STATEMENT OF

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BEFORE THE

Subcommittee on Technology and Innovation

Committee on Science and Technology

U.S. House of Representatives

HEARING ON

The Research and Development Portfolio to Support the Priorities of the Department of Transportation

November 19, 2009

Chairman Wu, Ranking Member Smith, and distinguished Members of the Subcommittee, I am honored to join you today to examine the role of research and development in supporting the priorities of the U.S. Department of Transportation (DOT).

My name is Ann Flemer, and I am Deputy Executive Director for Policy at the Metropolitan Transportation Commission (MTC). MTC is the metropolitan planning organization for the San Francisco Bay Area, which includes the cities of San Francisco, San Jose and Oakland. With a combined population of 7.3 million people residing in 101 cities and 9 counties, the Bay Area ranks as the 6th-largest metropolitan area in the United States. Our region's $487-billion economy has long benefited from the technological leadership of Silicon Valley; if the Bay Area were its own nation, we would rank as the world's 22nd-largest economy.

MTC allocates more than $1 billion a year to help fund the operation, maintenance and expansion of the Bay Area's diverse transportation system. MTC also serves as the Bay Area Toll Authority (BATA), which is responsible for allocating all toll revenue from the seven state-owned toll bridges that span the Bay. BATA has issued over $5 billion in toll revenue bonds to finance bridge, highway and transit construction projects.

I also serve as vice chair of the board of directors at the Intelligent Transportation Society of America (ITS America). ITS America is a 501(c)(3) nonprofit association which represents several hundred member organizations – including state and local transportation, transit and planning agencies, research institutions, and private sector firms from the automotive, transit and commercial vehicle sectors to information and communications technology manufacturers and providers – who are all working to advance the development and deployment of intelligent transportation systems to improve safety, mobility and the environment.

The Challenges

When President Eisenhower launched the Interstate Highway System in 1956, he opened up a new era of commerce and mobility that enabled rapid economic expansion and solidified our nation as the land of opportunity and prosperity.

But today, that opportunity and prosperity are at risk. Traffic is grinding our communities to a halt for hours each day, stifling commerce, polluting our environment, wasting fuel and taking away precious time that we could be spending with family and friends. The economic cost of congestion in our major metro areas exceeds $87 billion per year, including 4.2 billion hours of delay and 2.8 billion gallons of wasted fuel. Some estimates place the total cost closer to $200 billion. And who can put a price tag on the personal toll to our families and our quality of life from spending a full work week sitting in traffic each year?

Before the day is over more than 100 people will die in traffic crashes, the equivalent of five fully-loaded 737 airplanes crashing every week. The human tragedy of this epidemic is beyond calculation, but we know that the economic cost alone from traffic fatalities and injuries exceeds $230 billion each year. The combined cost of traffic crashes and congested roadways – which leads to many of these accidents – totals more than $1 billion per day!

In addition, the transportation sector contributes nearly a third of our nation's human-caused CO^2 emissions and generates other pollutants that harm health and quality of life in cities and communities across the country. This is a growing problem that cannot be ignored.

In past decades we built more transportation infrastructure to alleviate the increasing traffic in our communities. But today, with budget shortfalls, a shrinking Highway Trust Fund, limited room for additional roads and bridges, and growing public demand for cleaner and more convenient transportation alternatives, we can no longer simply continue to build our way into a cleaner, safer and more efficient transportation future.

Today, we need to utilize our existing capacity more effectively and make better use of smart technologies to actively manage our transportation system to reduce congestion and emissions, make our roads safer, and provide the traveling public with better transportation options. The good news is that with bold policies, new technologies and smart investments, we can overcome these challenges. But this will not happen if we continue business as usual.

Performance-Based Planning and Investment

The key to a sustainable transportation future lies in transitioning to a more aggressive, performance-based approach to managing and investing in our transportation system, including better use of intelligent transportation systems (ITS) that are vital for measuring and improving system performance and reducing traffic congestion, emissions, and vehicle fatalities and injuries. We are excited that your committee has taken a strong interest in advancing research and technology programs to help make these goals a reality.

San Francisco Bay Area – A Performance Management Case Study

In the San Francisco Bay Area, at the Metropolitan Transportation Commission, we have several years' experience in performance-based planning and in deploying intelligent technologies to improve system management and performance. (See Attachment A: T-2035 Performance Assessment) Simply stated, a performance-based planning approach focuses on the measurable outcomes of potential investments and the degree to which they support stated policies. It provides a decision support tool to evaluate both transportation policies and investments relative to desired outcomes. Performance-based planning is systematic and analytic in that it:

- expresses policy in terms of quantifiable objectives;
- relies on analytic methods to predict the impacts of different types of investments on system performance;
- sets up an analytic framework for periodic monitoring of system performance; and
- assesses performance trends and provides the opportunity to make adjustments in either the performance measure or the investment priority when needed.

Using this process, MTC evaluated the cost-effectiveness of potential investments with respect to specific performance objectives and measured the degree to which our financially constrained program of investments contributed toward these objectives in our long-range transportation plan. The key was to focus on specific quantitative and qualitative measures that were readily understandable to the public, were able to be evaluated using reasonably available data, and provided a baseline for continuous and accurate measurement over time. Our experience may be

useful to the U.S. DOT's efforts to achieve national strategic goals of safety, livable communities, economic competitiveness, and environmentally sustainable transportation.

Federal Research Priority: Establish National Performance Goals and Measures

At ITS America, we believe that national performance goals can and should be established that align state and metropolitan planning, and that the U.S. DOT should support a state and metropolitan performance management process that sets short- and long-range mode-neutral performance targets for transportation programs. Based on our work in the San Francisco Bay Area, Attachment A sets forth possible measures that the U.S. DOT could use to further define a research agenda related to measuring the performance of the nation's transportation system related to safety, efficient freight movement, metropolitan mobility and congestion relief, transportation asset management, environmental quality and energy conservation.

However, establishing performance goals and measures is easier said than done, which is why the federal research program is so important. The first challenge is to reach consensus on appropriate national performance goals and an effective process for measuring progress toward these goals at the state and metropolitan level.

Federal Research Priority: Cost-Effective Data Collection

The second and perhaps more difficult challenge is in collecting the uniform, accurate and user-friendly data needed to establish baseline performance levels, set meaningful performance targets, and measure changes in performance categories over time. Intelligent transportation systems – including fixed sensors, GPS-enabled devices such as cell phones and navigational systems, electronic toll tags, cameras, and vehicle probe data – are being used today to collect real-time data to determine congestion levels, average speeds and travel times, incident duration, and other environmental, mobility and safety measures. But these technologies are not typically deployed consistently on a state-by-state and metro-by-metro basis, and there is no national program for gathering system performance data from agencies that have available data or to assist other state and local agencies to collect data that does not exist today.

Programs like the Research and Innovative Technology Administration's (RITA) *SafeTrip-21* partnerships with Caltrans and the I-95 Corridor Coalition are leveraging private sector innovation to provide real-time information along parts of the east and west coasts. But to be effective on a nationwide scale, the U.S. DOT needs to determine how best to gather the data through a robust real-time information system that would provide uniform data by which to measure and monitor the performance of the entire multimodal transportation network. Such a system was authorized in Section 1201 of SAFETEA-LU, but has yet to be implemented.

The same technologies that are needed to gather performance data are already in use today. The private sector and state and local agencies currently gather real-time information to better manage their transportation networks to reduce traffic delays, improve commercial transport, reduce emissions and fuel consumption, improve incident response, and provide the public with timely information about traffic conditions and transportation alternatives. But we are missing the opportunity to capture this real-time data and process it for use in long range planning, for more informed policy and investment decisions, as well as by the general public.

One option to ensure data uniformity and reduce costs that is well-suited to the U.S. DOT research agenda would be to create a National Surface Transportation Performance Service, in partnership with public and private sector data providers, from which state and local agencies, private companies, and the public could access national, state, regional or local system performance data based on their specific needs. The technologies are here today, but we need national leadership if we hope to create a performance-based transportation system.

As U.S. DOT considers performance measures, a key priority of the transportation research program should be to provide guidance about what performance objectives are measurable and achievable based on the state of the art in data collection techniques, as well as technologies and strategies that can be used to improve system management and performance. Maximum consultation among stakeholders and the private sector will be necessary. The research program should also partner with state and local agencies and private sector leaders to develop standards for real-time data collection that will promote uniformity and ensure that the data meets the

needs of state, regional and local officials in both urban and rural areas. The program should make the data publicly accessible, which will unleash private sector innovation to meet the public's demand for better and more convenient real-time information on traffic, transit and roadway conditions, as well as their demands for more accountability in long-range planning and decisions affecting investment priorities.

Federal Research Priority: Environmental Data and Technologies

The U.S. transportation sector contributes an estimated 28 percent of our nation's carbon dioxide emissions. Strategies for reducing greenhouse gas (GHG) emissions from the transportation sector are often thought of as a "three-legged stool": (1) improving the fuel economy of vehicles; (2) reducing the carbon content in fuels, e.g., the reformulated fuel standards and alternative fuels; and (3) improving the efficiency of the transportation system, which includes maximizing system operations, facilitating mode shifts (i.e., increased transit options), changing driver behavior, and system planning. Intelligent transportation systems, which are part of the third leg of the stool, can play a significant role in reducing emissions in the near term because they can be deployed more quickly, and can help improve the efficiency and mobility of the transportation system, thereby reducing fuel consumption and GHG emissions. Deployment of transportation technologies may also strengthen the second leg of the stool by supporting creation of the infrastructure for alternative energy sources, such as plug-in hybrids or hydrogen fuels.

As state and local governments – either of their own initiative or in response to federal policy changes – work to establish environmental performance goals and achieve greater efficiency improvements and emissions reductions, a key priority for the federal research program should be to identify and, if possible, quantify the environmental benefits of developing and broadly deploying a suite of transportation technologies that help reduce GHG emissions through efficiency gains in system operations, reductions in vehicle miles traveled, and/or use of alternative, cleaner fuels. The Department should broadly disseminate research and data to state and local agencies on technologies and strategies for measuring emissions levels and other environmental performance metrics, as well as research and data on the costs, benefits,

challenges and best practices associated with deploying and operating technologies and strategies to improve system efficiency and reduce emissions and fuel consumption.

ITS technologies like synchronized and adaptive traffic signals, smart transit and parking systems, active traffic management systems, electronic toll collection, weigh-in-motion truck inspections, GPS-enabled devices, and real-time traffic and transit information are creating new opportunities for state and local officials and the public to reduce their environmental footprint. In addition to a recommended toolkit of technologies and strategies that have proven effective at both measuring environmental performance and achieving efficiency improvements, state and local officials would benefit from readily accessible guidance on how to effectively deploy, operate and maintain these systems to achieve optimal results. The program should also encourage multimodal and multijurisdictional cooperation to meet system performance goals and create more livable, sustainable communities.

Federal Research Priority: Advancing Existing and Next Generation Safety Technologies

Traffic accidents take the lives of nearly 40,000 Americans each year, leave more than 2 million people injured, and cost our nation an estimated $230 billion annually. The problem is particularly acute on rural roads, where traffic accidents account for more than half of all U.S. traffic fatalities, despite only a quarter of the U.S. population living in rural areas.

As public and private sector leaders and safety advocates seek ways to reduce driver distraction and find other solutions to the epidemic of traffic accidents on our nation's roads, the ITS Joint Program Office (JPO) should work with the public and private sectors to encourage more rapid deployment of existing intelligent transportation systems that can improve driver awareness, reduce the number and severity of traffic crashes, and improve emergency response, while redoubling its efforts to advance the research and development of future safety solutions.

As a result of cooperative research efforts and private sector innovation, vehicle-based technologies exist today that enable cars and trucks to detect other vehicles in their blind spot, warn drivers if they are drifting out of their lane or off the road, detect pedestrians and even large

animals on the side of the road, and assist drivers in braking to avoid an accident. Many of these crash avoidance features are already being offered on higher end cars and commercial vehicles, with additional safety features being offered through aftermarket devices that provide drivers with critical real-time information about traffic, roadway and weather conditions.

Additional infrastructure-based safety systems that do not rely on in-vehicle sensors are also starting to be deployed across the country, including high-tech cameras and sensors at intersections that can detect speeding vehicles and other dangerous situations and adjust traffic signals or warn drivers to prevent potential collisions. Key obstacles to the more widespread deployment of these quick, often low-cost solutions is the lack of dedicated funding for ITS deployment and operations, and the lack of performance-based policies that incentivize agencies to improve system management to meet performance goals.

A system that holds significant promise for reducing traffic accidents – *IntelliDrive*^{SM} – is the result of cooperative research between the U.S. DOT, automotive and other industry leaders, state and local officials, and associations like ITS America to develop high-speed wireless connectivity and sensing capability between moving vehicles, and between vehicles, intersections and other roadside sensors. Using spectrum which has been designated for this purpose by the Federal Communications Commission, the system would gather anonymous traffic data such as vehicle speed, direction and location, providing a 360 degree early warning system to help drivers avoid crashes, while also reading data from other vehicles and sensors to alert drivers to icy patches, accidents or stopped traffic ahead, a speeding car about the run the red light, and the fastest or most eco-friendly route to work based on real-time traffic conditions.

This smart network would provide traffic managers with real-time information to operate their transportation systems more efficiently, give state and local officials the comprehensive data they need to measure system performance, provide emergency personnel with the tools they need to respond more quickly to traffic incidents, and even enable innovative financing options like a VMT-based user fee that could vary by pricing zone, time of day or congestion level.

The ITS JPO has provided tremendous leadership in the development and testing of vehicle-to-vehicle and vehicle-to-infrastructure communications capability, and should now focus on conducting the research necessary to accelerate the deployment of an *IntelliDrive*^{SM} network. This includes research into expected installation and operational costs, governance structure, privacy standards, potential liability issues, regulatory research to support possible rulemakings, potential commercial applications, and anticipated safety, mobility, environmental benefits.

While much of the focus of the *IntelliDrive*^{SM} program has been on collision-avoidance and other advanced safety applications, the initiative has been expanded over the past couple of years to include mobility applications that have significant near-term potential for reducing traffic congestion and providing transportation agencies and the public with real-time traffic and multimodal travel information. These mobility solutions, which collect and disseminate critical traffic-related information using a variety of technologies including cell phones and other consumer devices, do not require the roadside instrumentation or vehicle-to-infrastructure communications systems required for advanced collision avoidance, and as such are already beginning to be deployed in places like the San Francisco Bay Area. In addition to the mobility benefits, these technologies can provide vital information to transportation managers and emergency responders to improve system operations and incident response, as well as to drivers in order to avoid potentially dangerous traffic situations and road and weather conditions.

The Department should continue working with its public and private sector partners to advance the *IntelliDrive*^{SM} program, with the goal of achieving real-world deployment as soon as possible. In addition, as the U.S. DOT, Congress, and many state legislatures are considering policies to combat distracted driving, including bans on certain electronics devices, the ITS JPO should quickly compile and disseminate research results, cost-benefit projections, and other relevant data to policymakers about current and emerging technologies and devices that impact the driver experience, with a particular focus on helping policymakers distinguish between technologies that can improve driver awareness, provide vital information and enhance public safety, and those devices that cause significant driver distraction but do not (and are not anticipated in the future to) have measureable safety benefits.

Proposed Safety, Mobility and Environmental Solution: Smart Cities and Communities

A critical next step in advancing the real-world deployment of smart technologies and encouraging more aggressive investment by the automotive, information and communications technology industries, and state and local agencies is through a large-scale operational testing and model deployment initiative that will begin providing the public with safety, mobility and environmental benefits while also generating real-world data on deployment costs, benefits, challenges, and lessons learned.

ITS America has been joined by state, city and local transportation officials, industry leaders, university researchers, and safety and environmental advocates in proposing a Smart Cities and Communities initiative that would aggressively deploy and provide for real-world testing of smart infrastructure, connected vehicles, and other intelligent technology solutions in several model cities and communities.

Smart Cities and Communities would be selected by U.S. DOT through a competitive process to establish clear performance objectives, based on multi-modal investments and advanced transportation management systems, including systems like *IntelliDrive*^{SM}, to make measurable progress toward reducing traffic accidents, congestion and emissions, to provide real-time information to travelers for smarter travel decisions, to optimize system performance for supporting travel by all modes (auto, transit, commercial vehicles, pedestrian, bicycling, etc.), and to provide a real-world test bed for innovative financing alternatives like VMT-based user fees and congestion pricing.

This initiative is consistent with the *National Surface Transportation Infrastructure Financing Commission* conclusion that using technology to improve how people pay for their transportation usage, when integrated with existing ITS technologies and systems like *IntelliDrive*^{SM}, "will enable the delivery of a host of other benefits, including real-time information to vehicle drivers to help reduce congestion, improve safety, and reduce emissions, to transit operators to improve the convenience and reliability of public transit, and to system managers to better monitor and manage the system and improve the allocation of transportation infrastructure resources."

The Smart Cities and Communities initiative would provide U.S. DOT with the opportunity to support the deployment of new technologies and operational strategies in real-world settings in order to advance key goals such as safety, livability, environmental sustainability and economic competitiveness. As part of the program, participating cities and communities would be required to perform rigorous data collection and analysis, and regularly report back on deployment and operational costs, safety, mobility and environmental benefits, challenges and lessons learned, and recommendations for future research areas and deployment strategies.

Federal Research Priority: Innovative Financing Options

In conjunction with the Smart Cities and Communities initiative, at least one selected city or community should include a model VMT-based user fee pricing program that could vary rates by time of day, pricing zone, congestion levels and other factors; be interoperable with other tolling, pricing, and intelligent transportation systems; and accommodate multiple forms of payment including cash, credit and debit cards, the Internet, and other integrated payment systems. Smart Cities and Communities would also have flexibility to pursue other innovative financing options, including congestion pricing systems.

The U.S. DOT – with leadership from the ITS JPO – should conduct a complementary research and development program to address challenges associated with deployment of a VMT-based user fee as a potential transportation financing mechanism. The research program should work closely with the public and private sectors and stakeholder associations to explore policy and technical issues and make recommendations regarding the best option(s), system design, required technologies, implementation plan, and challenges and benefits associated with the system. To effectively implement the research program, U.S. DOT could utilize the expertise of member-based research and technology organizations like ITS America to explore issues such as:

- Necessary protocols and systems to accommodate concerns regarding personal privacy;
- Impacts of such a system on rural drivers who have no choice but to drive long distances;
- Options related to the method and point of collection of a national VMT fee;

- Methods to ensure the feasibility of multiple forms of payment;
- The administrative costs associated with such a national program;
- Whether it is more logical to transition all vehicles simultaneously or some vehicle classes first as early adopters;
- How to ensure individuals are not paying both the gas tax and the VMT fee under any phased-in transition approach;
- Impacts of a voluntary or mandatory use of the system;
- Whether different systems for different vehicle types will be necessary or appropriate, including pilot programs for automobiles and different classes of trucks;
- How to provide the positioning accuracy and availability necessary to support state, local, or private charges based on specific areas or lanes traveled; and
- Other benefits that could be gained through integration of a VMT-based user fee system with other intelligent transportation systems and technologies.

Conclusion

The goal of the federal research program should be to help solve state and local challenges, with a specific focus on supporting national goals and informing policy decisions. And if this isn't a great enough task, the combined challenges of implementing a performance-based system, addressing critical safety, mobility and environmental problems, and finding innovative financing mechanisms, calls for strong a federal leadership role and a robust research agenda that will work to advance the deployment of intelligent technologies and system management tools, improve the availability of quality data for performance measurement and investment decisions, and leverage private sector innovation to help state and local agencies solve critical challenges.

Thank you again for inviting me to join you today. I will be happy to answer any questions that you have regarding these recommendations.

Attachment A: Performance Measures for the US DOT's Strategic Priorities

(Source: Transportation 2035 Plan, Metropolitan Transportation Commission)

For illustration purposes, the numbers in parentheses represent the 2035 performance targets set by MTC against which alternative investment strategies were tested in the long range plan.

Maintenance and Safety Measures

- Reduction in fatalities from motor vehicle collisions (*15% reduction from 2008)*
- Reduction in bicycle and pedestrian fatalities attributed to motor vehicle collisions *(25% from 2000 levels)*
- Reduction in bicycle and pedestrian injuries attributable to motor vehicle collisions *(25% from 2000 levels)*
- Maintain pavement condition index of X or higher *(annual index of 75 or better over 25 year period)*
- "Distressed" lane miles no more than __% of state highway system *(no more than 10%)*
- Average transit asset no more than __% of useful life *(average no more than 50%)*
- Average distance between vehicle service calls no less than ___ miles *(minimum 8000 miles between service calls)*

Measures for Livable Communities (*targets still under discussion)*

Transportation Availability and Choices

- Transit Availability
- Transit Service Frequency
- Change in Transit Service Coverage over time
- Walkability (destinations reachable by walking
- Auto availability (households with at least one vehicle)

Accessibility

- Access to essential destinations by 30-minute auto trip

- Access to essential destinations by 30-minute transit trip
- Access to essential destinations by 15-minute walk

Mobility

- Average transit travel time to work vs. auto travel time

Affordability *(10% reduction from today of earnings spent on housing and transportation costs by low and moderately-low income households)*

- Transportation costs as a percent of household income
- Housing costs as a percent of household income
- Households with housing and transportation costs exceeding 50% of income

Environmental

- Emission density of diesel PM2.5 from all transportation sources

Economic Competitiveness

- Reduce congestion as measured by per capita travel time delay *(reduce by 20% from 2008)*
- Freight mobility as measured by delay *(reduce by 20% from 2008)*

Environmentally Sustainable

- Reduce daily per-capita vehicle miles traveled (VMT) by ___% *(reduce by 10% from 2008)*
- Reduce emissions of fine particulates (PM2.5) by ___ % *(reduce by 10% from 2008)*
- Reduce emissions of coarse particulates (PM 10) by ___% *(reduce by 45% from 2008)*
- Reduce carbon dioxide (CO2) emissions to __% below 1990 levels *(reduce by 40%)*