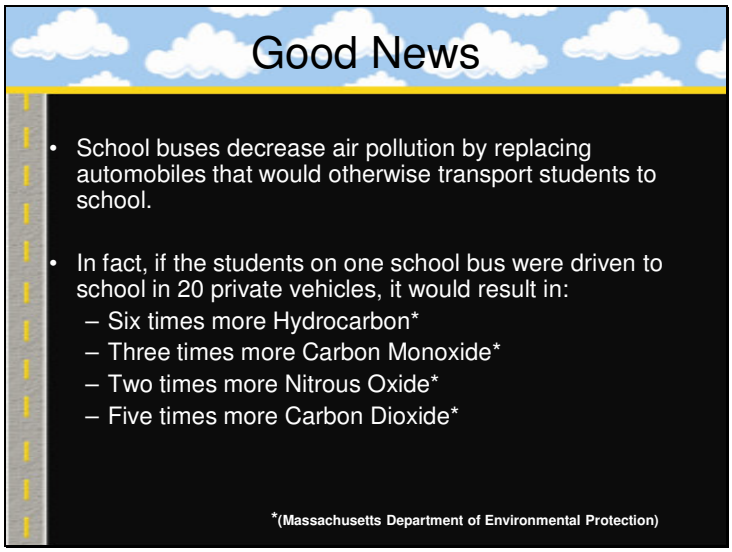
Sources

1) 96 times more likely, Transportation Research Board
2) 9 times safer, Transportation Research Board

Additional Background Information

No additional notes accompany this slide

Slide 22



Basic Presentation Information

It is impossible to know how many private vehicles would transport students if school buses were eliminated. Some students who currently ride the bus to school might walk while others might carpool with their peers. Estimating at least 20 private vehicles would be driven to school to replace one school bus, the additional air pollution created, including "greenhouse gases" would be significant.

Sources

1) 6 X Hydrocarbon, Massachusetts Department of Environmental Protection
2) 3 X Carbon Monoxide, Massachusetts Department of Environmental Protection
- 2 X Nitrous Oxide, Massachusetts Department of Environmental Protection
- 5 X Carbon Dioxide, Massachusetts Department of Environmental Protection

Additional Background Information

According to US EPA Clean School Bus USA Program, http://www.epa.gov/cleanschoolbus (this program is part of the Office of Transportation and Air Quality (OTAQ) http://www.epa.gov/otaq (formerly Office of Mobile Sources)

The goals of Clean School Bus USA are to reduce children's exposure to diesel exhaust and the amount of air pollution created by diesel school buses.

24 million American children ride school buses daily.

On average, these students spend an hour and a half each day in a school bus. School buses drive more than 4 billion miles each year.

School buses are the safest way for children to get to school. However, pollution from older diesel vehicles has health implications for everyone, especially children. By working together, we can reduce pollution from public school buses -- making sure that school buses are also a clean way for children to get to school. Clean School Bus USA brings together partners from business, education, transportation, and public-health organizations to work toward these goals:

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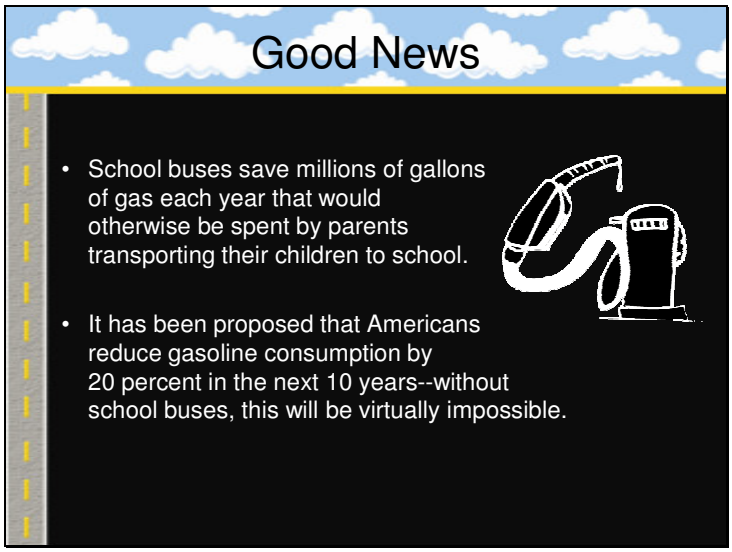

Basic Presentation Information

If there were no school buses, millions of additional gallons of gasoline would be consumed transporting children to and from school. Reducing the demand for oil products keeps prices for the oil products lower than they would otherwise be. Additionally, more efficiently transporting children to school saves parents and caregivers money that would be spent on private transportation.

The current presidential administration has recommended reducing gasoline consumption by 20% in the next 10 years. To do so, may require greater use of school bus transportation--not less. In fact, increasing the number of children transported to school by school bus rather than private vehicles would be one way to reduce oil consumption in the United States.

Sources

1) Reduce Gasoline Consumption, State of the Union Address, January 2007

Additional Background Information

According to American School Bus Council (ASBC)

- Total U.S. savings in fuel by students riding school buses (gallons) 2,297,142,857 =55 million BBL=1% of all transportation fuels
- Total U. S. savings in fuel cost per year by students riding school buses: $8,086,457,143
- The information below is the national data used to calculate how much gas and mileage is saved by children riding the yellow school bus as opposed to being driven to school by Mom and Dad. If you'd like to figure out the savings for your community and plug in the right

amounts for your community, use the ASBC fuel calculator (http://americanschoolbuscouncil.org/index.php?page=fuel-calculator)

- ASBC estimates the number of school buses in the U.S. to be 480,000
- Average miles traveled per year per bus: 12,000
- Total mileage for all buses: 5,760,000,000
- School buses transport 26 million of the 50 million students who attend school each day (ASBC estimate): 26,000,000
- The number of students transported by each school bus: 54

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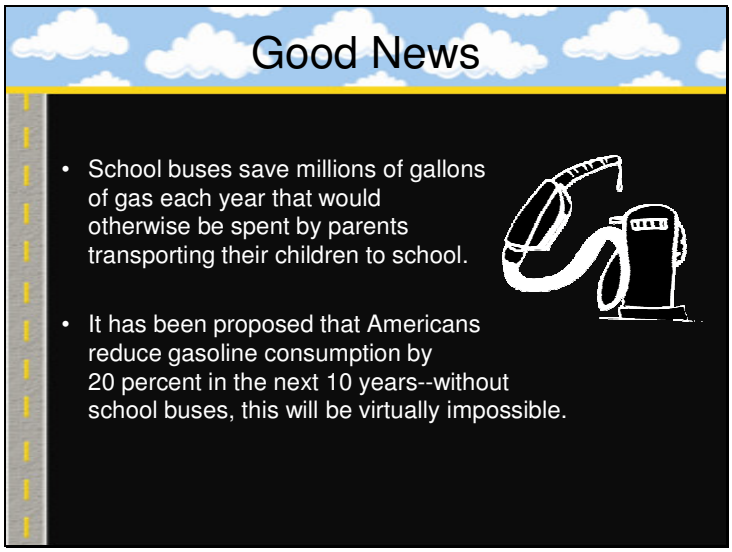


Additional Background Information (continued)

According to American School Bus Council (ASBC)

Average number of students transported per car if a school bus is not available (ASBC estimate): 1.5

The number of cars needed to transport students currently riding on one school bus: 36

The number of cars needed to transport students currently riding on all U.S. school buses : 17,333,333

Average fuel consumption (mpg) for school buses (assuming large capacity buses, diesel engines): 7

Average fuel consumption (mpg) for private vehicles (gasoline engines): 17.2
(According to the US EPA 2007 Report of Light-Duty Automotive Technology and Fuel Economy (see http://www.epa.gov/oms/fetrends.htm)

Average fuel use per school bus per year (gallons) 1,714

Total fuel used by all school buses per year (gallons) 822,857,143

Cost of diesel fuel per gallon (Source: Energy Information Administration, August 25, 2008) $4.145

Cost of gasoline per gallon (Source: Energy Information Administration, August 25, 2008) $3.685

Cost of diesel fuel per bus per year $7,106

Total cost of diesel fuel for all buses per year $3,410,742,857

Annual cost of fuel per child transported by school bus: $131

Average distance (miles) from home to school for bus riders (ASBC estimate): 5

Distance per day per student, assuming 2 round trips per day to transport students in private vehicle: 20

Length of average school year (days): 180

Average annual mileage to transport students from home to school and back in private vehicle: 3,600

Cost of fuel for transporting one private vehicle making two round trips to school: $663

Total daily car mileage saved by students riding school buses: 346,666,667

Total annual car mileage saved by students riding school buses: 62,400,000,000

Total annual car fuel savings by students riding school buses: (gallons) 3,120,000,000

Total annual car fuel COST savings by students riding school buses: $11,497,200,000

Total U.S. savings in fuel by students riding school buses (gallons) 2,297,142,857 =55 million BBL=1% of all transportation fuels

Total U. S. savings in fuel cost per year by students riding school buses: $8,086,457,143

Slide 25

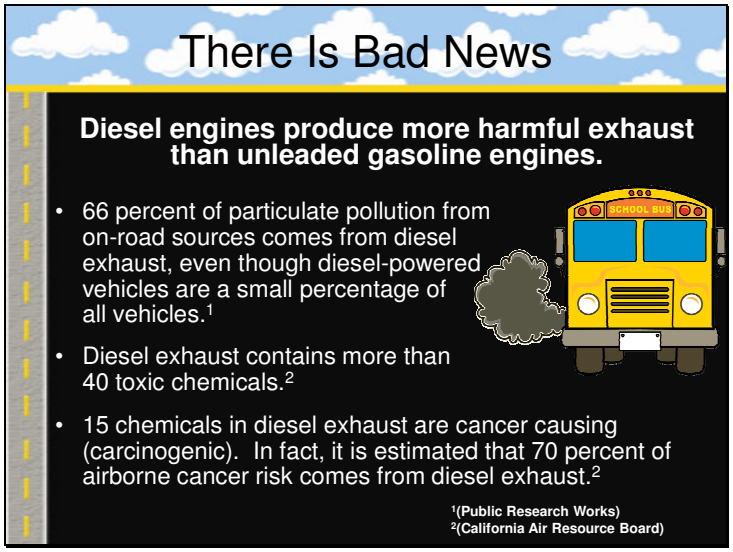
Basic Presentation Information

This presentation would be unnecessary if not for some recent studies that have revealed the health risks associated with school bus transportation. There are steps, however, that can be taken to reduce these risks.

Additional Background Information

No additional notes accompany this slide

Slide 26



Basic Presentation Information

Unfortunately, diesel engines, particularly older engines, produce more than their fair share of harmful pollution. In fact, it has been estimated that diesel exhaust causes 70% of the airborne cancer risk. Minimizing exposure to diesel exhaust is a significant public health goal. The general population is affected by breathing air that is contaminated with diesel fumes. School children who ride diesel powered buses to school are even more vulnerable because of their proximity to the source. One research study showed that a school bus passenger on a moving school bus is exposed to 4 times the amount of diesel exhaust as a passenger in the car directly in front of the bus.

Sources

1) 66% Particulate Pollution, Public Research Works
2) 40 Toxic Chemicals, California Air Resource Board
3) 15 Carcinogenic Chemicals, California Air Resource Board

Additional Background Information

According to the American Lung Association:

Why is Diesel Exhaust an Air Pollution Problem?

Diesel exhaust is a mixture containing over 450 different components, including vapors and fine particles. Over 40 chemicals in diesel exhaust are considered toxic air contaminants by the State of California. Exposure to this mixture may result in cancer, exacerbation of asthma, and other health problems.

For the same load and engine conditions, diesel engines spew out 100 times more sooty particles than gasoline engines. As a result, diesel engines account for an estimated 26 percent of the total hazardous particulate pollution (PM10) from fuel combustion sources in our air, and 66 percent of the particulate pollution from on-road sources. Diesel engines also produce nearly 20 percent of the total nitrogen oxides (NOx) in outdoor air and 26 percent of the total NOx from on-road sources. Nitrogen oxides are a major contributor to ozone production and smog.

What are the Health Effects?

Diesel exhaust has been linked in numerous scientific studies to cancer, the exacerbation of asthma and other respiratory diseases. A draft report released by the US EPA in February 1998 indicated that exposure to even low levels of diesel exhaust is likely to pose a risk of lung cancer and respiratory impairment. And in August 1998, the State of California decided that there was enough evidence to list the particulate matter in diesel exhaust as a toxic air contaminant - a probable carcinogen requiring action to reduce public exposure and risk.

Dozens of studies link airborne fine particle, such as those in diesel exhaust, to increased hospital admissions for respiratory diseases, chronic obstructive lung disease, pneumonia, heart disease and up to 60,000 premature deaths annually in the US.

The health risk from diesel exposure is greatest for children, the elderly, people who have respiratory problems or who smoke, people who regularly strenuously exercise in diesel-polluted areas, and people who work or live near diesel exhaust sources. Studies have shown that the proximity of a child's residence to major roads is linked to hospital admissions for asthma, and there is a positive relationship between school proximity to freeways and asthma occurrence. Truck and traffic intensity and exhaust measured in schools were significantly associated with chronic respiratory symptoms.

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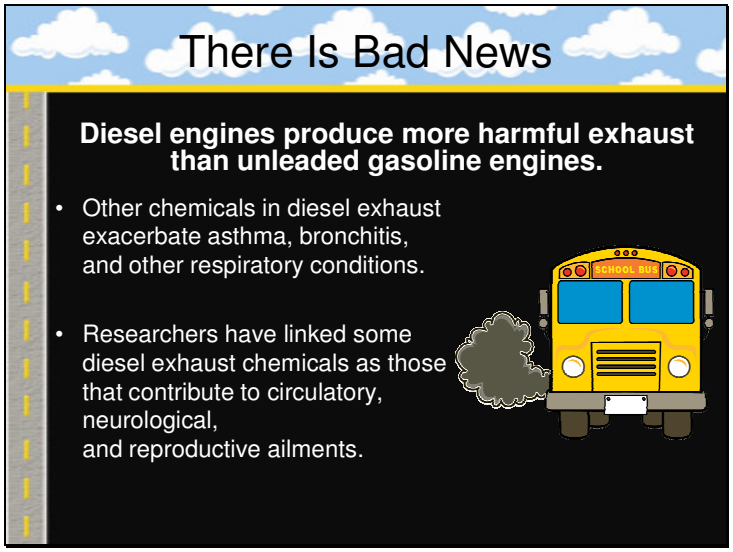

Basic Presentation Information

Again, diesel engines, particularly older engines produce more than their fair share of harmful pollutants. Chemicals in diesel exhaust exacerbate respiratory conditions such as asthma and bronchitis. It is currently estimated that 7-10% of children in the United States have asthma and the number on reason children are absent from school is asthma-related. Between 1980 and 1995, asthma increased 74% in the population between the ages of 5 and 14.

Sources

1) Asthma, Bronchitis, Respiratory: Union of Concerned Scientists
2) Circulatory, Neurological, Reproductive Ailments, Public Research Works

Additional Background Information

No additional notes accompany this slide

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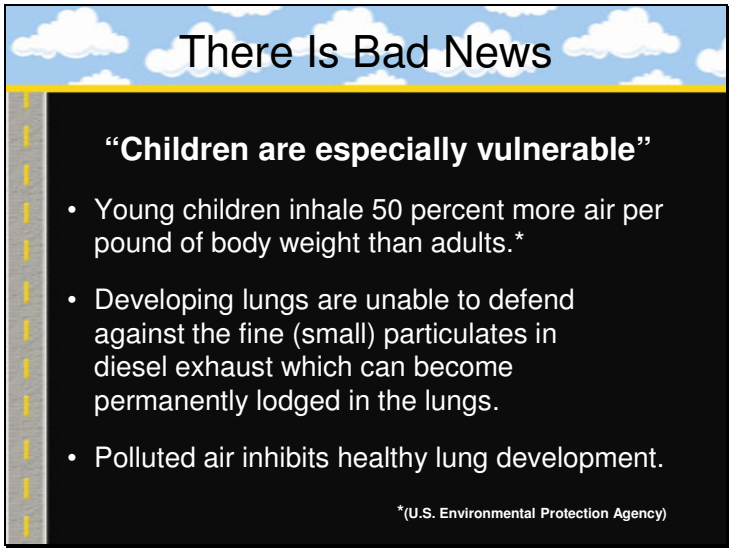

Basic Presentation Information

Children's lungs are still developing during the years they attend school. Exposure to diesel exhaust can create more significant health issues for children than adults because fully developed adult lungs can protect the body from harmful particulates found in diesel exhaust. Additionally, children tend to spend more time outside and inhale air closer to the ground where pollutants are denser. It is critical that steps be taken to minimize a child's exposure to diesel exhaust.

Sources

- Young Children Inhale 50% More Pollution, Environmental Protection Agency
- Fine Particulates, Environmental Protection Agency

3) Healthy Lung Development, California Air Resources Board

Additional Background Information

See article by Committee on Environmental Health of the American Academy of Pediatrics, **Ambient Air Pollution: Health Hazards to Children**, http://pediatrics.aappublications.org/cgi/reprint/114/6/1699

According to US EPA http://www.epa.gov/ttn/oarpg/naaqsfin/pmhealth.html

Children may be more vulnerable to environmental exposures than adults because:

- Their bodily systems are still developing
- They eat more, drink more, and breathe more in proportion to their body size
- Their behavior can expose them more to chemicals and organisms

Health and Environmental Effects of Particulate Matter

Why are We Concerned About Particulate Matter?
Particulate matter is the term used for a mixture of solid particles and liquid droplets found in the air. Coarse particles (larger than 2.5 micrometers) come from a variety of sources including windblown dust and grinding operations. Fine particles (less than 2.5 micrometers) often come from fuel combustion, power plants, and diesel buses and trucks. These fine particles are so small that several thousand of them could fit on the period at the end of this sentence.

They are of health concern because they easily reach the deepest recesses of the lungs. Batteries of scientific studies have linked particulate matter, especially fine particles (alone or in combination with other air pollutants), with a series of significant health problems, including:

- Premature death
- Respiratory related hospital admissions and emergency room visits
- Aggravated asthma
- Acute respiratory symptoms, including aggravated coughing and difficult or painful breathing;
- Chronic bronchitis
- Decreased lung function that can be experienced as shortness of breath
- Work and school absences

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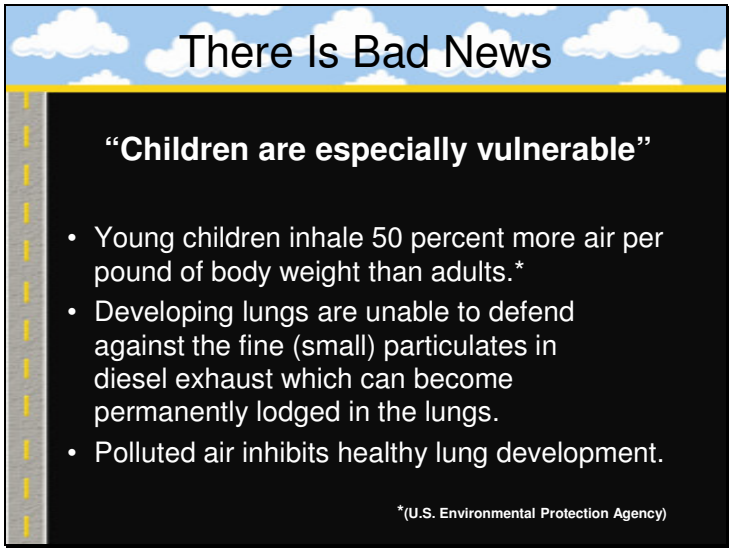

Additional Background Information (continued)

Who is Most at Risk from Exposure to Fine Particles?

The Elderly: Studies estimate that tens of thousands of elderly people die prematurely each year from exposure to ambient levels of fine particles. Studies also indicate that exposure to fine particles is associated with thousands of hospital admissions each year. Many of these hospital admissions are elderly people suffering from lung or heart disease.

Individuals with Preexisting Heart or Lung Disease: Breathing fine particles can also adversely affect individuals with heart disease, emphysema, and chronic bronchitis by causing additional medical treatment. Inhaling fine particulate matter has been attributed to increased hospital admissions, emergency room visits and premature death among sensitive populations.

Children: The average adult breathes 13,000 liters of air per day; children breathe 50 percent more air per pound of body weight than adults. Because children's respiratory systems are still developing, they are more susceptible to environmental threats than healthy adults. Exposure to fine particles is associated with increased frequency of childhood illnesses, which are of concern both in the short run, and for the future development of healthy lungs in the affected children. Fine particles are also associated with increased respiratory symptoms and reduced lung function in children, including symptoms such as aggravated coughing and difficulty or pain in breathing. These can result in school absences and limitations in normal childhood activities.

Asthmatics and Asthmatic Children: More and more people are being diagnosed with asthma every year. Fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. Children make up 25 percent of the population, but comprise 40 percent of all asthma cases. Breathing fine particles, alone or in combination with other pollutants, can aggravate asthma, causing greater use of medication and resulting in more medical treatment and hospital visits.

How do Particulate Matter and Fine Particles Affect the Environment?
The same fine particles linked to serious health effects are also a major cause of visibility impairment in many parts of the U.S. In many parts of the U.S. the visual range has been reduced 70% from natural conditions. In the east, the current range is only 14-24 miles vs. a natural visibility of 90 miles. In the west, the current range is 33-90 miles vs. a natural visibility of 140 miles. Fine particles can remain suspended in the air and travel long distances. For example, a puff of exhaust from a diesel truck in Los Angeles can end up over the Grand Canyon, where one-third of the haze comes from Southern California. Emissions from a Los Angeles oil refinery can form particles that in a few days will affect visibility in the Rocky Mountain National Park. Twenty percent of the problem on dirtiest days in that Park is attributed to Los Angeles-generated smog

What is Particulate Matter and What are "Fine" Particles?
Particulate matter originates from a variety of sources, including diesel trucks, power plants, wood stoves and industrial processes. The chemical and physical composition of these various particles vary widely. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or grey hazes.

Those particles that are less than 2.5 micrometers in diameter are known as "fine" particles; those larger than 2.5 micrometers are known as "coarse" particles. Fine particles result from fuel combustion (from motor vehicles, power generation, industrial facilities), residential fireplaces and wood stoves. Fine particles can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, crushing and grinding operations, and windblown dust.

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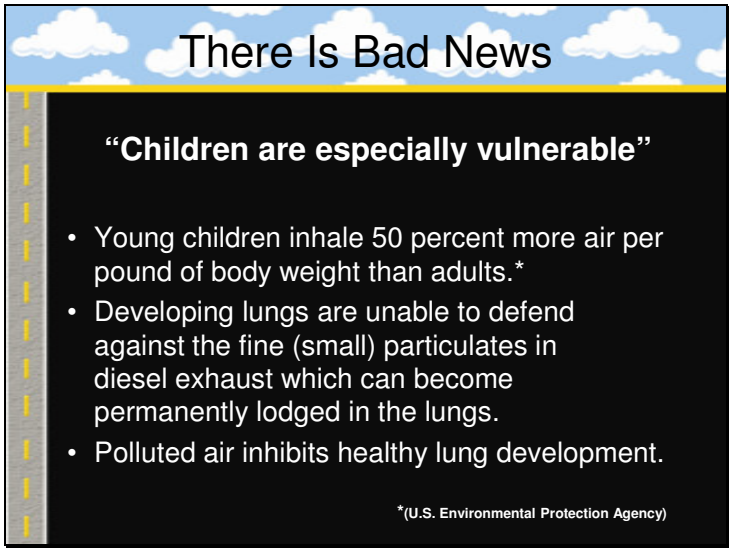

Additional Background Information (continued)

How does EPA regulated particulate matter?
EPA is also maintaining a national air quality standard focused on small particles less than 10 micrometers in diameter (known as "PM_{10}") to protect against coarse particle effects. Ten micrometers are about one-seventh the diameter of a human hair. Before 1987, EPA's standards regulated larger particles (so called "total suspended particulates"), including those larger than 10 micrometers. By 1987, research had shown that the particles of greatest health concern were those equal to or less than 10 micrometers that can penetrate into sensitive regions of the respiratory tract. At that time EPA and states took action to monitor and regulate particulate matter 10 micrometers and smaller.

In the years since the previous standard was enacted, hundreds of significant new scientific studies have been published on the health effects of particulate matter. Recent health effects studies suggest those adverse public health effects, such as premature deaths and increased morbidity in children and other sensitive populations, have been associated with exposure to particle levels well below those allowed by the current standard.

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Basic Presentation Information

The Environmental Protection Agency has launched the National Clean Diesel Campaign (NCDC), designed to aggressively reduce the pollution emitted from diesel engines across the country. The EPA is implementing control strategies as well as encouraging voluntary measures from national, state, and local partners.

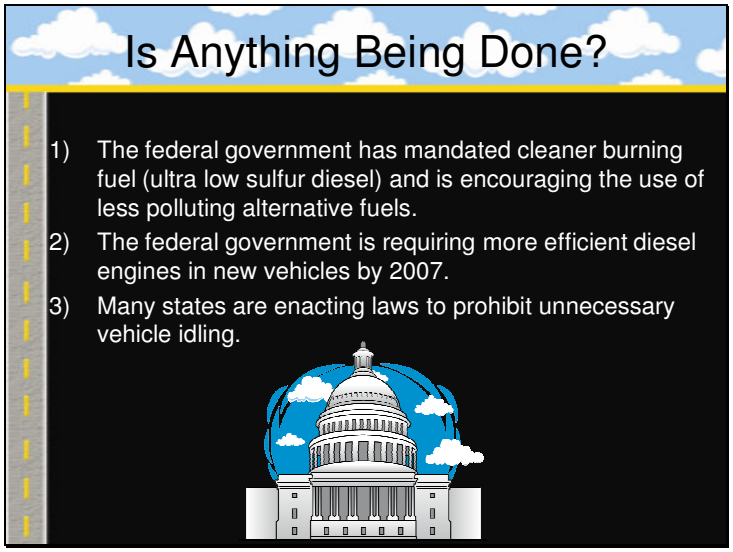
It is noteworthy to recognize that school bus idling is only one component of this larger campaign to significantly reduce harmful, diesel emissions. Off-road and other on-road sources of diesel exhaust are also included.

Sources
1) National Clean Diesel Campaign, Environmental Protection Agency

Additional Background Information

No additional notes accompany this slide

Slide 32



Basic Presentation Information

Steps are being taken to reduce the harmful effects of diesel pollution from all sources. Unfortunately, school districts throughout the United States are often financially strapped, so replacing older school buses manufactured prior to 1990 or even 2004 or installing pollution control devices are often not fiscally feasible. It is estimated that 1/3 of the diesel buses in operation were manufactured prior to 1990 when standards for diesel exhaust reduction were minimal. These school buses produce the bulk of the harmful pollution.

Sources

1) Ultra Low Sulfur Fuel, Environmental Protection Agency
2) More Efficient Vehicles, Environmental Protection Agency

Additional Background Information

According to EPA National Clean Diesel Campaign, http://www.epa.gov/diesel

EPA's Heavy-Duty Highway Diesel Rule

Schedule of Compliance: 25% by 2007, 50% by 2008, 75% by 2009, 100% by 2010

In 2000, EPA moved forward with its rule to make heavy-duty trucks and buses run cleaner. The Highway Diesel Rule (the "2007 Highway Rule"), was finalized in January 2001. Beginning with the 2007 model year, the harmful pollution from heavy-duty highway vehicles will be reduced by more than 90 percent.

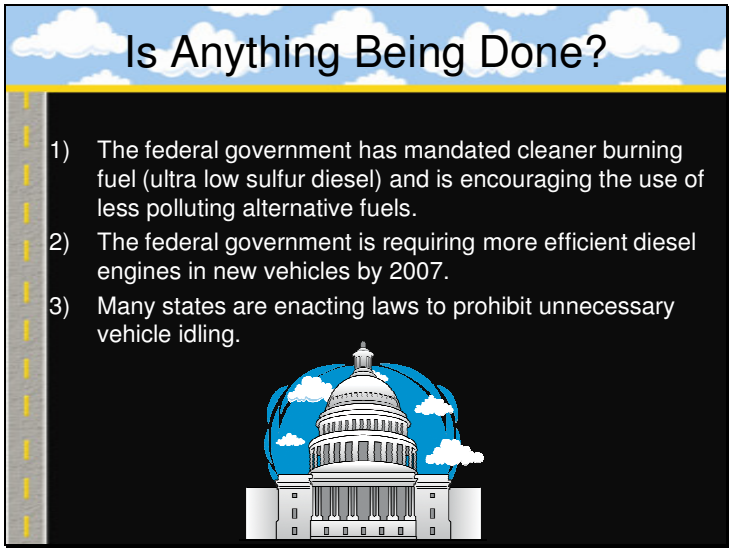
Sulfur in diesel fuel must be lowered to enable modern pollution-control technology to be effective on these trucks and buses. EPA will require a 97 percent reduction in the sulfur content of highway diesel fuel from its current level of 500 parts per million (low sulfur diesel, or LSD) to 15 parts per million (ultra-low sulfurdiesel, or ULSD). Refiners began producing the cleaner-burning diesel fuel (ULSD) for use in highway vehicles beginning June 1, 2006.

ULSD enables advanced pollution control technology for cars, trucks, and buses so that engine manufacturers can meet the 2007 emission standards. Engine manufacturers have the flexibility to meet the new standards through a phase-in approach between 2007 and 2010. The program also includes various flexible approaches, including additional time for some refiners and special provisions for small refiners.

Once this action is fully implemented, EPA estimates:

- 2.6 million tons of smog-causing nitrogen oxide (NOx) emissions will be reduced each year.
- Particulate matter will be reduced by 110,000 tons per year.
- In the long term, this program will result in more than $70 billion annually in environmental and public health benefits at a cost of $4 billion per year.

Slide 33



Additional Background Information (continued)

Health benefits will include the annual prevention of:

- 8,300 premature deaths
- 5,500 cases of chronic bronchitis
- 17,600 cases of acute bronchitis in children
- 360,000 cases of respiratory symptoms in asthmatic children
- 1.5 million lost work days
- 7,100 hospital visits
- 2,400 emergency room visits for asthma

About ULSD

EPA's Clean Air Highway Diesel final rule requires a 97 percent reduction in the sulfur content of highway diesel fuel, from its current level of 500 parts per million (ppm), to 15 ppm. As of October 15, 2006, ULSD is available at retail stations. Cars, trucks and buses with advanced pollution control will be available beginning in the autumn of 2006.

By addressing diesel fuel and engines together as a single system, this program will provide annual emission reductions equivalent to removing the pollution from more than 90 percent of today's trucks and buses, or about 13 million trucks and buses, when the current heavy-duty vehicle fleet has been completely replaced in 2030. This is the greatest reduction in harmful emissions of soot, or particulate matter (PM), ever achieved from cars and trucks.

Public Health Benefits

Smog causes a range of health problems related to breathing, including chest pain, coughing, and shortness of breath. Soot is deposited deep in the lungs and causes premature death, increased

emergency room visits, and increased respiratory symptoms and disease. With both smog and soot, children and the elderly are most at risk. Smog and soot also adversely affect the environment in various ways, including crop damage, acid rain, and visibility impairment.

National Clean Diesel Innovative Programs

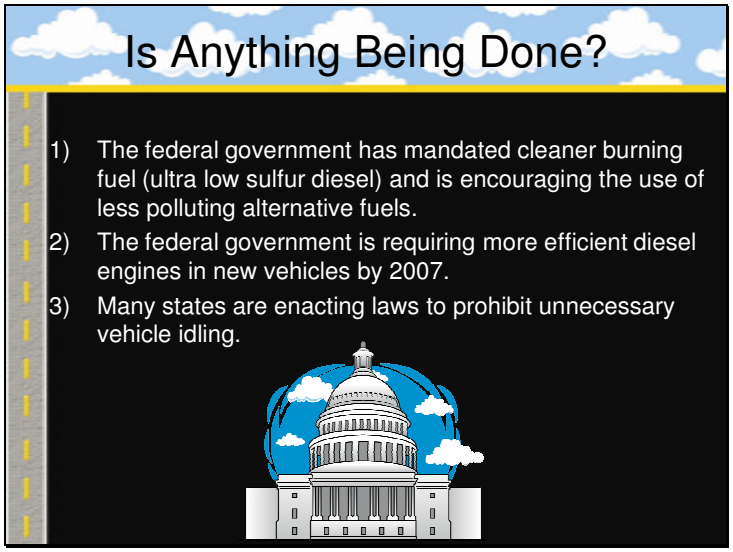
EPA has created a number of very successful innovative programs, all designed to reduce emissions from the diesel fleet.

In conjunction with state and local governments, public interest groups, and industry partners, EPA has established a goal of reducing emissions from the over 11 million diesel engines in the existing fleet by 2014. Looking at these engines, EPA determined there were general sectors that provided the best opportunity to obtain significant reductions. In addition, school buses were identified as an area where diesel emission control can greatly help a susceptible population.

Each program provides technical and financial assistance to stakeholders interested in reducing their fleet's emissions effectively and efficiently including

- SmartWay Transport (Commercial Trucks)
- Clean School Bus
- Clean Agriculture
- Clean Construction
- Clean Ports

Slide 34



Additional Background Information (continued)

Tips for a Diesel Exhaust Retrofit

1. Create a Fleet Inventory

Verified Diesel Particulate Filters (DPFs) and Diesel Oxidation Catalysts (DOCs) are available for nonroad and highway heavy-duty diesel engines for a wide range of model years, including buses, trucks, construction and cargo handling equipment, auxiliary power units and stationary generators. Each retrofit device is verified for use with specific engines and/or with specific configurations. A fleet inventory is an important tool for understanding and defining your fleet, and is the first step in any retrofit project.

You will need to identify the following for each vehicle in the fleet:

- Vehicle Type: highway or nonroad
- Vehicle Class: school bus, class 8A tractor, ferry, locomotive, forklift, etc.
- Vehicle Specifications: manufacturer, model, year
- Engine Specifications: manufacturer, model, year, displacement, horsepower; location, turbo-charge, exhaust gas recirculation
- EPA Engine Family Name: found on the engine's emission label; contains 11 or 12 characters such as TCP7.2RZBDBRB or 3NVXHO466ANA
- Annual Miles Traveled (highway) or Annual Hours of Operation (nonroad)
- Maintenance History: include documented lubrication oil and fuel consumption
- Engine-out Particulate Matter (PM) Emission Levels
- Based on the vehicle and engine information, you can sort your fleet into likely candidate vehicles for various emission reduction strategies: DPFs, DOCs, engine rebuilds or repowers, vehicle replacement.

- The fleet inventory will also help you complete the Applicant Fleet Description Spreadsheet (xls) (59K, February 2008) that is required for all EPA National Clean Diesel Campaign grant applications.(To view this spreadsheet you might need: MS Excel reader.)

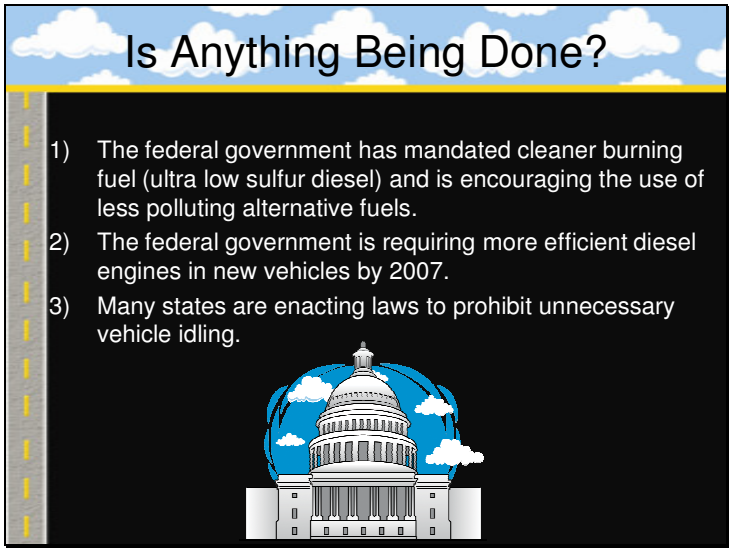
2. Log Exhaust Temperature Data

The exhaust temperature is a significant factor in determining whether a DOC or a DPF is applicable for a specific vehicle or piece of equipment. Data logging must be performed on each vehicle to document exhaust temperatures. If different vehicle routes or sporadic work loads are used, or significant changes in ambient temperatures are expected, data logging may be necessary under different conditions, to accurately document duty cycle and the resultant exhaust temperatures. Exhaust pipe insulation may be used to retain heat. If insulation is used, data logging should be performed with insulation installed.

To achieve verified emissions reductions, DOCs typically require a minimum exhaust gas temperature of 150°C, which is easily achieved on a wide range of engine models, years, and duty cycles. The required minimum exhaust temperatures for passive DPF systems range from approximately 240°C for 50 percent of the operating cycle to 400°C for 30 minutes. Active DPF systems rely on an additional heat source and are, therefore, not dependant on the engine duty cycle and the resultant exhaust temperatures.

Documenting exhaust temperatures early in the process will help you identify your retrofit technology options. Fleets should maintain data logging records for all vehicles for later reference.

Slide 35



Additional Background Information (continued)

Tips for a Diesel Exhaust Retrofit (continued)

3. Understand DPF Regeneration Requirements
DPF regeneration occurs when the filter element reaches the temperature required for combustion of the carbon in the PM to occur, converting it to gaseous carbon dioxide (CO2) and carbon monoxide (CO). How regeneration occurs depends on the exhaust temperature.

"Passive" regeneration occurs when the exhaust temperatures are hot enough to sufficiently raise the temperature of the filter element during the normal duty cycle. Metal-based catalysts applied to the filter alter the combustion chemistry and reduce the exhaust temperature needed for passive regeneration.

"Active" regeneration must be used when the engine exhaust temperature is not hot enough to initiate combustion of the collected PM, and requires an additional heat source to sufficiently raise the temperature of the filter element. The minimum frequency of regeneration is determined by the rate of PM build-up and is generally once per day or shift.

4. Understand DPF Cleaning Requirements
In addition to PM, the filter also traps noncombustible materials (ash), resulting primarily from lubrication oil and fuel additives. The removal of the ash from the DPF is called “cleaning” and is done much less frequently than regeneration. Intervals for DPF cleaning generally vary from bi-annually to annually, or longer, depending on engine-out PM emissions. Monitoring engine exhaust backpressure is the best way to determine if and when DPF cleaning is necessary. The need for

very frequent filter cleanings may indicate incomplete filter regeneration or the need for engine maintenance. Periodic filter cleaning for ash removal is necessary for both active and passive DPF systems.

In general, cleaning requires heating the filter and using compressed air, combined with a vacuum system to blow the ash from the filter and capture it in a sealed container. Professional filter cleaning services are available. Highly automated cleaning stations are also becoming available, allowing fleet service technicians to perform cleaning on-site. Costs for cleaning stations or professional cleaning services should be considered when purchasing DPFs.

Cleaning requires the manual removal of the DPF from the vehicle. If equipment down time during cleaning is a concern, fleets may consider buying extra filters, so that each vehicle will always be equipped with a filter. The filter must be reinstalled on the original vehicle and in the correct flow direction to maintain proper operation. Track the serial numbers for each retrofit device and the vehicle on which it is originally installed. Removal of the DPF for filter cleaning and reinstallation is typically performed by fleet service technicians.

It is important that all vehicle/equipment operators and fleet service technicians are properly trained on filter cleaning procedures.

(Continued next slide)

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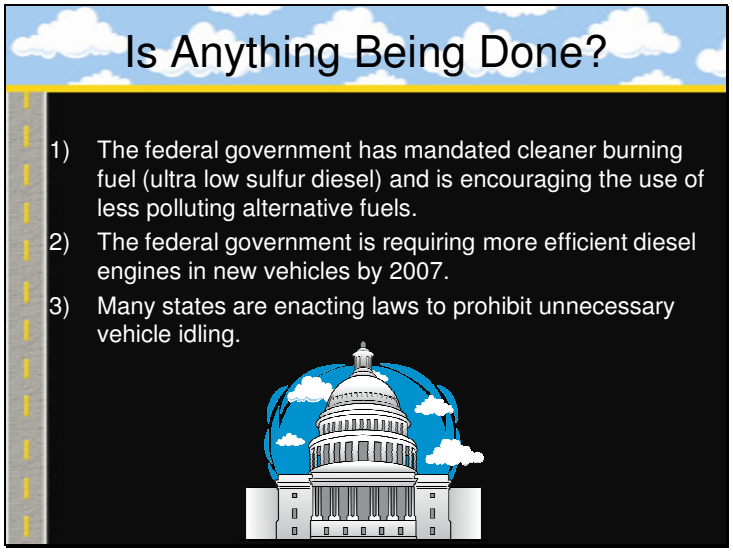


Additional Background Information (continued)

Tips for a Diesel Exhaust Retrofit (continued)

5. Select a Retrofit Technology
Several factors will determine which retrofit technology you install on each of your fleet vehicles, including your program's emissions reduction goals; the number of vehicles and available project funding; and the technical feasibility of installing various retrofit devices on your specific fleet.

EPA and California Air Resources Board's (CARB) lists of verified diesel retrofit technologies quantify the emission reductions achieved by each device and define the specific engine operating criteria that must be met, in order to successfully apply that device. EPA's Verified Technology List can be found at: www.epa.gov/otaq/retrofit/verif-list.htm. CARB has also developed a search tool that will identify potentially compatible CARB verified retrofit technologies, based on the fleet inventory information.

In addition, maintenance requirements and your maintenance capabilities should be considered for each type of retrofit. A centralized garage and maintenance facility may expand your retrofit options.

6. Select a Technology Supplier
To purchase goods or services under an EPA National Clean Diesel Campaign grant, you must compete the contracts for those goods and services and conduct cost and price analyses to the extent required by the procurement provisions of 40 CFR Part 30 or 31. The regulations require that efforts are made to provide small and disadvantaged businesses with opportunities to compete. In your bid proposal, be sure to specify that the technology must be verified by either EPA or CARB.

Once selected, retrofit suppliers will review actual vehicle operating conditions and perform temperature data logging prior to retrofitting a vehicle, to ensure retrofit compatibility. Fleets should obtain and store data logging records for all vehicles for later reference.

7. Install the Retrofit Device

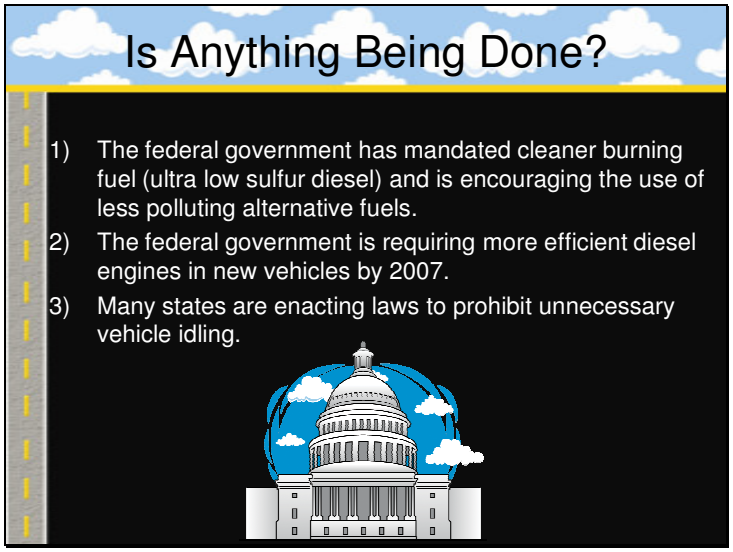
Prior to installing any retrofit device, engine inspection and maintenance should be performed to ensure proper engine operation conditions, including a check of the vehicle exhaust system integrity and lubrication oil consumption.

Installation may be performed by the retrofit supplier, or the retrofit supplier may provide training to fleet personal to perform the installation.

Since a retrofit device typically weighs more and may be larger than the muffler, stronger clamps and brackets may be required in place of those used with the original muffler. Failure to utilize appropriate hardware can result in a mechanical failure of support brackets and damage to the retrofit components. To facilitate removal of the device for cleaning, quick-release clamps are often used.

In some applications, the retrofit device matches the dimensions of the conventional muffler and can be installed as a muffler replacement. In other cases, the space available for retrofit installation on the vehicle or equipment is very restricted, and the retrofit configuration needs to be custom designed. Safety, visibility, and vibration may also need to be addressed by a custom installation.

Slide 37



Additional Background Information (continued)

Tips for a Diesel Exhaust Retrofit (continued)

Retrofit devices must be mounted within a set distance from the exhaust manifold, as specified by the manufacturer. Exhaust pipe insulation may be used to retain heat. The time required for retrofit installation will vary and can range from approximately two to twelve hours.

8. Monitor Backpressure
As a DPF collects PM, the passage of exhaust gas through the pores of the filter element may be progressively blocked, causing an increase in exhaust backpressure. Engine manufacturers place limits on the exhaust backpressures for their engines; therefore, an exhaust backpressure monitoring and operator notification system must be installed with every DPF.

If exhaust backpressure exceeds certain thresholds, the operator is notified that maintenance is needed. It is important that all vehicle/equipment operators and fleet service technicians are properly trained to recognize and respond to high backpressure alert signals. Backpressure monitoring systems should be periodically inspected for proper operation.

In most DOC retrofit applications, there is no need for backpressure monitoring. However, if the vehicle emits extremely high levels of PM and/or idles for long periods of time, an exhaust backpressure monitoring and operator notification system may be installed so that the operator is notified if maintenance is needed.

9. Maintain the Engine

It is important to properly maintain vehicles and monitor fuel and lubrication oil consumption. A bad fuel injector or increase in oil consumption may be masked by a retrofit device. A retrofit device may be damaged by a poorly maintained engine.

10. Keep Special Requirements for Closed Crankcase Ventilation Systems in Mind
Closed Crankcase Ventilation (CCV) systems are verified by EPA and CARB only when installed in conjunction with a DOC. EPA generally allows for grants to also fund the installation of a CCV in conjunction with a DPF, but grant funds can not be used to install a CCV by itself (independent of a DOC or DPF).

CCV systems may have special mounting requirements to enable oil flow back to the crankcase. The CCV system filter cartridges must be replaced periodically. Depending on the specific manufacturer, this frequency can vary from every 500 to 1000 engine hours, or once a year, or at every lubrication oil change recommended by the engine manufacturer. Some CCV models will have a service indicator to direct you to change the filter cartridge. You should consult with your technology provider on the correct maintenance schedule for your particular CCV.

Periodic inspection is necessary to confirm proper operation. Consult the manufacturer's instructions and check return lines for kinks and tight connections. Additionally, there should not be any oil or residue in the engine intake where the CCV connects.

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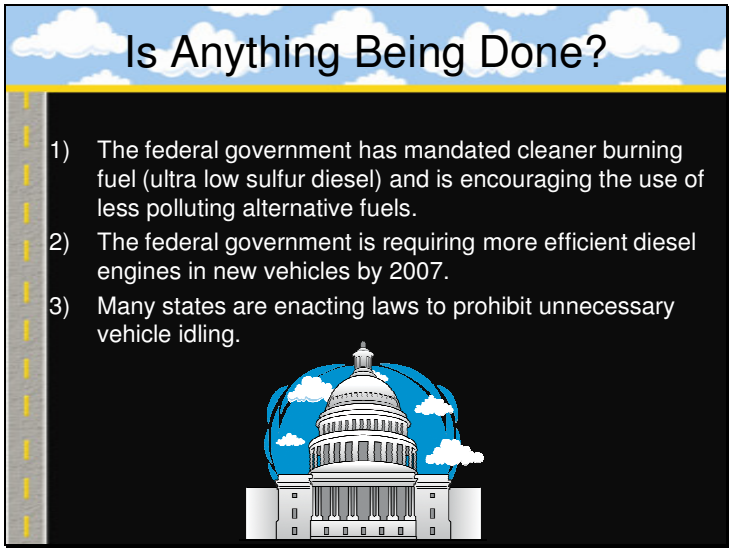


Additional Background Information (continued)

Tips for a Diesel Exhaust Retrofit (continued)

11. Understand Fuel Standards and Requirements
Ultra Low Sulfur Diesel fuel (ULSD), which contains up to 15 ppm sulfur, is required for highway vehicles and will begin to be phased in to the nonroad sector beginning in 2010. ULSD is required for all DPF installations, and is highly recommended for use with all DOCs. Fuel additives should not be used, unless explicitly approved by the retrofit manufacturer. CARB has verified many diesel emission control systems for use with biodiesel blends, subject to the following conditions:

- The biodiesel portion of the blend shall be 20 percent or less of the fuel.
- The biodiesel portion of the blend shall comply with the American Society for Testing and Materials (ASTM) specification D6751 applicable for 15 parts per million sulfur content.
- The diesel fuel portion of the blend shall comply with Title 13 California Code of Regulations, § 2281 and 2282.
- The use of biodiesel applies only to devices verified to reduce diesel particulate matter.

Other alternative diesel fuels such as, but not limited to, ethanol diesel blends and water emulsified diesel fuel, are excluded.

You should consult with your retrofit provider regarding the use of biodiesel and negotiate the warranty accordingly. Engine manufactures have varying policies regarding the use of biodiesel and biodiesel blends and should be consulted before fueling with biodiesel.

More so than regular diesel fuels, biodiesel will gel in cold weather. Cold weather strategies include blending biodiesel with kerosene; blending biodiesel with diesel that has been treated with cold weather additives; using block and filter heaters; storing your vehicles indoors; and using a B20 blend or below. You should consult with your fuel distributor to make sure your fuel is properly treated for cold weather performance.

The EPA hopes that the information provided in this document will help you get started on your diesel retrofit initiatives and avoid common mistakes as your retrofit program evolves. If you have questions after reading this document, please send an e-mail message to Clean Diesel (cleandiesel@epa.gov)

Slide 39

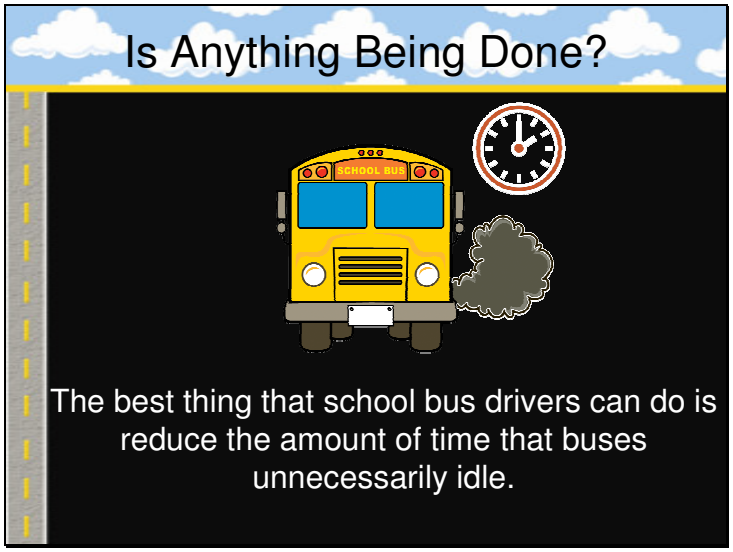
Basic Presentation Information

School bus drivers can make a substantial impact on the amount of harmful pollution in the air because small changes in individual driving practices when multiplied by the total number of school buses results in significant air quality improvement.

Additional Background Information

No additional notes accompany this slide

Slide 40



Basic Presentation Information

School buses idle at many different times and for a variety of reasons. It is important to identify when buses are unnecessarily idling for three reasons:

- Diesel engines emit more pollutants into the air when they idle
- Idling wastes fuel
- Idling increases engine wear and increases bus maintenance costs

Sources

1) Reasons to Discontinue Unnecessary Idling, Environmental Protection Agency

Additional Background Information

No additional notes accompany this slide

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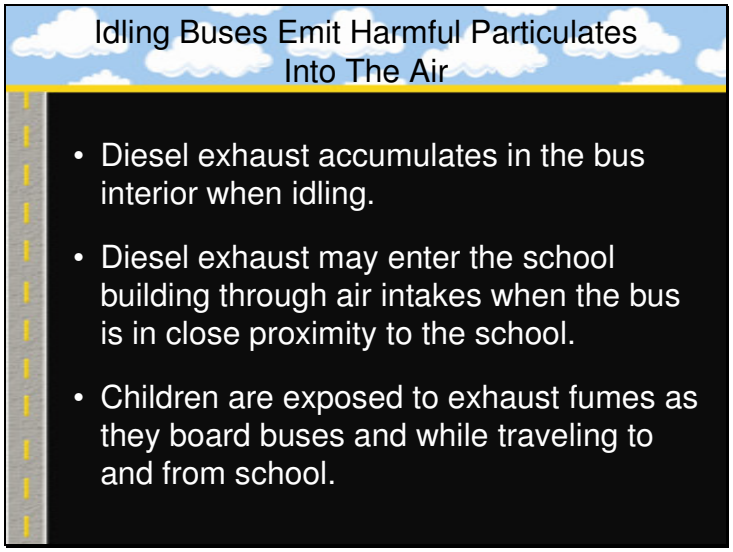

Basic Presentation Information

There are at least 3 good reasons to reduce idling besides the fact that an idling school bus gets zero miles per gallon of fuel.

- Idling buses emit harmful particulates into the air that everyone breathes. Children, even those who do not ride the bus, may be exposed to diesel exhaust as they enter or leave the school building.
- When school buses load and unload children close to the school building, diesel exhaust fumes can enter the school through air intakes and open windows and doors. Students and school employees breathe these fumes during the school day.
- Studies have also shown that diesel exhaust has a greater tendency to accumulate in the bus interior when the bus engine is running but the bus is stationary. Boarded students breathe this exhaust for all or some portion of their bus ride to and from school.

Sources

1) Harmful Particulates, California Air Resource Board
2) Diesel Exhaust Enters School, Massachusetts Department of Environmental Protection
3) Exhaust Accumulates in Bus, Coalition for Clean Air
4) Exposure While Boarding, Massachusetts Department of Environmental Protection

Additional Background Information

According to a study by Yale University and Environment and Human Health Inc., http://www.ehhi.org/reports/exhaust/exhaust06.pdf

Children's Exposure to Particulates on Buses
In a study of school buses in Connecticut, researchers found children were exposed to concentrations of airborne particulate matter (PM2.5) in that were sometimes 5-15 times higher than background levels.

Levels of fine particles and black carbon were higher under certain circumstances:

- When buses were idling with doors or windows opened;
- When buses moved through intense traffic;
- When buses followed other diesel vehicles; and
- Especially when buses were queued to load or unload students while idling.

Variability Within Buses
Particulate and black carbon levels vary within individual buses over time. The most important influences on variability include: bus idling behavior, queuing practices, bus ventilation via windows, and outdoor concentrations on bus routes. Particulate and carbon concentrations did not vary by sampling location within diesel buses (e.g., front vs. rear). Engine model, age of engine, number of miles since last overhaul, maintenance cycles, location of bus engine (front, next to driver, or rear), elevation change, passenger load, and climate may all influence levels of interior pollutants and children's exposure.

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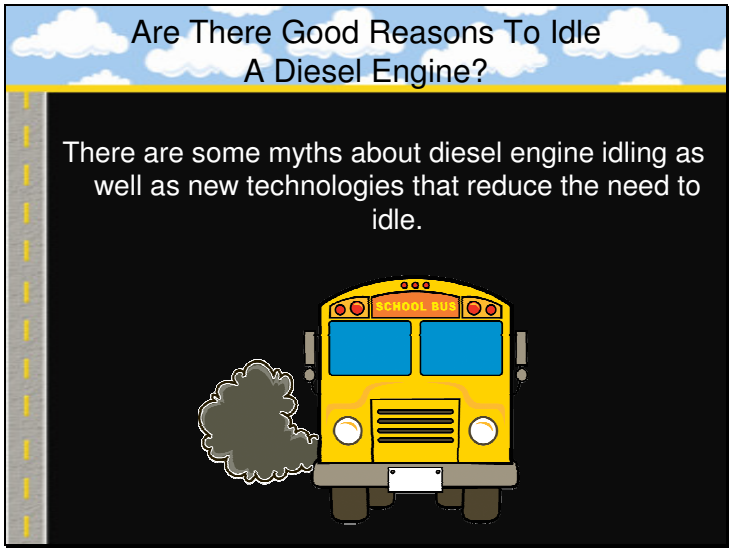


Basic Presentation Information

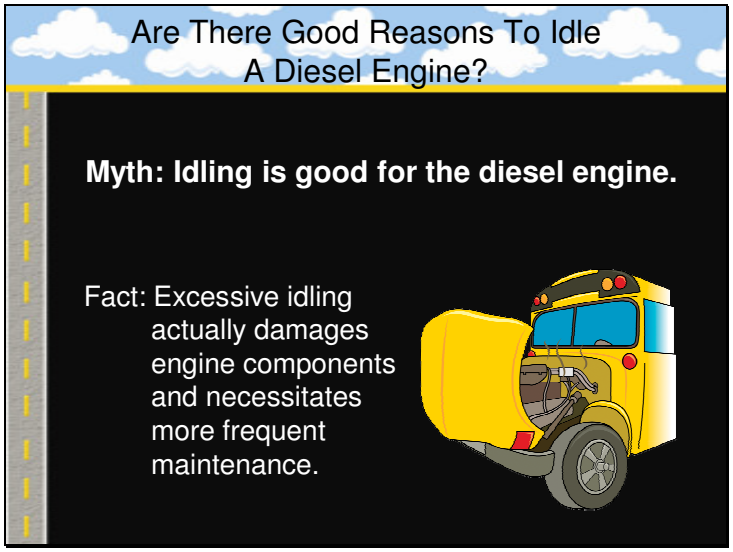
A number of reputable sources including manufacturers of diesel engines are now suggesting that idling be kept to a minimum. Unnecessary idling wastes fuel, increases maintenance costs, pollutes the air, and exposes children and bus drivers to toxic chemicals. New technologies have also been developed that reduce the need to idle for necessary reasons including cabin warm-up, electrical systems operation, and initial start-up in cold weather.

Educating those who use diesel engine equipment is the first step to idling reduction. To that end, a look at some of the myths about diesel engine idling is included.

Additional Background Information

No additional notes accompany this slide

Slide 43



Basic Presentation Information

For many years, there has been a belief that idling is good for the diesel engine. New technologies have eliminated many of the reasons that it was considered acceptable to idle a diesel engine in the past and recent research on the harmful effects of diesel exhaust should discourage unnecessary idling. Diesel engine mechanics know that the diesel engine operates most effectively when it is working, not idling. Excessive idling causes carbon build-up and may cause engine slobber. It also reduces fuel economy and oil life. It is estimated that idling the diesel engine causes twice the wear on internal parts compared to driving at regular speeds.

Sources

1) Idling Damages Diesel Engine Components, Environmental Protection Agency

Additional Background Information

According to the American Trucking Association

Diesel Engine Idling and Excessive Engine Wear (****these stats don't add up, need citation and clarification)

- Running an engine at low speed (idling) causes twice the wear on internal parts compared to driving at regular speeds.
- A truck idling for one hour suffers engine wear equal to about seven miles of driving.

- One hour of idling per day for one year results in the equivalent of 64,000 miles in engine wear when adding up all the contributing factors.

- Increases maintenance costs by almost $2,000 per year and shortens the life of the engine.

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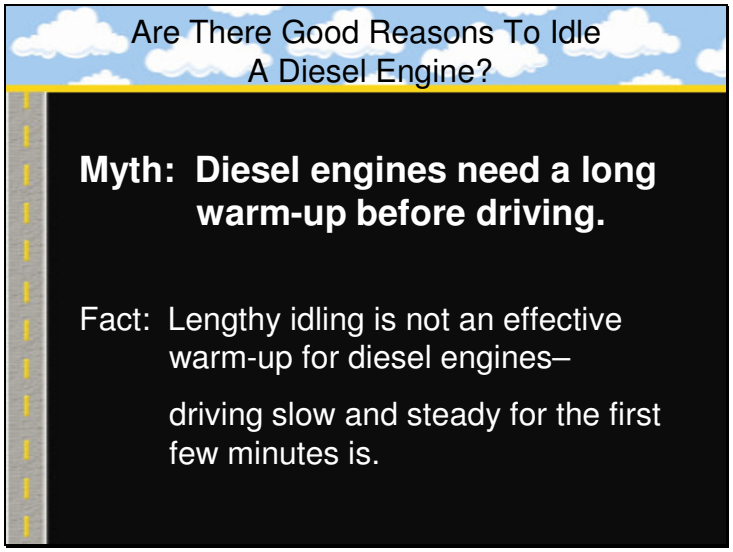

Basic Presentation Information

Diesel bus manufacturers suggest a warm-up time of less than 5 minutes. It is considered much more effective to warm-up a diesel bus by driving at a slow, steady speed than to idle for lengthy amounts of time at start-up.

Sources
1) 5-Minute Warm-up, Environmental Protection Agency

Additional Background Information

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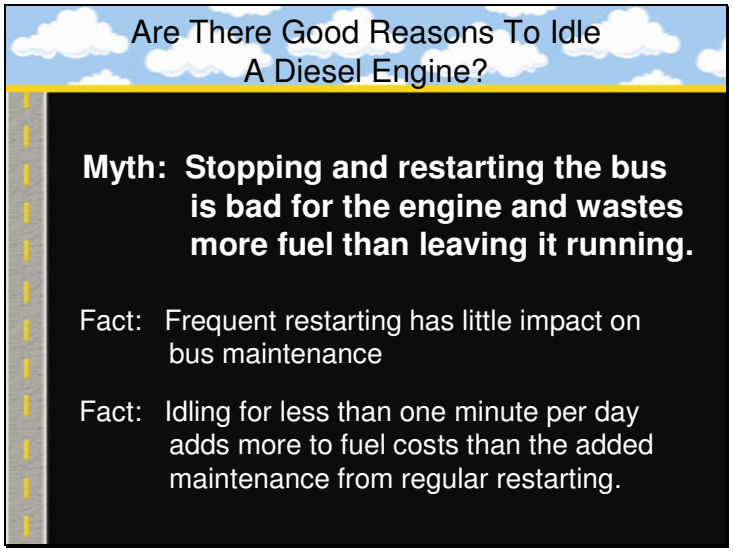
Slide 45



Basic Presentation Information

According to most sources, idling for more than 10 second uses more fuel than restarting a school bus diesel engine. Frequent restarting does necessitate more maintenance of mechanical systems but this cost is far less than the combination of additional idling engine maintenance costs and the fuel wasted during idling.

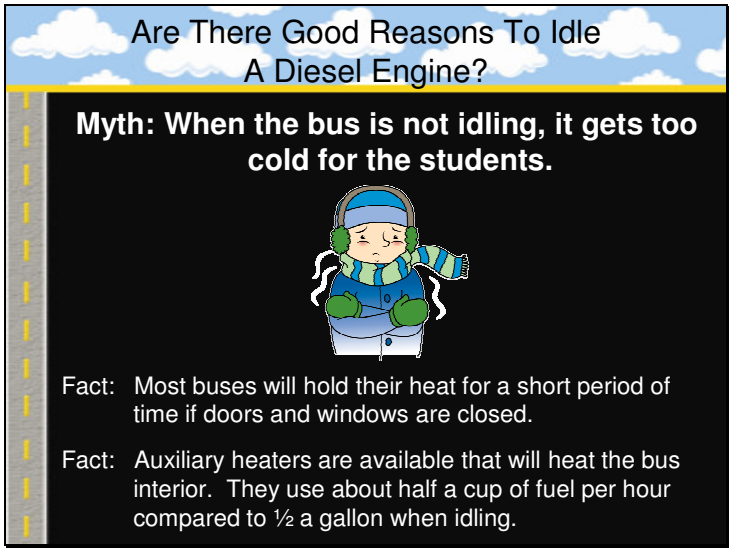
Sources

1) Idling Costs, Environmental Protection Agency

Additional Background Information

No additional notes accompany this slide

Slide 46



Basic Presentation Information

Once the cabin is warm, most school buses will maintain a comfortable interior temperature without idling. Idling is a very ineffective way to keep the cabin warm. In areas where temperatures get extremely cold, school transportation officials should consider auxiliary heaters that use significantly less fuel than idling to keep temperatures in the bus comfortable. There are currently a number of manufacturers of these devices.

Sources

- Idling to Maintain Cabin Temperature, Environmental Protection Agency

2) Aftermarket Auxiliary Heaters, Environmental Protection Agency

Additional Background Information

No additional notes accompany this slide

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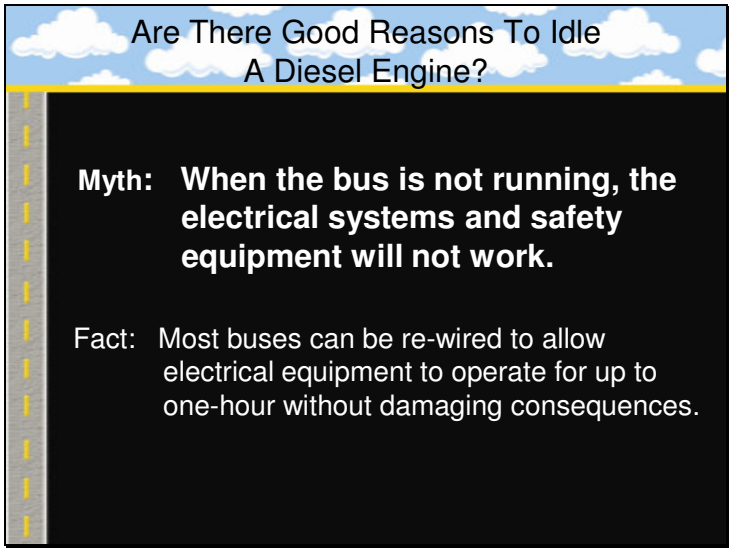

Basic Presentation Information

No notes accompany this slide

Additional Background Information

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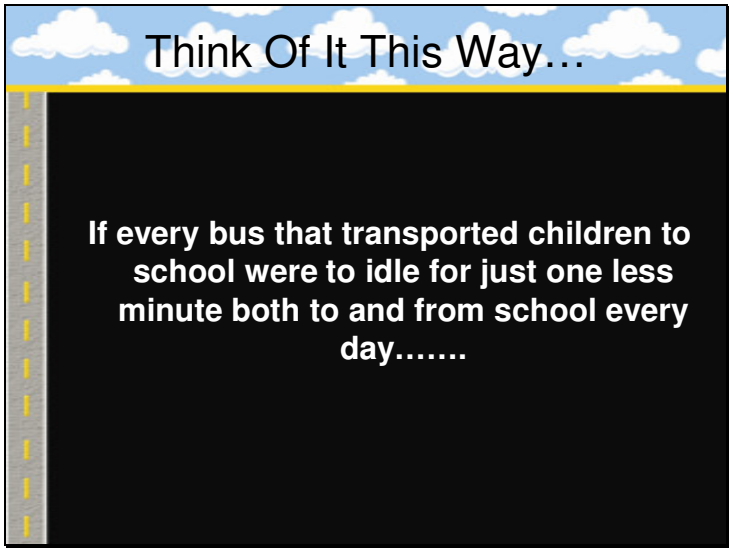
Slide 48



Basic Presentation Information

With over 500,000 school buses in operation daily in the United States, even a small modification in bus driver practices can have a significant impact. It is estimated that the average school bus is idled for 315 hours a year. Even reducing unnecessary idling by one minute, both before and after school, can significantly improve air quality, save fuel, and reduce maintenance.

Sources
1) 315 Hours Idling, National Environmental Enforcement Journal

Additional Background Information

No additional notes accompany this slide

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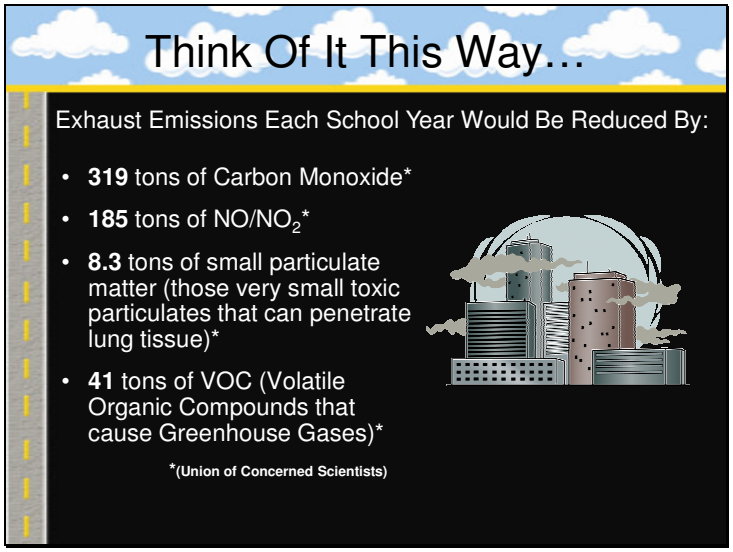

Basic Presentation Information

It is difficult to conceive the volume of airborne pollution it would take to add up to one ton. 319 tons of Carbon Monoxide (a deadly gas) would fill over 73 million 2-liter soda bottles. If each school bus driver in the United States reduced idling by 2 minutes a day, the pollutants in those 73 million bottles would be eliminated. Additional reductions in idling would serve to reduce pollution even more.

Sources

- 319 Tons of CO, Union of Concerned Scientists

2) 185 Tons of NO/NO_2, Union of Concerned Scientists

- 8.3 Tons of PM_{10}, Union of Concerned Scientists
- 41 Tons of VOC, Union of Concerned Scientists

5) 2-Liter Conversion, Arkansas Department of Environmental Quality

Additional Background Information

No additional notes accompany this slide

Slide 50

Basic Presentation Information

Idling any vehicle results in zero miles per gallon of fuel. As the demand for fossil fuels increases throughout the world, better conservation will be necessary. Idling reduction is one obvious way to reduce unnecessary fuel consumption.

Sources

1) 1,500,000 Gallons of Fuel, Environmental Protection Agency

Additional Background Information

No additional notes accompany this slide

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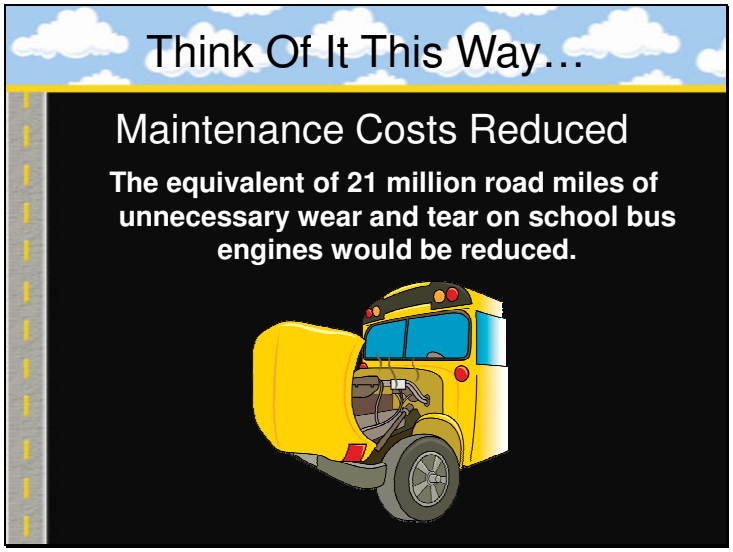


Basic Presentation Information

It is estimated that idling the diesel engines creates double the "wear and tear" of driving at regular speeds. Cummins, a leading diesel engine manufacturer lists the reasons as:

- Fuel contamination of lube oil is high
- Cylinder wall wear is accelerated by "wash down"
- Idling "over cools" the engine

According to Cummins (engine manufacturer), 500 hours of idling a diesel engine results in the equivalent of 64,000 miles of engine wear. Since the average school bus idles 315 hours in a year, the equivalent of 40,000 miles of road wear are added each school year.

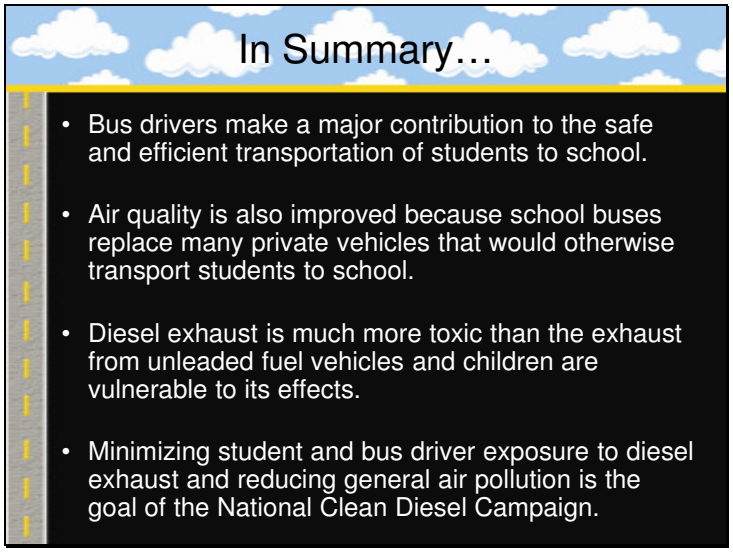
Sources

1) 21 Million Road Miles, School Transportation News
2) Idling Wear Equivalent, Cummins

Additional Background Information

No additional notes accompany this slide

Slide 52



Basic Presentation Information

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Additional Background Information

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Basic Presentation Information

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Additional Background Information

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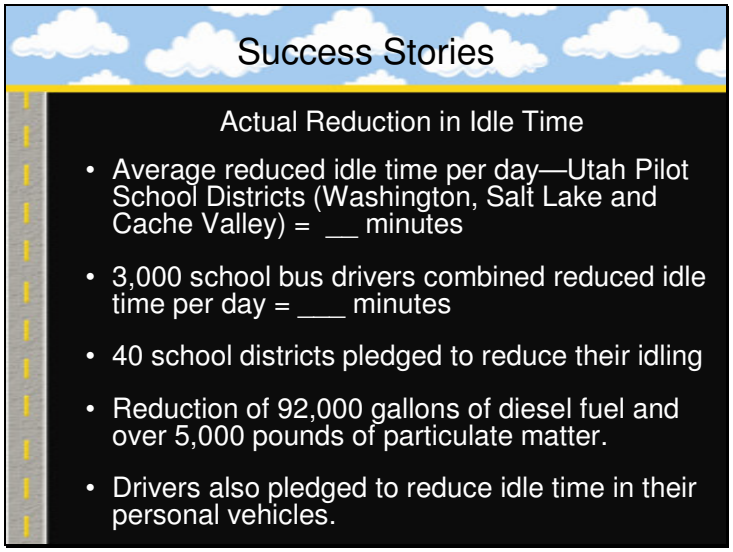
Slide 54



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Additional Background Information

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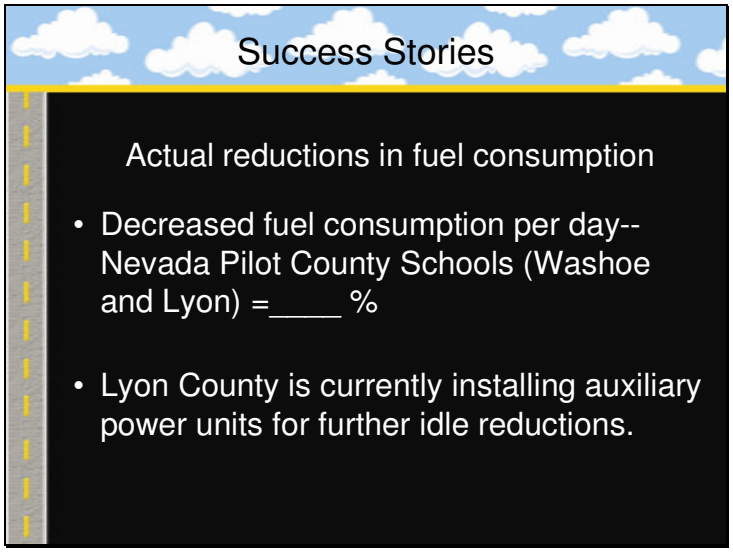
Slide 55



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