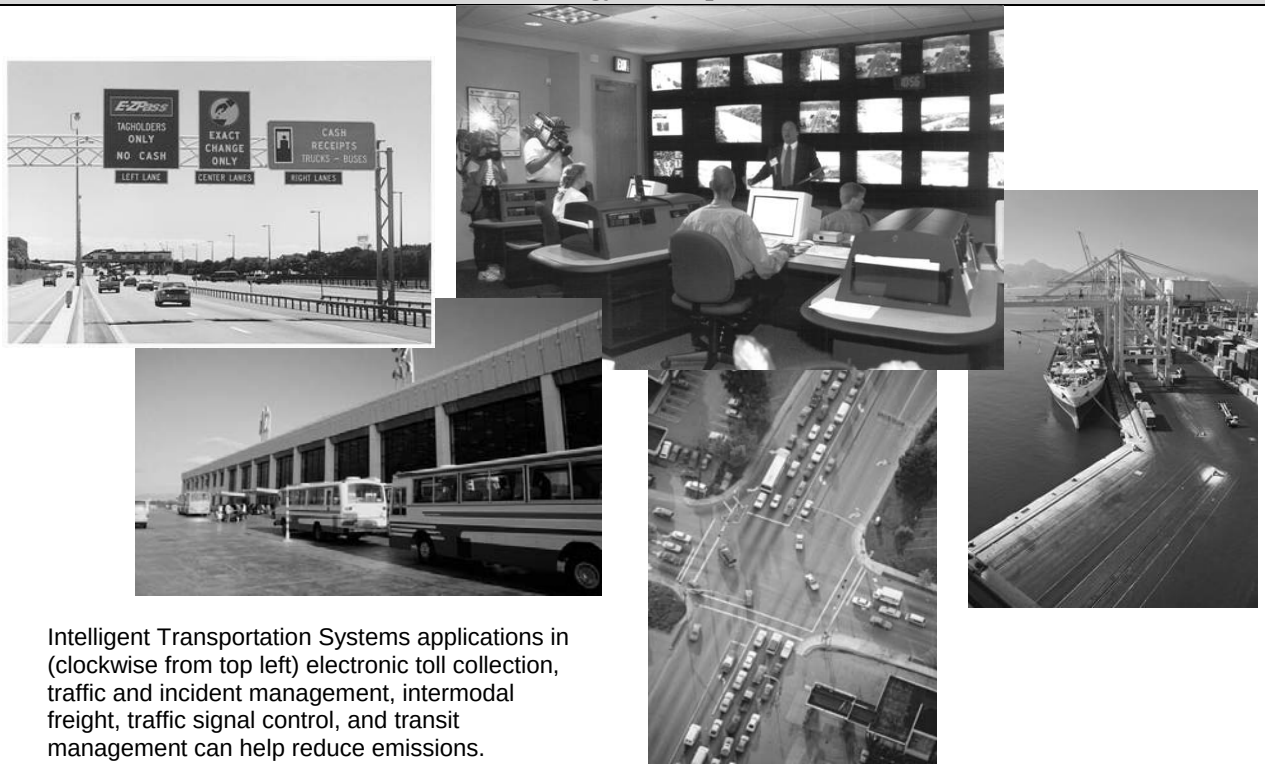
1.1.4 INTELLIGENT TRANSPORTATION SYSTEMS INFRASTRUCTURE

Technology Description



Intelligent Transportation Systems applications in (clockwise from top left) electronic toll collection, traffic and incident management, intermodal freight, traffic signal control, and transit management can help reduce emissions.

Faced with annually increasing demand for travel and transport of goods, the transportation system is reaching the limits of its existing capacity. Intelligent Transportation Systems (ITS) can help ease this strain, and reduce the emissions created and fuel wasted in associated congestion and delays, through the application of modern information technology and communications. Several ITS applications and services offer the potential for reducing fuel use and related carbon emissions associated with travel and freight transportation.

System Concepts

- Intelligent transportation systems (ITS) apply well-established technologies in communications, control, electronics, and computer hardware and software to improve surface transportation system performance.
- ITS are intended to reduce congestion, enhance safety, mitigate the environmental impacts of transportation systems, enhance energy performance, and improve productivity.

Representative Technologies

- Adaptive traffic signal-control systems and freeway management systems smooth the flow of traffic, and reduce stops and delay, which lead to reductions in fuel use and emissions.
- By clearing incidents faster and more efficiently, incident management systems have demonstrated large reductions in energy use associated with the travel delays surrounding the incident.
- ITS applications for intermodal freight include freight and asset tracking, as well as enhancements to freight terminal and international border crossing processes. These enhancements can help create a seamless connection between modes of travel for goods shipments as well as reduce delays and associated emissions at terminals and inspection stations.
- Traveler information/navigation systems help travelers avoid major delays and avoid wasted fuel as a result of navigation errors.
- Electronic screening of commercial vehicles saves fuel and reduces emissions associated with stopping at inspection stations.
- Electronic toll collection – saves fuel consumption and emissions at tollbooths by minimizing delays, queuing, and idling time.

Technology Status/Applications

- Deployment of ITS is underway across the United States. A survey covering 78 of the largest U.S. cities finds that the most widespread deployments are electronic toll collection (ETC) (73% of toll lanes in surveyed cities are ETC capable), emergency management (75% of emergency vehicles are under computer-aided dispatch), and electronic fare payment (EFP) area (52% of fixed route buses accept EFP). Other areas of significant deployment include incident management and signal control systems.
- The Commercial Vehicle Information Systems and Networks (CVISN) is the collection of information systems and communications networks that support commercial vehicle operations in the United States. CVISN is expected to improve commercial vehicle safety, while enhancing productivity, reducing delays and associated emissions. Eight states have been fully funded to achieve Level 1 deployment (i.e., electronic credential administration, safety information exchange, and roadside electronic screening) by September 2003. Of these eight, four states have demonstrated Level 1 capabilities. Forty-nine states have completed a CVISN Business Plan, and 34 states have completed a CVISN Top-Level Design and CVISN Program Plan.

Current Research, Development, and Demonstration

RD&D Goals

- Develop improved analysis capabilities that properly assess the impact of ITS strategies.
- Develop strategies that will improve travel efficiency resulting in lower delays, thereby reducing emissions.

RD&D Challenges

- Develop the next-generation mobile emissions models that assess how reductions in stop-and-go traffic, resulting from effective ITS traffic management, reduce emissions – including those of greenhouse gases. Current models primarily consider vehicle miles traveled, whether that travel occurs at cruising speed (where current vehicles are extremely low-emitters) or under stop-and-go conditions (where vehicular emissions are significantly higher, except for hybrid electrics). Thus, they have the potential of incorrectly penalizing effective strategies.

RD&D Activities

- The Traffic Analysis and Tools Program is developing tools and models for evaluating various ITS strategies and courses of action.
- The Next Generation Simulation Model (NGSIM) program is developing a repository of improved and well-documented algorithms for use by traffic-simulation models.
- The Department of Transportation (DOT) is carrying out evaluations of Field Operational Tests of technologies to reduce commercial vehicle queues and wait times at weigh stations.
- The Electronic Toll Collection/Electronic Screening Interoperability Pilot deployment is being evaluated to determine the impact of using interoperable transponders for toll collection and electronic screening of heavy vehicles. The evaluation hypotheses being tested include the following: “With reduced delays and idle time, fuel consumption and emissions will be reduced.”
- EPA is developing the Multiscale Motor Vehicle and Equipment Estimation System (MOVES) mobile source emissions model. This model will provide improved characterization of vehicle emissions from high-emitting and heavy-duty vehicles.
- The Signal Timing Program is being carried out by FHWA to encourage localities to time or retime their traffic signals and optimize their signal systems. This will result in reduced stops and delays, thereby decreasing vehicular emissions.
- The Incident Management Program is developing strategies and providing guidance on clearing traffic incidents sooner. The resulting decrease in vehicle queues and delays result in reduced emissions.
- The Freeway Management Program is developing operational strategies, technologies, and policies for improved efficiency of freeway facilities. Included in the program is research on strategies for sharing HOV lanes with low-emission, energy-efficient vehicles when extra capacity is available; detecting and verifying incidents; and providing en route information to travelers. Reduced delay and travel time, both of

which result in reduced emissions and fuel conservation, are the relevant MOEs.

- The ITS Traffic Management Program carries out long-term and applied research toward smoothing traffic flow through management and control technologies. This enhances environmental goals by reducing stopping and starting of traffic, thereby reducing emissions.

Recent Progress

- Developed ITS Deployment Analysis System (IDAS) to determine impacts, benefits, and costs of ITS deployments.
- Completed evaluation of a Field Operational Test to reduce vehicle queues and idling times at land border crossings, including an estimate of the avoided health-related costs resulting from reduced emissions. For the Washington State/British Columbia border along the I-5 corridor alone, the avoided costs were calculated as $1.6M to $2.5M over a 10-year period, depending on the deployment scenario. These reductions are primarily from time savings at the border but include reduced idling at weigh stations.
- There has been a significant increase in the number of Traffic Management Centers (TMCs) implemented nationwide, which are essential for implementing and coordinating traffic-management strategies such as incident management and freeway management. For example, the 2002 Freeway Management Deployment Tracking Survey indicates that 83 agencies had a TMC, of which 41 provide environmental monitoring.
- Increased bus ridership at Acadia National Park, resulting from implementation of ITS technologies, resulted in an estimated reduction of 1.17 tons of emissions in 2002, the first year that ITS was operational.
- ITS deployment tracking in 75 large metropolitan areas indicates that 27 now have high levels of integrated ITS deployment and 30 have medium deployment levels.
- The Comprehensive Mobile Emission Model (CMEM) was developed under the National Cooperative Highway Research Program (NCHRP Project 25-11) to accurately reflect light-duty vehicular emissions, such as those from automobiles.

Commercialization and Deployment Activities

- An example of the many commercialization activities underway in ITS is the Center for Commercialization of ITS Technologies recently established in California. Having begun operations on February 7, 2002, the center is a unique partnership among the State DOT, the University of California, and the industry to facilitate and accelerate the deployment and commercialization of ITS Technologies.
- Deployment of electronic toll collection (ETC) systems continues to expand. In a 2002 survey, 73% of toll lanes in 78 of America's largest cities were equipped with ETC.