Making California's Transportation System More Intelligent

A Joint Informational Hearing of the Senate Transportation and Housing Committee and Assembly Transportation Committee

November 16, 2011 – 1 PM Long Beach, California City Council Chambers

BACKGROUND PAPER

Purpose

This joint informational hearing of the Senate Transportation and Housing Committee and Assembly Transportation Committee will examine the use of intelligent transportation systems (ITS) technologies by the state and local governments to improve the state's transportation network.

Background

The country's growing population and expanding economy has led to demand outpacing the capacity on our transportation systems. According to a report prepared for the National Surface Transportation Policy and Revenue Commission, the number of highway lane miles in the US has increased by 6 percent over the past forty years, while the number of vehicle miles travelled on them has nearly tripled in that time.

Pressure on our transportation network is centered on our metropolitan regions. The 2010 Census reports that 84 percent of Americans now live in metro areas, intensifying urban mobility problems and leading experts to predict that these regions will face growing congestion challenges into the future. Transportation policy makers need to address urban congestion because it reduces economic efficiency and increases travel time, air pollution, and fuel consumption.

Seeking a solution to these challenges, California's Department of Transportation (Caltrans) and the state's regional agencies are turning to intelligent transportation systems (ITS) to help them improve the operating efficiency of existing infrastructure.

Intelligent Transportation Technologies

ITS technologies advance transportation safety and mobility and enhance productivity by integrating a broad range of communications, information, and electronic technologies into transportation infrastructure and vehicles. ITS offers a cost-effective system management strategy for improving traffic flow, transit operations, incident management, emergency response, and traveler information for all travel modes.

At the federal level, the US Department of Transportation (DOT) sets the parameters of an intelligent transportation system in its ITS Strategic Research Plan. The plan is "designed to achieve a vision of a national, multimodal surface transportation system that features a connected transportation environment among vehicles, the roadway infrastructure, and passengers' portable devices. This connected environment will leverage technology to maximize safety, mobility and environmental performance."

ITS technologies vary in the types and degrees of sophistication. Examples of basic ITS applications include traffic signal control systems, freight container management systems, and variable message signs. Other ITS applications include automatic license plate recognition, red light traffic enforcement, and speed cameras. More advanced ITS applications integrate live data and feedback from a number of sources to provide users with accurate information, such as up-to-date parking guidance and traffic information systems.

Experts group most ITS applications into five categories:

- **Advanced traveler information systems –** These provide drivers with real time information including information about delays due to congestion, accidents, weather conditions or road repairs.
- **Advanced transportation management systems –** Examples include coordinated traffic signals, ramp meters, which regulate the flow of traffic onto major highways, and changeable message signs that inform motorists of potential problems ahead.
- **ITS-enabled transportation pricing systems –** These include electronic toll collections, congestion and variable pricing, fee-based express or HOT lanes, and vehicle miles traveled fee systems.
- **Advanced public transportation systems –** These applications, for example, allow trains and buses to report their position so passengers know arrival and departure information in real time.
- **Fully-integrated transportation systems –** These include vehicle-to-infrastructure and vehicle-to-vehicle technologies that enable communication among links in the transportation system that lead to safer, more efficient travel.

Benefits of ITS

According to the Information Technology and Innovation Foundation (ITIF), ITS technology delivers five key classes of benefits:

1. **Increased safety –** Whereas most developments in transportation safety over the past 50 years were designed to protect passengers in the event of a crash, fully-integrated ITS technologies are being designed to help motorists avoid accidents altogether. For example, the US Intellidrive system, which uses wireless communications to connect vehicles to the road infrastructure as well as other vehicles, could potentially address 82 percent of vehicle crash scenarios involving unimpaired drivers, according to US DOT estimates.

2. **Improved operational performance –** ITS technologies maximize the capacity of infrastructure, reducing the need to build additional road capacity. For example, applying real-time traffic data to US traffic signal lights can improve traffic flow significantly, reducing stops by as much as 40 percent and reducing travel time by 25 percent. This improved throughput can help transportation agencies avoid or postpone needing to add additional lanes to busy arterials.

3. **Enhanced mobility and convenience –** ITS technologies can contribute significantly to reducing congestion, which in turn creates improved mobility options for drivers. Some estimate improved ITS implementation could reduce congestion by 20 percent or more in most urban areas.

4. **Improved environmental outcomes –** ITIF estimates that improving traffic flow by synchronizing traffic signals alone can cut gas consumption by 10 percent and emissions by 22 percent. Other ITS efforts that reduce congestion and enable traffic to flow smoothly, such as ramp meters, also contribute to increased environmental benefits.

5. **Boosted productivity and economic growth –** According to the Texas Transportation Institute, congestion costs US commuters 4.2 billion hours and 2.8 billion gallons of fuel each year, costing the economy up to $200 billion per year. To the extent ITS applications reduce congestion, the economy overall improves. In addition, the US DOT estimates that implementing various ITS solutions could create almost 600,000 jobs over the next 20 years, and a United Kingdom study found that a $8 billion investment in ITS would create or retain 188,500 jobs in one year.

Further, investment in ITS technologies deliver superior benefit-cost returns when compared to traditional investments in highway capacity, such as adding auxiliary lanes, which generally have a cost benefit ratio of 2.7 to 1 according to the US Government Accountability Office (GAO). A 2005 study of a model ITS deployment in Tucson, Arizona, costing $72 million to implement, estimated that the average annual benefits to mobility, the environment, safety, and other areas had a 6.3 to 1 benefit-cost ratio. If the US were to implement a national real-time traffic information system, the GAO estimates the present value cost of establishing and operating the program would be $1.2 billion, but would deliver present value benefits of $30.2 billion, a 25 to 1 benefit-cost ratio.

Challenges to Implementing ITS

Despite providing significant benefits compared to the costs, many challenges arise when developing and implementing ITS solutions.

One key challenge arises from the need to properly scale technologies to make them viable solutions. While some ITS applications, such as ramp meters and adaptive traffic signals, can be deployed locally and prove effective, many applications must operate at a larger scale and involve adoption by various systems and individual users at the same time. For example, it makes little sense for states to independently develop a vehicle-miles-travelled (VMT) fee system because, in addition to requiring an on-board device in vehicles, VMT can require other significant infrastructure investments, such as a satellite system and back-end payment system, which may not be cost-effective for individual states to employ. Moreover, auto manufacturers would prefer to install on-board devices to accommodate all applications of this technology, and nothing guarantees all states and regions would adopt compatible systems.

Another barrier to ITS deployment comes from the fact that transportation funding is often allocated without consideration of performance, giving planners little incentive to seek investments that optimize performance. As ITIF describes, "part of the problem is that state and local transportation agencies were created to build and maintain infrastructure, not to manage transportation networks, and thus see themselves as 'builders' and not 'managers' of a system and therefore place more emphasis on building new roads than ensuring the system functions optimally." This can discourage companies developing new ITS products, in part because governments as key buyers of this technology demonstrate limited commitment to funding it.

ITS applications often compete for funding with conventional transportation projects, such as fixing potholes, repairing roads, and expansion projects, that may be immediately more pressing but do not deliver as great long-term returns. An example of this is what has occurred with California's Proposition 1B program aimed at reducing congestion, called the Congestion Mobility Improvement Account (CMIA). While the CMIA program originally included $150 million for deployment of ITS applications in the state, when the bids for other highway expansion projects in the program came in over budgeted amounts, the ITS funding was redirected to cover the shortfalls. In addition, as opposed to many capital projects that are funded through one-time sources such as bond dollars, many ITS technologies require ongoing operational budgets, which compete with other priorities for funding within a particular government's budget.

Finally, there can be jurisdictional challenges to implementing ITS solutions, such as which level of government has responsibility for deploying various ITS technologies and how they are coordinated across jurisdictional boundaries. For example, it can provide virtually no benefit for one city to spend transportation funds synchronizing traffic lights on a busy arterial that crosses into a neighboring city that chooses not to time the lights. Another example is what jurisdiction should be responsible for ensuring that one transponder in your vehicle is able to communicate with every toll facility in the state or elsewhere in the country. Coordinating technologies and identifying common technological platforms can pose a major challenge to successful implementation of ITS.

Witnesses

This hearing will include three panels of witnesses, background for whom is provided below, plus time for public testimony.

Panel 1: Intelligent Transportation Systems Overview

Richard Backlund is the Associate Division Administrator of the Federal Highway Administration's (FHWA) Los Angeles Metro Office. The Southern California office is as an extension of both the Federal Transit Administration Region and the FHWA Division Offices for their respective program areas. Planning activities include working with the Southern California Association of Governments and the Caltrans District offices. ITS activities involve the Southern California Priority Corridor Project, which reaches 130 miles south of Los Angeles to San Diego and Tijuana, Mexico. Air quality activities cover an area that stretches east nearly to Arizona.

Paul Sorensen, Ph.D, is an operations researcher at the RAND Corporation, where he serves as Associate Director of the Transportation, Space and Technology Program. Dr. Sorensen's research interests include transportation finance, urban mobility, alternative fuels, and sustainable transportation. He holds a Bachelors of Arts in computer science from Dartmouth College, a Masters of Arts in urban planning from UCLA, and a Ph.D in geography from UCSB.

Panel 2: California's Existing Use of ITS Technology

Robert Copp is the State Traffic Engineer for Caltrans responsible for statewide coordination of traffic operations' policies and state highway operations. Mr. Copp has been in this position for five years and has been with Caltrans for 32 years. Mr. Copp has additional knowledge in pavement management, truck operations, data analysis and modeling, and transportation management center operations.

Doug Failing is currently serving as the Executive Director of the Highway Program for Los Angeles County Metropolitan Transportation Authority where he is responsible for delivery of the nearly $8 billion Measure R Highway Program. Mr. Failing earned his degree in civil engineering from Michigan Technological University in Houghton in 1980 and worked at Caltrans until moving to Metro in 2009.

Jerry R. Wood is the Director of Transportation and Engineering for the Gateway Cities Council of Governments (GCCOG), representing the 2.2 million residents of the 27 communities of Southeast Los Angeles County. The Gateway Cities area is anchored by the Ports of Long Beach and Los Angeles, the largest port complex in the United States, receiving about 45% of the nation's imports. Mr. Wood received a Bachelor's Degree in civil engineering and a Master's Degree in environmental engineering from Ohio State University.

Mark Jensen is a Principal with Cambridge Systematics. He has more than 24 years of experience working on projects at the federal, state, and local/regional level, including major freight technology projects for the across multiple USDOT agencies, and for several DHS offices related to freight security technologies. Mr. Jensen is currently serving as technical lead on a groundbreaking effort for MTA and the Gateway Cities COG that is developing an Concept of Operations the integration of multiple ITS and freight technology applications into a goods moment efficiency system for the Southern California port transportation region.

Matt Carpenter is the Director of Transportation Services for the Sacramento Area Council of Governments (SACOG), overseeing transportation planning, program, and project delivery. Mr. Carpenter holds a Master's Degree in urban engineering from the University of Tokyo and a Master's Degree in urban design from the Massachusetts Institute of Technology (MIT).

Panel 3: The Future of ITS

Alan Clelland has served as a senior Vice President of Iteris, Inc. since October 2007, focusing on various activities in its Transportation Systems segment. Prior to joining Iteris, Mr. Clelland worked in management positions at several ITS consulting and transportation engineering companies. Mr. Clelland holds a degree in physics and electronic engineering from the University of Leeds in the United Kingdom and is the current Chair of the Intelligent Transportation Society of California.

Thomas West currently serves as Co-Director of Program for Advanced Transportation Technology (PATH) at the Institute of Transportation Studies at UC Berkeley. Mr. West previously served as the Director of the California Center for Innovative Transportation at UC Berkeley. Prior to coming to the University, Mr. West functioned as the single focal point at the California Department of Transportation for all activities related to GoCalifornia, the Governor's Strategic Growth Plan, and the resultant $20B bond package passed by California voters in late 2006. Mr. West has also served as the Chief of Research and Innovation at Caltrans, and as the statewide ITS liaison for all twelve Caltrans district offices. He holds a degree in electrical engineering and is a registered professional engineer in the State of California.

Roberto Horowitz, Ph.D, currently serves as Co-Director of the California Program for Advanced Transportation Technologies (PATH) at UC Berkeley. Dr. Horowitz' current research interests include Intelligent Transportation Systems (ITS), Micro-mechatronics, and robotics. He is currently leading a research effort toward the development and implementation of next generation Tools for Operations Planning (TOPL) of Integrated Corridor Management Systems. Dr. Horowitz received his Bachelor of Science degree with highest honors in 1978 and Doctoral Degree in 1983 in mechanical engineering from UC Berkeley. Dr. Horowitz received the Henry Painter Outstanding Investigator Award in 2010 from the Dynamic Systems and Control Division of ASME.