

Executive Session 04

Transportation and Climate Change—How Washington is Shaping Our Future

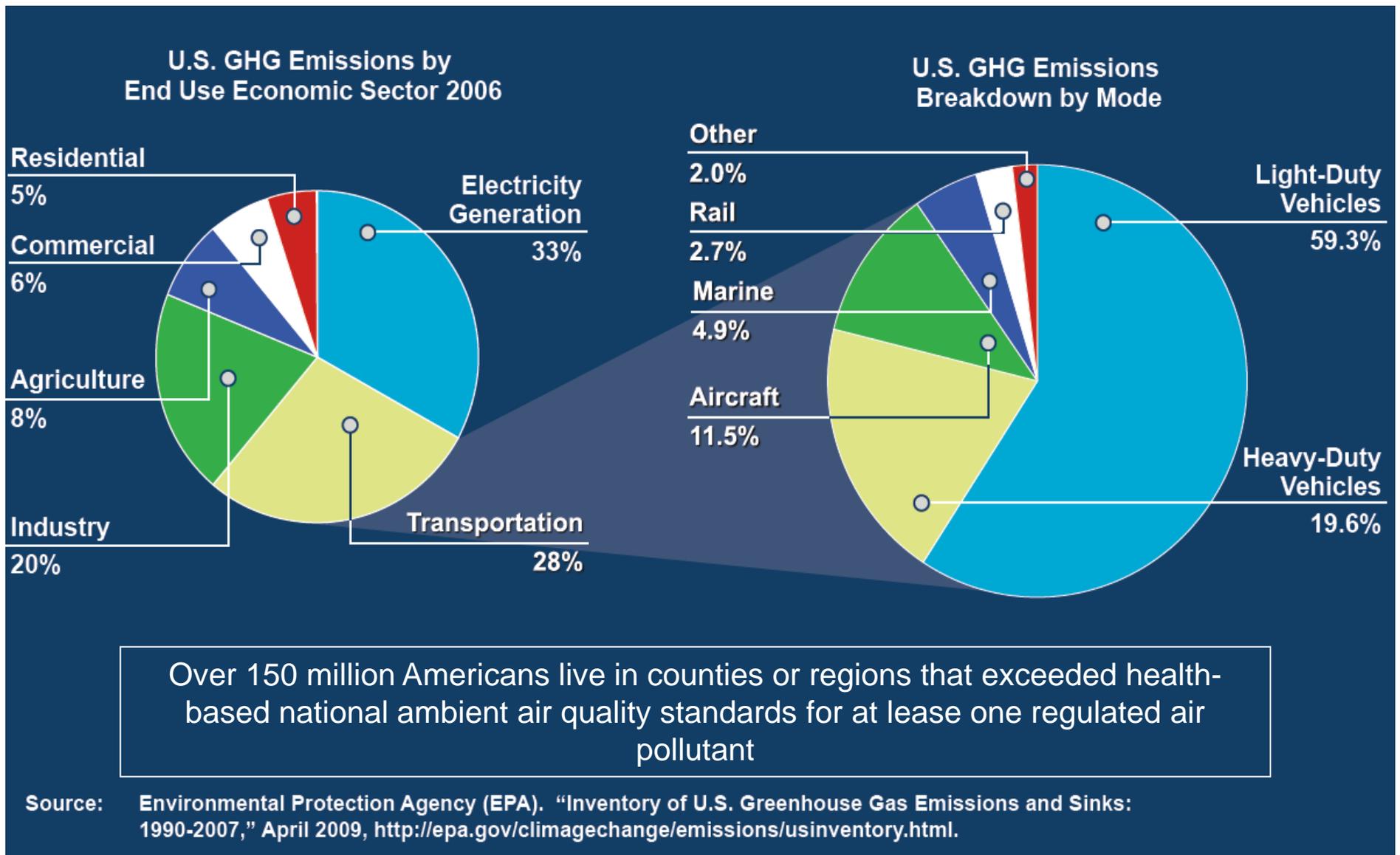
Technology and Policy Perspectives on Sustainable Transportation



INTELLIGENT
TRANSPORTATION
SOCIETY OF AMERICA
20th Annual Meeting & Exposition
May 3-5, 2010 • Houston, Texas

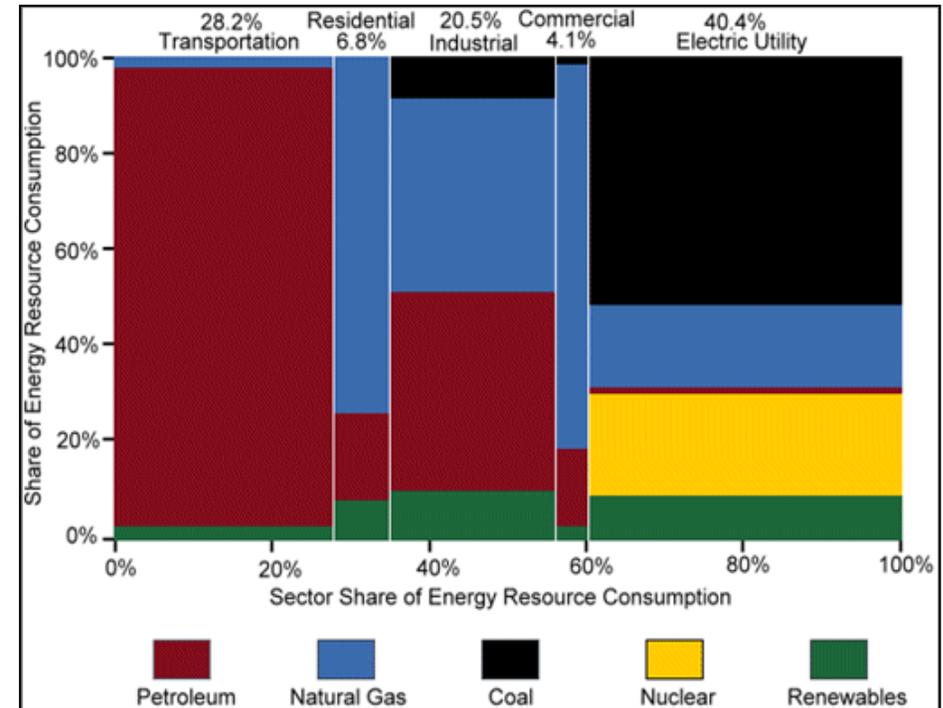
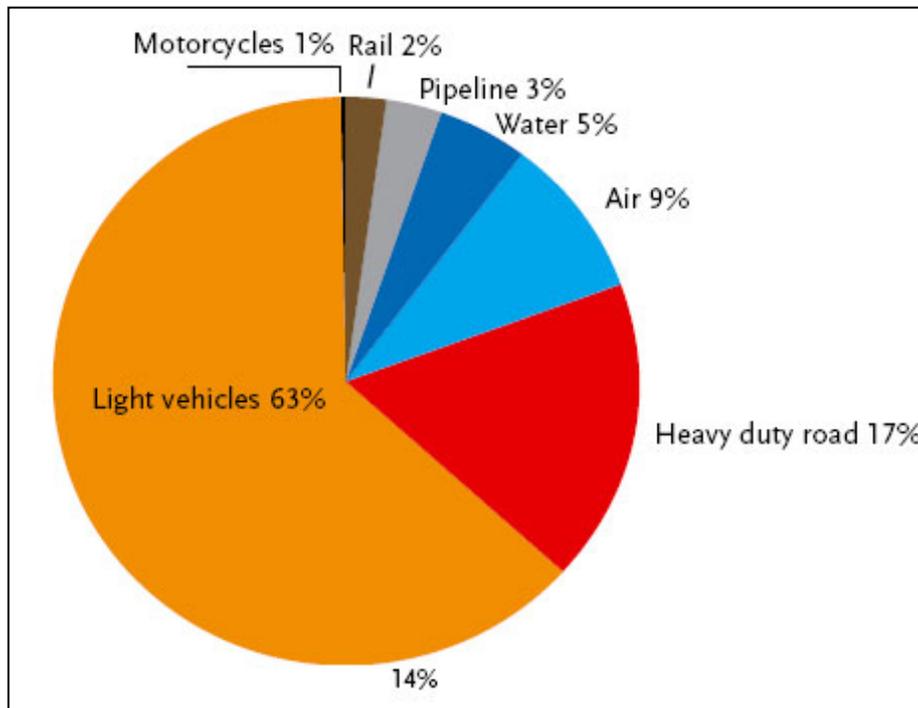
Robert L. Bertini, Ph.D., P.E., Deputy Administrator
Acting Director, Intelligent Transportation Systems Joint Program Office
Research and Innovative Technology Administration
U.S. Department of Transportation

U.S. GHG Emissions



Transportation Energy Consumption

- Transportation accounts for 28% of U.S. energy consumption
- Light vehicles account for 63% of transportation energy consumption
- Almost all of U.S. energy consumed for transportation is in the form of petroleum.
- In 2006 more than 60% of oil was imported



Source: US DOE

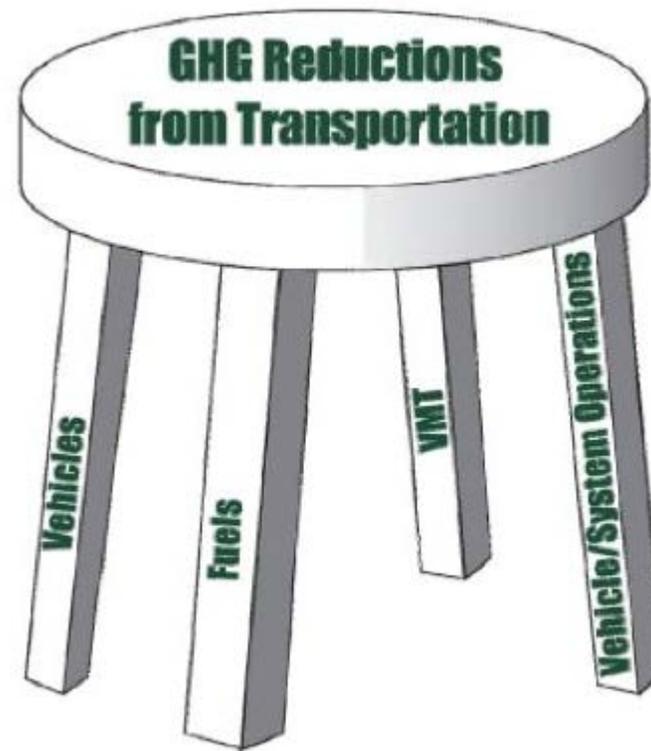
Solution: Four Legged Stool for GHG Reductions

Vehicle
Technology

Fuel
Technology

Vehicle Miles
Traveled

Vehicle/System
Operations



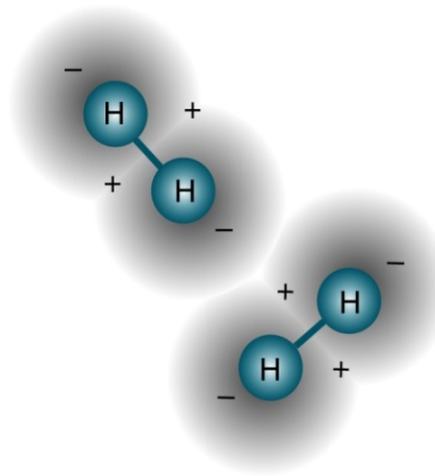
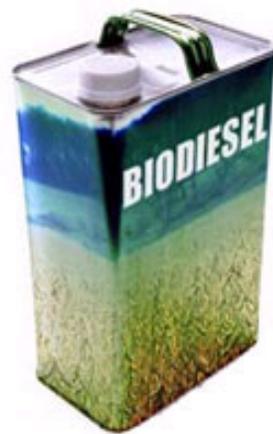
Vehicle Technology

- Greener Conventional Vehicles
- Alternative Fuel Vehicles
- Fuel Cell Vehicles
- Hybrid Electric Vehicles
- Battery Electric Vehicles

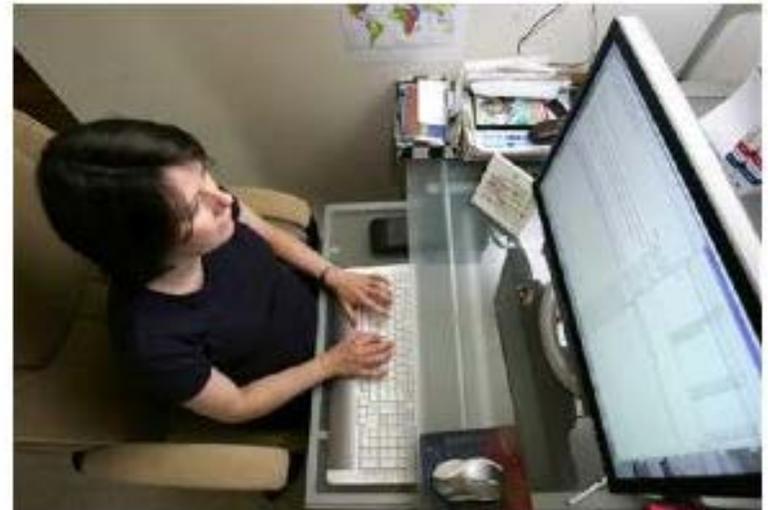


Fuels Technology

- Hydrogen
- Ethanol
- Biodiesel
- Compressed Natural Gas
- Liquefied Natural Gas
- Liquefied Petroleum Gas



VMT Reduction Via Mode Shift



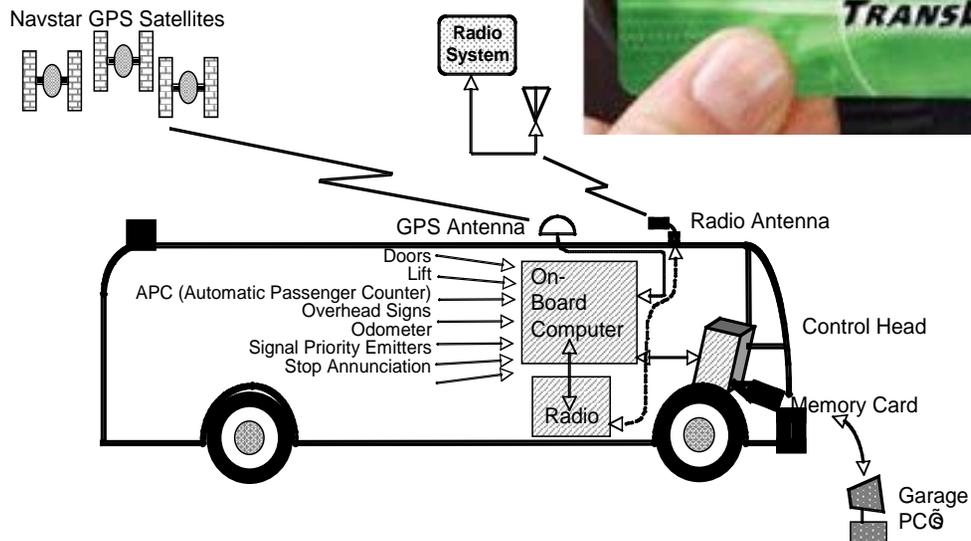
VMT Reduction Via Land Use



Improved Vehicle Operations Via EcoDriving



Transit Management



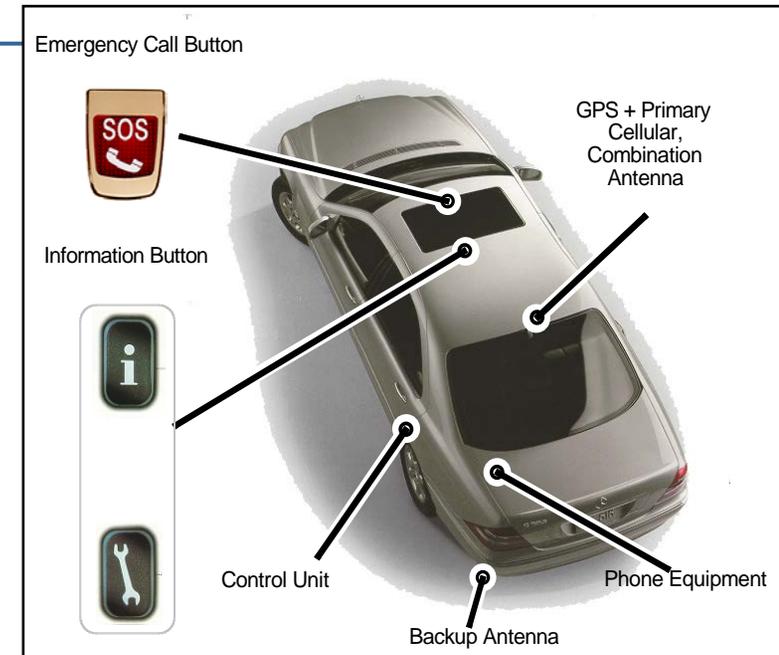
Intelligent Vehicles



Automated Highway System



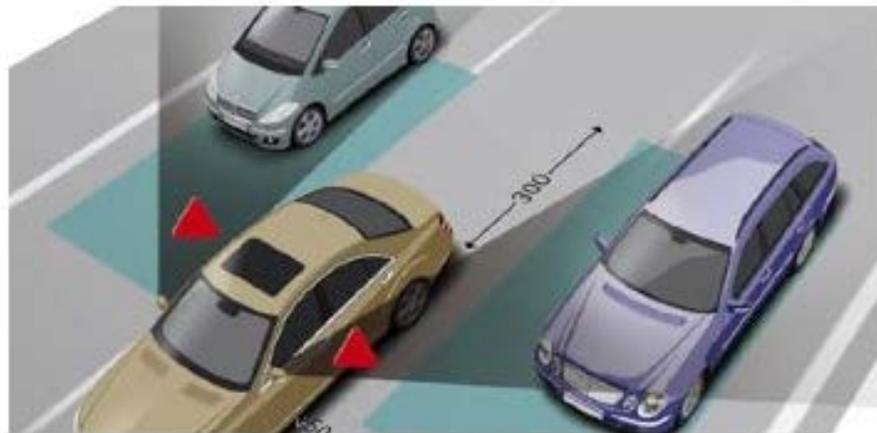
Hazard Warning



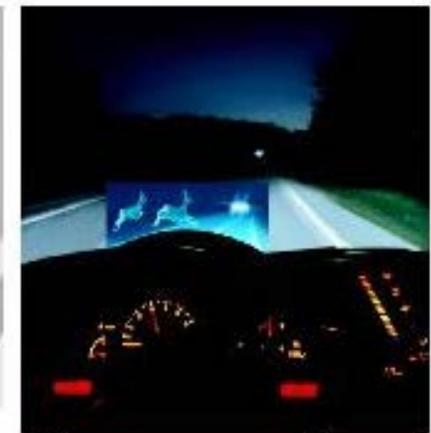
Telematics



Vehicle Infrastructure Integration

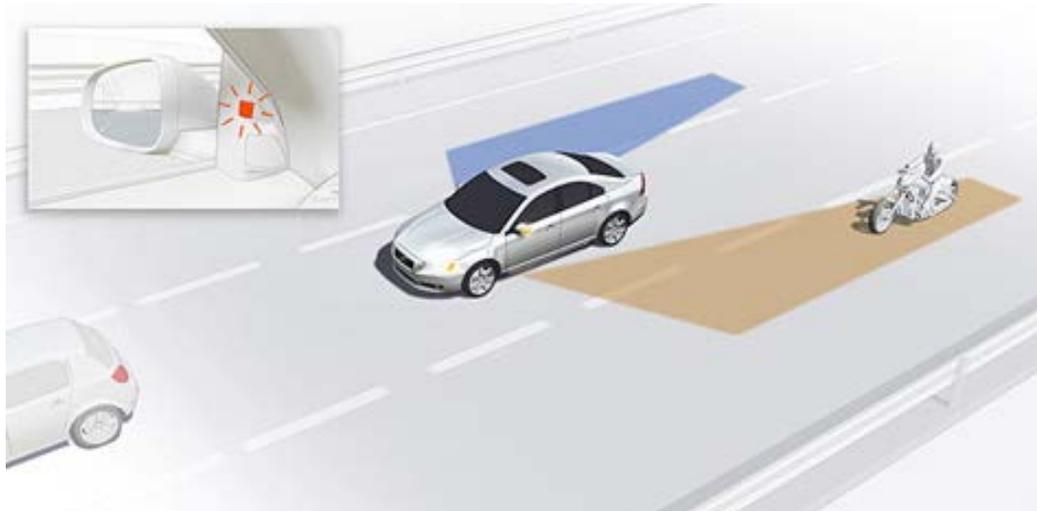


Vehicle to Vehicle Communications



Night Vision

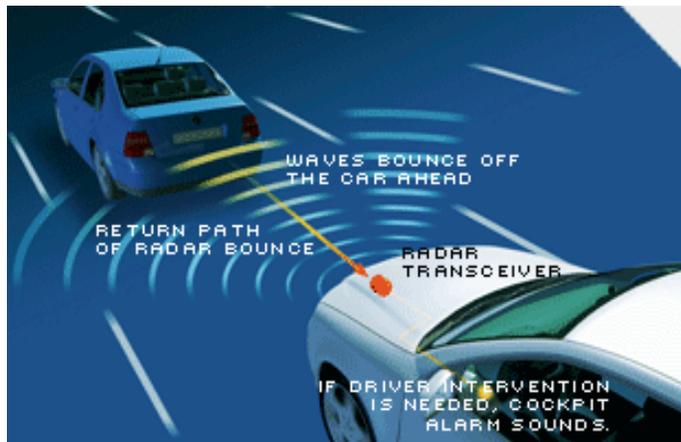
Intelligent Vehicles



Blind Spot Warning



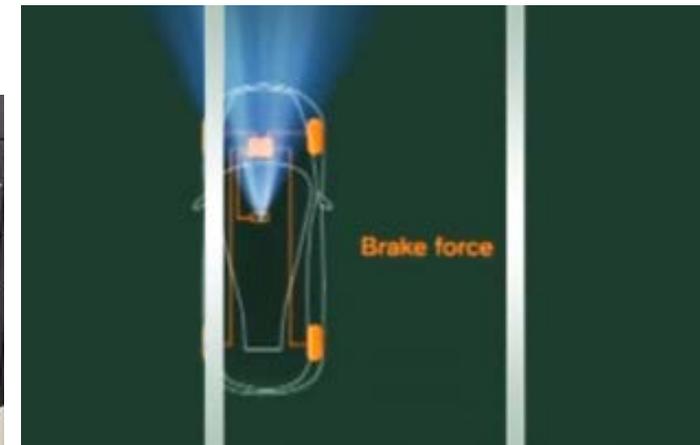
Lane Departure Warning



Adaptive Cruise Control
Forward Collision Warning



Parking Assist



Lane Keep Assist

Sustainability @ DOT



Sustainable development: *Meets the needs of the present without compromising the ability of future generations to meet their own needs.* (WCED 1987)



Sustainability must be a principle reflected in all our infrastructure investments, from highways and transit to aviation and ports.

Secretary Ray LaHood
Before the Committee on Commerce, Science and Transportation
U.S. Senate, January 21, 2009

Environmental Sustainability: Advancing environmentally-sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.

Sustainable community: If you don't want an automobile, you don't have to have one.

Obama Administration



New Energy for America plan with goal of reducing U.S. greenhouse gas emissions 80 percent below 1990 levels by 2050

- Implement market-based cap-and-trade system and invest \$150 billion over 10 years in advanced energy technologies
- National low carbon fuel standard
- National portfolio standard requiring 25% of electricity from renewable sources by 2025
- Double fuel economy standards in 18 years and get 1 million plug-in hybrid cars on road by 2015
- Require federal government to use renewable sources of electricity and by making federal buildings “zero-emission” by 2025
- Incentives to reward forest owners, farmers, and ranchers when they plant trees, restore grasslands, or undertake farming practices that capture CO₂ from the atmosphere



Executive Order 13514, October 5, 2009



- *Federal Leadership in Environmental, Energy and Economic Performance*
- Committed the Federal Government to lead by example
- All government agencies will be required to take steps to become more environmentally sustainable.
- **The federal government will reduce its greenhouse gas pollution by 28 percent by 2020**
- For DOT that means:
 - 30% reduction in vehicle fleet petroleum use by 2020
 - 26% improvement in water efficiency by 2020
 - 20% GHG reduction by 2020
 - 50% recycling and waste diversion by 2015
 - 95% of new contracts will meet sustainability requirements
 - 2030 net zero energy building requirements for new buildings
 - Sustainable federal building locations
 - Reduce travel via web/video conferencing/collaboration
 - Maximize recycling and use of recycled materials
 - Eliminate use of paper whenever possible
 - Ship recycling



Secretary LaHood's Priorities

- **Safety:** Improve public health and safety by reducing transportation-related fatalities and injuries.
- **Livability:** Promote place-based policies that provide transportation choices and improve the quality of life for all Americans.
- **State of Good Repair:** Ensure the U.S. proactively maintains its critical transportation infrastructure.
- **Economic Competitiveness:** Foster transportation investments and policies that serve the traveling public and freight movement to bring lasting economic and social benefit to the Nation.
- **Environmental Sustainability:** Pursue transportation policies and investments that reduce carbon emissions and foster protection of critical watersheds and ecosystems.



New Fuel Economy Standards



- March 27, 2009: Secretary LaHood announces new fuel economy standards for cars and light trucks for the 2011 model year
 - Industry-wide combined average raised to **27.3** mpg
 - 2.0 mpg increase over the 2010 model year average
 - Saves about 887 million gallons of fuel
 - Reduces CO₂ emissions by 8.3 million metric tons.
- May 19, 2009: President Obama announces agreement between auto industry, State of California, United Auto Workers, EPA & DOT to issue a joint rule to address fuel economy and greenhouse gas reductions.
 - **35.5** mpg standard by **2016**
 - 39 mpg for passenger cars
 - 30 mpg for light trucks
 - Exceeds Energy Independence and Security Act requirements of 35 mpg by 2020.



Key Priority: Environmental Sustainability

Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.

- Reduced carbon emissions, improved energy efficiency and reduced dependence on fossil fuels
- Reduced transportation-related air, water and noise pollution and impacts on ecosystems
- Increased use of environmentally sustainable practices and materials in the transportation sector
- Increased use of environmentally sustainable practices and a reduction in pollution and other adverse environmental effects from DOT owned or controlled transportation services and facilities



Key Priority: Environmental Sustainability

Outcome	Metric
Reduced carbon emissions, improved energy efficiency and reduced dependence on fossil fuels	<ul style="list-style-type: none"> • Aviation fuel efficiency • Transit vehicles using alternative fuels • GHG emissions from transportation • HSR funding • Investments in projects meeting outcome
Reduced transportation-related air, water and noise pollution and impacts on ecosystems	<ul style="list-style-type: none"> • Emissions of urban air pollutants • Hazardous liquid pipeline spills • People exposed to significant aircraft noise • Transit market share for top 50 urbanized areas • Energy use/GHG emissions for TIGGER projects • Localities reached through marine highway
Increased use of environmentally sustainable practices and materials in the transportation sector	
Increased use of environmentally sustainable practices, reduction in pollution and adverse environmental effects from DOT owned or controlled transportation services and facilities	<ul style="list-style-type: none"> • DOT fleet petroleum use • DOT water efficiency • DOT recycling and waste diversion • DOT contracts with sustainability requirements



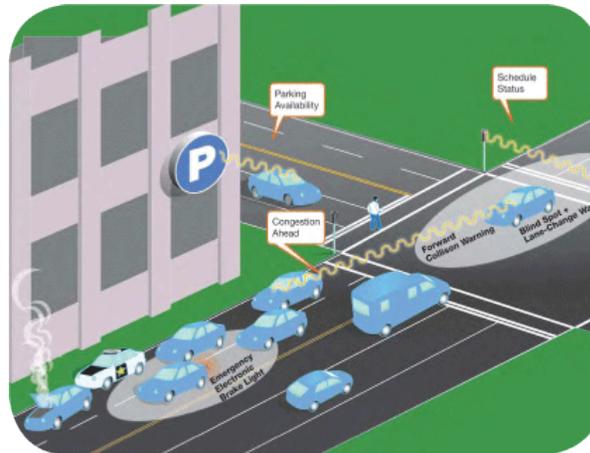
What is DOT Doing in Sustainability?

- Increase use of environmentally sustainable practices in transportation sector
- More research in sustainable transportation materials, construction and infrastructure
- Best practices in planning, construction, operations and maintenance
- Environmental management systems for facilities
- Innovative technologies and lifecycle analysis
- Assess impacts of climate change on transportation systems
- Exploratory advanced research promoting more environmentally friendly highway template
 - Recyclable techniques
 - Renewable materials
 - Permeable surfaces
 - Innovative techniques to mitigate storm water runoff
 - Use of transportation rights of way to improve air quality and electricity generation



U.S. DOT is Focused on Critical Transportation Issues

- Safety
- Distracted driving
- High-speed rail
- Alternative fuels
- Livability
- Sustainability
- Nanotechnology
- Land use planning
- Connected vehicles
- Next generation 9-1-1
- Traffic congestion
- Innovative financing
- Marine highways
- Climate change



Research Clusters

Key Priorities

- Safety
- Livable Communities
- State of Good Repair
- Economic Competitiveness
- Environmental Sustainability

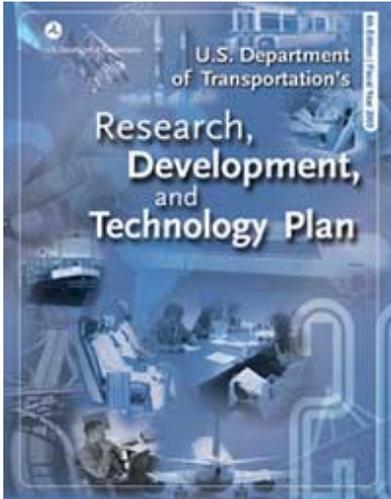


Scientific Clusters

- Infrastructure & Materials
- Human Factors
- Energy Sustainability
- Risk-Based Analysis to Address Safety Issues
- Data Driven Decision Making
- Multimodal Intelligent Transportation Systems
- Livability
- Modeling and Simulation
- Positioning, Navigation & Timing
- Transportation Implications for an Aging Population and Those with Special Needs
- System Resilience & Global Logistics
- Policy Analysis
- Travel Behavior
- Economics



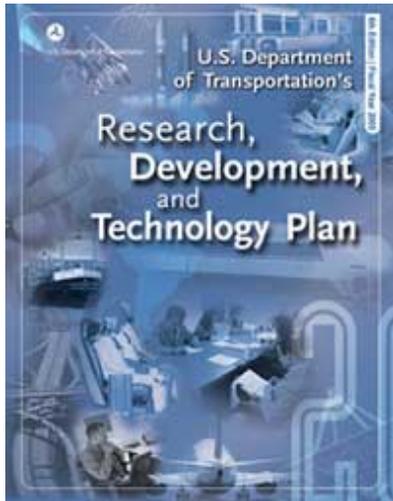
RD&T Strategic Plan: Sustainability Issues



- In development since December 2009 under RD&T Planning Team, with stakeholder input and involvement
- RD&T programs address environmentally sustainable transportation while maintaining a safe and efficient transportation network
- Research is improving understanding of broad environmental impacts of aviation, highway, rail, pipeline, and hazardous materials activities
- Reduce and mitigate transportation's adverse impacts through improved environmental standards and innovative planning tools
- Reduce emissions & fossil fuel dependence, improve energy efficiency
 - DOT/HUD/EPA Interagency Working Group on Transportation, Land Use & Climate Change: performance metrics, research & data needs
 - More efficient vehicles
 - DOT Center for Climate Change strategic research
 - Research program to assess role of transportation in climate change
 - Data collection for sustainability, GHG emissions and travel behavior
 - V2V and V2I research
 - Research and development for transit systems/vehicles



RD&T Strategic Plan



- Reduce transportation related air, water & noise pollution & impacts on ecosystems:
 - Aviation research to advance cleaner alternative fuels
 - Aviation Climate Change Research Initiative to study impacts of high altitude emissions
- Environmentally sustainable practices and materials in transportation sector requires research to:
 - Develop and implement innovative technologies via lifecycle analysis for products and processes
 - Promote more environmentally friendly highway template
 - Promote use of recyclable/renewable/permeable/innovative materials
- Reduce pollution and other adverse environmental effects from DOT owned or controlled transportation services and facilities:
 - Research and development of effective ballast water treatment systems and compliance monitoring methods for marine fleet

DOT Climate Change Center

- Formed in May 1999 to address issues associated with climate change adaptation and mitigation through **intermodal collaboration**
- Effects of climate change include rising sea levels, heavier rainfalls, more hurricanes, tornadoes and forest fires, and melting permafrost
- Conducts strategic research, policy analysis, partnerships, and outreach
- Holds monthly Climate Change Forums
- Hosts a Transportation and Climate Change Clearinghouse as a place for researchers to find comprehensive information on transportation and climate change.

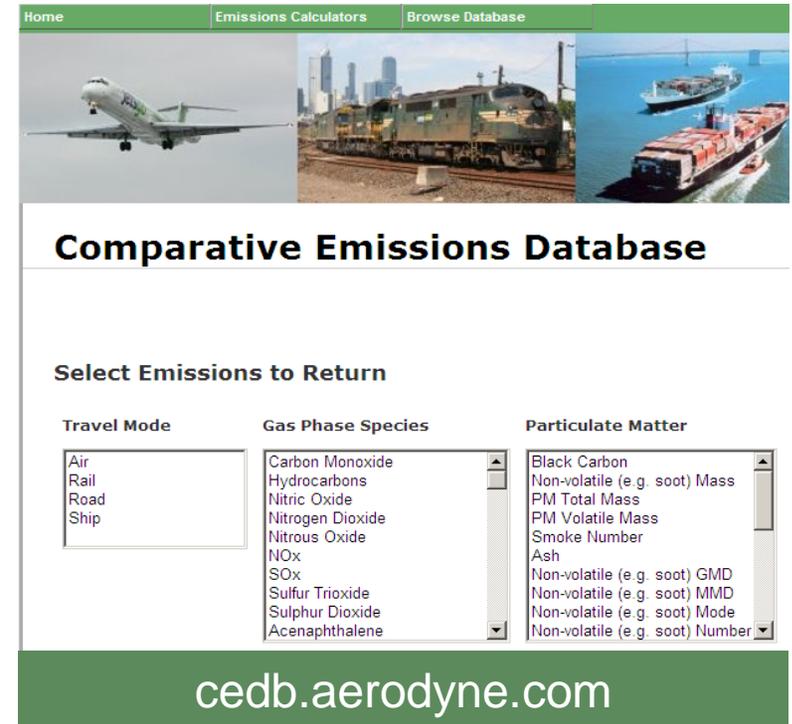
The screenshot shows the DOT Climate Change Clearinghouse website. At the top, there is a navigation menu with links for 'Clearinghouse Home', 'About the Clearinghouse', 'About the Center', 'Calendar of Events', 'Hot Topics', 'Climate Exchange', 'Glossary', and 'Site Map'. Below the menu is a search bar with the text 'Google search this site:' and a search button. The main content area is titled 'Transportation and Climate Change CLEARINGHOUSE'. On the left, there is a vertical menu with links to 'About Transportation & Climate Change', 'GHG Inventories, Forecasts, & Transportation Data', 'Methodologies for Analyzing GHG Emissions from Transportation', 'Greenhouse Gas Emissions Reduction Strategies', 'Climate Change Impacts & Adaptation', 'State/Local Actions & Policies', 'Federal Actions', 'Related Organizations', and 'Resources'. In the center, there is a circular graphic with icons representing various transportation modes and a globe. To the right of the graphic, there is a text block describing the Clearinghouse's purpose. Below the graphic, there is a 'Hot Topics' section with two links: 'California Air Resources Board Approves Climate Change Scoping Plan' and 'National Action Plan Vision for 2025: A Framework for Change'. At the bottom, there are two columns: 'New Resources' and 'Calendar of Events'. The 'New Resources' column contains two articles: 'Carbon Sequestration Pilot Program: Implementation and Next Steps (2009)' and 'Growing Cooler: The Evidence on Urban Development and Climate Change (2008)'. The 'Calendar of Events' column contains three events: 'Association of Metropolitan Planning Organizations 2009 Annual Conference', '2010 Environment and Energy in Transportation Summit', and 'The 9th National Conference on Access Management "Sustainable Solutions for Transportation"'. A 'Read more' link is located at the bottom right of the 'Calendar of Events' section. The URL 'www.climate.dot.gov' is displayed at the bottom of the page.



DOT Climate Change Center

Recent Climate Change Center studies include:

- Transportation's Role in Reducing U.S. Greenhouse Gas Emissions (Report to Congress)
- Gulf Coast II
- The Potential Impacts of Global Sea Level Rise
- Comparative Emissions Database
 - Enables comparison of the potential emissions associated with moving passengers and freight via various transportation modes.
 - This data can be used as input to emissions models to calculate inventories and health and climate impacts.

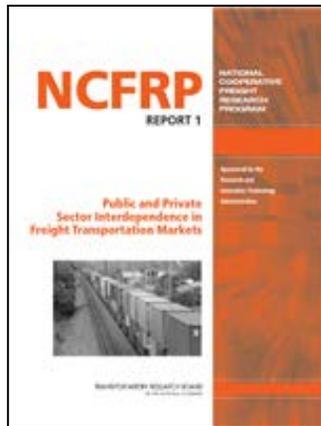


The screenshot shows the website interface for the Comparative Emissions Database (cedb.aerodyne.com). At the top, there are navigation links for "Home", "Emissions Calculators", and "Browse Database". Below these are three images: an airplane, a train, and a ship. The main heading is "Comparative Emissions Database". Underneath, there is a section titled "Select Emissions to Return" with three columns: "Travel Mode", "Gas Phase Species", and "Particulate Matter". Each column has a list of options with scroll bars. The "Travel Mode" list includes Air, Rail, Road, and Ship. The "Gas Phase Species" list includes Carbon Monoxide, Hydrocarbons, Nitric Oxide, Nitrogen Dioxide, Nitrous Oxide, NOx, SOx, Sulfur Trioxide, Sulphur Dioxide, and Acenaphthalene. The "Particulate Matter" list includes Black Carbon, Non-volatile (e.g. soot) Mass, PM Total Mass, PM Volatile Mass, Smoke Number, Ash, Non-volatile (e.g. soot) GMD, Non-volatile (e.g. soot) MMD, Non-volatile (e.g. soot) Mode, and Non-volatile (e.g. soot) Number. At the bottom of the interface, the URL "cedb.aerodyne.com" is displayed.

An example of I-95 running through areas that are currently wetlands that may become open water (highlighted in transparent dark blue), as outlined in the Sea Level Rise Study. The dikes on which the roads are built were designed for and work well in the existing wetlands, but will they perform appropriately in open water?



National Cooperative Freight Research Program



NCFRP 16
Representing Freight in Air Quality and
Greenhouse Gas Models



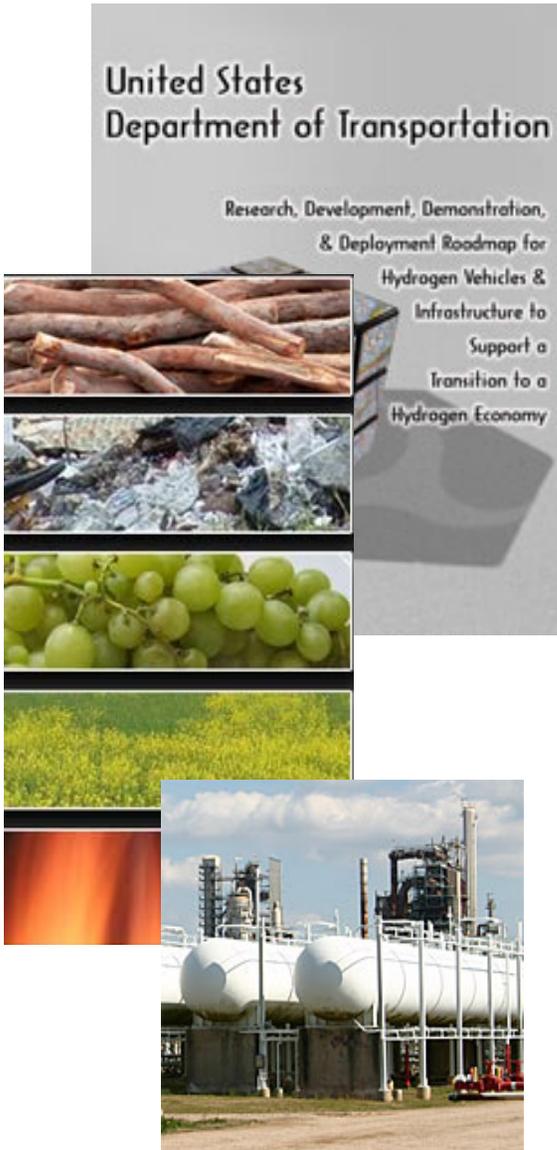
NCFRP 28
Truck Idling Scoping Study



NCFRP 27
Promoting Environmental Goals in Freight
Transportation through Industry
Benchmarking



Alternative Fuels



- RITA coordinates most of DOT's research on alternative fuels, alternative vehicles, hydrogen fuels and fuel cells, and advanced vehicle technology
- RITA leads hydrogen research, including finding safe and effective storage materials, testing hydrogen fuel cell vehicles, and training emergency responders on hazardous characteristics of hydrogen
- RITA administers research on furthering the development and use of alternative fuels and alternative vehicles in transportation
- Specific topics include:
 - Identifying and improving second generation/sustainable biomass and algae
 - Testing engine emissions to develop standards that commercializes use of fuels containing higher biomass – E85, B100, etc.
 - Developing emergency response training for responders to deal with these new fuels including hydrogen
- RITA works within DOT and with DOE, DoD, USDA and EPA to better coordinate federal research in these areas

Alternative Fuels: Biobased Research

National Biodiesel Board and Sun Grant Initiative



- Develop uses for biodiesel byproducts
- Codes & standards testing and development to facilitate deployment of B20 to B100 fuels
- Outreach to state officials to ensure continued fuel integrity and facilitate acceptance of B20+ diesel fuels
- Sustainable Cropping Systems for Harvesting Corn Stover for Biomass
- Developing the potential of hazelnuts as a feedstock for biodiesel and other oleochemicals in the Northeast
- Biofuels from Salt Basin Algae: A Renewable Energy

ITS Strategic Plan: Vision for 2010-2014



National, multi-modal surface transportation system that features a connected transportation environment among vehicles (cars, trucks, buses, fleets of all kinds), the infrastructure, and mobile devices to serve the public good by leveraging technology to maximize safety, mobility and environmental performance. Connectivity is achieved through dedicated short range communications (DSRC).

ITS Strategic Plan: Vision for 2010-2014



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Goal: Safety

Vehicle to Vehicle Communications for Safety
Vehicle to Infrastructure Communications for Safety

Goal: Mobility

Real-Time Data Capture and Management
Dynamic Mobility Applications

Goal: Environment



Applications for the Environment: Real-Time Information Synthesis (AERIS)

Real-time, environmental data from all sources will be integrated and available for use in multimodal transportation management and performance improvement and will contribute to better environmental practices.

AERIS: Research Goal and Objective

- **Ultimate Goal**

- **Transform** environmental management of the transportation system.

- **Objectives**

- To investigate whether it is **possible and feasible** to generate/capture **environmentally-relevant real-time transportation data** (from vehicles and the system), and use this data to create **actionable information** that can then be used by system **users and operators** to support and facilitate **“green” transportation choices**.
- **Assess** whether doing these things yields a good enough environmental benefit to **justify further investment**.



AERIS Research Questions

- Three overarching questions:
 - **Data:**
 - What vehicle-based data is available, and what is its quality and validity? (**all types** of vehicles)
 - **Information/Connectivity**
 - How can vehicle-based data be used and integrated with existing transportation system operation and other data (such as road weather data, for example)?
 - **Benefit:**
 - What **cross-modal public-sector oriented** applications/strategies are available, or could be available/developed, and what are their expected benefits?

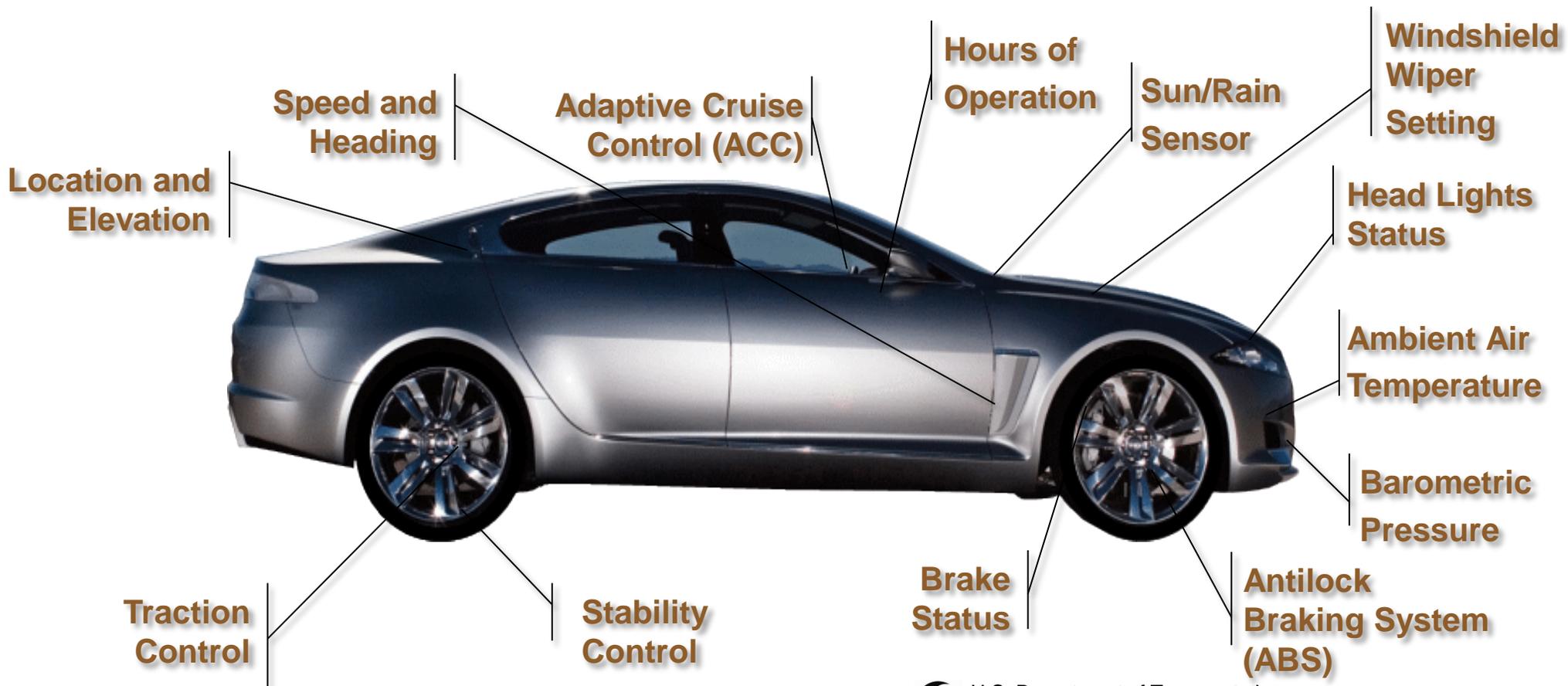
“Green Choices” for System Users & Operators

- Eco-driving using signal phasing and timing (SPaT)?
- Integrated Corridor Management (ICM) -like system able to optimize for environmental factors?
- Work zones, incident management, special event applications?
- Parking applications?
- Transit and freight applications?
- Pricing/payment applications?
- Others?
- What’s “next-gen”?
 - **New ways of managing the entire transportation system**
 - Transformational change from an environmental perspective
 - **Innovative public sector responses** to private sector advances



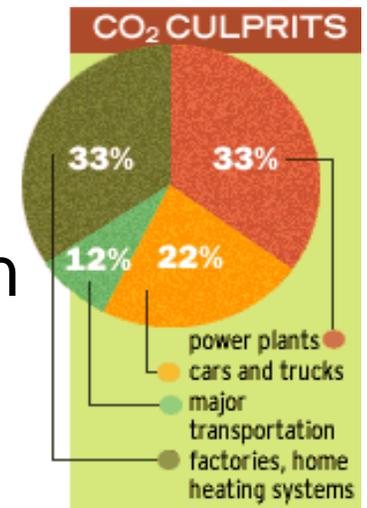
AERIS: Environmental Benefits

- Connected vehicles through DSRC (cars, trucks, buses, fleet vehicles) provide vehicle operating data, location, environmental and weather data at high resolution.
- Applications for system managers and users



AERIS: Environmental Benefits

- Connectivity and **real time data capture** from:
 - **Vehicles** (cars, trucks, buses, fleets)
 - Environmental conditions
 - Infrastructure and road conditions
- Applications **supporting transportation management** decisions for agencies
- Traveler choices for **eco-friendly** options
 - Alternative/active **modes** and **decisions**
 - Realtime information on environmental footprint
 - Real time information for **eco-routing**
 - **Eco-driving**
- Reduce transportation's impact on the environment (fuel consumption and emissions)



A satellite view of Earth showing the Americas and the Atlantic Ocean. The text "Thank You" is overlaid in yellow.

Thank You

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www.rita.dot.gov