

# Use of Incentives to Encourage ITS Deployment

[www.its.dot.gov/index.htm](http://www.its.dot.gov/index.htm)

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# Technical Report Documentation Page

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<b>16. Abstract</b> Moving Ahead for Progress in the 21st Century Act (MAP-21) identifies Intelligent Transportation Systems (ITS) as part of the solution to the Nation's transportation needs and provides mechanisms for accelerating deployment of innovative technology. The legislation contains a provision directing the U.S. Secretary of Transportation to: "encourage deployment of ITS to improve the performance of the National Highway System (NHS) in areas such as: traffic operations, emergency response, incident management, surface transportation network management, freight management, traffic flow information and congestion management by accelerating adoption of innovative technologies through the use of: <ul style="list-style-type: none"> <li>demonstration programs,</li> <li>grant funding,</li> <li>incentives to eligible entities, and</li> <li>other tools/strategies or methods that will result in the deployment of innovative ITS technologies."</li> </ul> Further, the Secretary is directed to prepare a plan that addresses the manner in which incentives may be adopted, as appropriate, through existing deployment activities carried out by surface transportation modal administrations.  This report addresses these requirements. It provides insights based on past and present experience with incentive programs and provides analysis and findings on appropriate incentives that the United States Department of Transportation (Department) has adopted, or is considering for adoption. The report was prepared through a collaborative process within and outside of the Department, and managed by an advisory team consisting of representatives of the surface transportation modal administrations.					
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# Preface

Moving Ahead for Progress in the 21st Century Act (MAP-21) identifies Intelligent Transportation Systems (ITS) as part of the solution to the Nation's transportation needs and provides mechanisms for accelerating deployment of innovative technology. The legislation contains a provision<sup>1</sup> directing the United States (U.S.) Secretary of Transportation to: "encourage deployment of ITS to improve the performance of the National Highway System (NHS) in areas such as: traffic operations, emergency response, incident management, surface transportation network management, freight management, traffic flow information and congestion management by accelerating adoption of innovative technologies through the use of:

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This report addresses these requirements. It provides insights based on past and present experience with incentive programs and provides analysis and findings on appropriate incentives that the United States Department of Transportation (Department) has adopted, or is considering for adoption. The report was prepared through a collaborative process within and outside of the Department, and managed by an advisory team consisting of representatives of the surface transportation modal administrations.

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<sup>1</sup> P.L. 112-141, Section 53001 Use of Funds for ITS Activities (c) ITS Adoption.

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# 1 Introduction

## 1.1 ITS Technologies Are Now Widely Deployed Across the U.S.

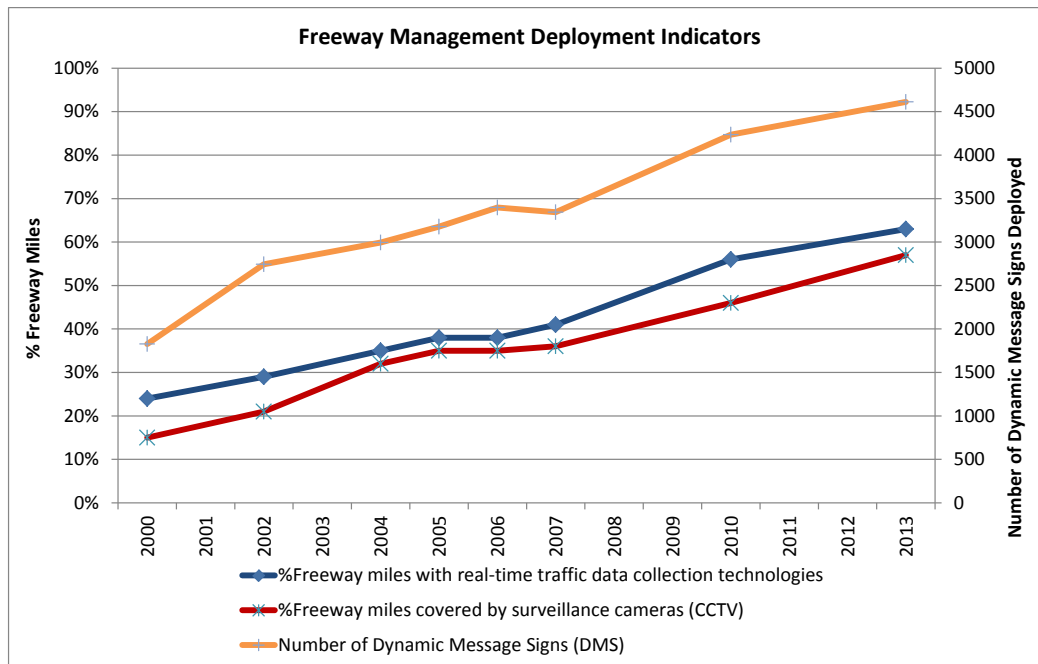
For more than 20 years, the Department has led the research and development of ITS technologies,<sup>2</sup> demonstrated their effectiveness in solving transportation problems, and conducted technology transfer activities such as training and technical assistance to equip state and local transportation officials with the knowledge, skills, abilities, and resources to adopt and deploy these technologies. The Department also conducts evaluations, publishes research findings, and maintains a National ITS Architecture and Standards program to help states and jurisdictions integrate and deploy interoperable ITS systems. These systems have been shown to improve the safety, mobility, and reliability of surface transportation, and to reduce the environmental impact.

The Department has successfully used and continues to use a wide variety of incentives and strategies to encourage the adoption and deployment of ITS technologies across the country. As a result, ITS have been successfully deployed in cities and rural areas and in transportation management centers (TMCs) across the country, as well as by the private sector. The Department seeks to integrate proven ITS technologies into the daily activities of transportation agencies, so that the technology considerations are integrated into normal business processes, from the initial planning process to project development and through the everyday operations and maintenance (O&M) of the transportation system.

The growth of ITS over the past 15 years has been documented by the Department through a periodic deployment tracking survey effort [1]. Figure 1-1 illustrates the growth in urban freeway management deployments, with these deployments more than doubled since 2000. Substantial expansion has continued in the past few years, including the percentage of metropolitan area freeway miles covered by real-time traffic data collection technologies (up from an average of 56 percent in 2010 to 63 percent by 2013) and closed-circuit television (CCTV) (increasing from 46 to 57 percent from 2010 to 2013). Since 2000, there has also been a significant increase in the deployment of several transit technologies. The percentage of fixed route buses equipped with Automatic Vehicle Location (AVL) increased from 31 percent of vehicles in 2000 to 66 percent in 2010 and to 86 percent in 2013. In addition, the percentage of demand responsive vehicles operating under computer-aided dispatch (CAD) systems has climbed from 28 percent of vehicles in 2010 to become virtually universal by 2013. Finally, the proportion of fixed route buses equipped with electronic real-time monitoring system components increased from 15 percent in 2000 to 48 percent in 2013. Other ITS deployment successes include electronic toll collection, Commercial Vehicle Information Systems and Networks (CVISN), particularly electronic roadside screening, and traveler information systems (511 telephone and website services).

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<sup>2</sup> ITS utilize information, communications, and electronic technologies to improve transportation safety and mobility and enhance productivity through the integration of advanced communications technologies into the transportation infrastructure and in vehicles.



**Figure 1-1: Freeway management deployment indicators of large urban areas (Source: Draft Report: Deployment of Intelligent Transportation Systems: A Summary of the 2013 National Survey Results)**

These data show that ITS deployment is becoming part of the fabric of transportation systems across the country. State and local decision-makers are considering and implementing ITS applications and technologies as an integral part of their plans to address local and regional transportation problems. Many of the first generation ITS applications have nearly reached their full deployment potential, particularly in large urban areas, including electronic tolling and AVL/CAD systems for transit. Still, additional research and technology transfer work remains to be done by the Department to assist their state and local agency partners with efficient implementation of these systems, and incentives continue to remain an important tool to encourage deployment.

The next generation of ITS technologies and applications currently in the research stage include areas such as connected vehicle (CV) technologies and vehicle automation.<sup>3</sup> These technologies have the potential to revolutionize surface transportation systems. The research, development, and implementation of the systems require an unprecedented level of collaboration between the Department and other Federal agencies, state and local agencies, automobile manufacturers and suppliers, and industry. The Department will need to use the full range of incentives previously applied, including demonstration projects, and will consider strategies from other industries in order to facilitate this emerging ITS market and lower the barriers to public agency deployment.

<sup>3</sup> For more information on CV technologies and vehicle automation, please see the ITS website at [www.its.dot.gov](http://www.its.dot.gov)

## 1.2 Purpose

The purpose of this report is to convey the ways in which the Department has used and will continue to use incentives to promote and accelerate the adoption and deployment of innovative ITS technologies in a variety of multimodal surface transportation areas. The report also contains a discussion of emerging or new types of incentives that the Department is considering to address the challenges of deploying the next generation of ITS, including CV applications.

## 1.3 Project Team

A project team consisting of representatives of the surface transportation modal administrations was convened to address the MAP-21 provision and guide the development of this report, led by the Office of the Secretary's ITS Joint Program Office (JPO), including: Federal Transit Administration (FTA), Federal Motor Carrier Safety Administration (FMCSA), Federal Highway Administration (FHWA), Federal Railroad Administration (FRA) and National Highway Traffic Safety Administration (NHTSA).

## 1.4 Approach to Plan Development

The framework used for considering ITS deployment incentives is contained in Figure 1-2. The first step was to consider previous efforts to incentivize ITS technology adoption and deployment. This step resulted in the development of an inventory of various types of incentives that have been used or considered. Through literature review and in-depth interviews with Federal officials<sup>4</sup> knowledgeable about the use of these incentives, incentive approaches that were deemed successful were identified. These successful practices are identified and highlighted for continued use in the future.

Step 2 was to identify the most important challenges and ongoing barriers to deployment. These challenges can be assessed to determine if other types of deployment incentives might be useful in addressing these challenges and reducing barriers. The most important barriers to deployment were identified through review of the literature, previous survey results, interviews with Federal staff, and facilitated discussion with various stakeholder groups, and the ITS Program Advisory Committee (PAC).<sup>5</sup> In addition, this step included an assessment of future ITS applications that the Department will be encouraging, given the state of the research program today. While traditional incentives will certainly be used to encourage adoption and deployment of these newer ITS programs (such as CV applications), the Department is considering other innovative approaches for encouraging deployment. These innovative approaches may be needed to address unique challenges associated with the CV environment.

Finally, in determining the plan for moving forward, the results from the previous steps were synthesized. Successfully used incentives were highlighted for continued use. Several innovative approaches were identified for further consideration.

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<sup>4</sup> The project team interviewed 32 experienced Department staff from across the modal administrations.

<sup>5</sup> Stakeholder engagement sessions were conducted with several organizations and committees involved in ITS deployment and transportation systems operations. See Appendix A for more information.

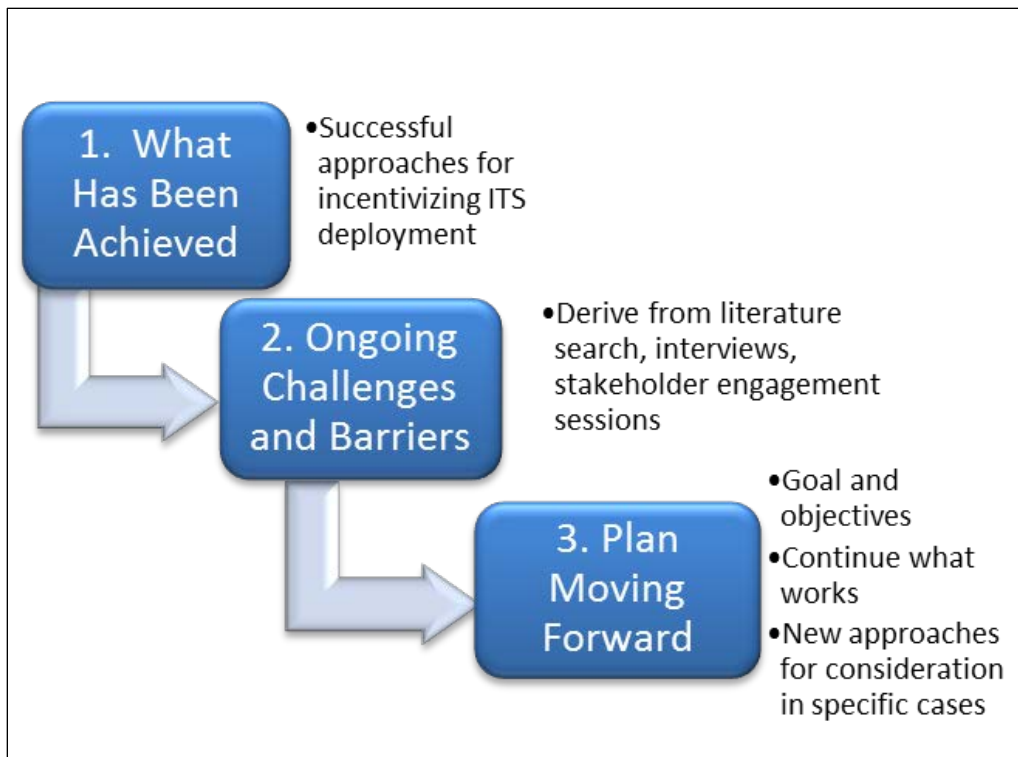


Figure 1-2. Framework and major steps to development of the ITS incentives plan.

## 1.5 Synthesis of Findings

Overall, cross-cutting analysis of the literature review, Federal agency approaches, Department modal staff interviews, and stakeholder feedback reveals several major themes regarding the use of incentives to encourage further deployment of ITS and adoption of next generation ITS. These findings are summarized below.

1. Deployment is more likely to be achieved when a **full range of incentives** is applied over the course of the ITS Research and Development lifecycle, from planning and demonstration program grants, to Knowledge and Technology Transfer (KTT) activities such as technical assistance, training and guidance. The Integrated Corridor Management (ICM) program is good example of this; the program has accelerated awareness of the ICM concept through a research and demonstration program, outreach and guidance, workshops, training activities, and a recent deployment planning grant program.
2. **Funding** is always an important ingredient to address. **Increasing the eligibility** of ITS systems and applications for Federal funding has proven very important in removing past barriers to deployment. Most Federal-aid programs now cover long term O&M costs as eligible expenses for Federal funding. ITS systems tend to have higher O&M costs relative to their capital costs, when compared to traditional transportation improvements, such as adding a traffic lane. Since these costs are now explicitly covered by most of the large Federal-aid programs, state and local decision-makers are more willing to try ITS solutions.

3. **Competitive grant programs for field trials and demonstrations** serve a very important role in stimulating interest in a technology, using financial incentives. They assist the early adopters in entering the market, and provide other agencies and industry with real world examples to follow.
4. While providing financial incentives is important, **encouraging sustainable funding for ongoing O&M is even more important for ITS deployment**. The Department has found that in the traffic operations area, that while agencies are aware that Surface Transportation Program (STP) funds can be used for O&M, most are reluctant to do so. Many agencies have found it impossible for innovative technologies requiring a commitment to O&M to compete with capital-intensive projects.
5. **Deployment planning grants are generally viewed favorably** by Federal officials and state and local stakeholders since they incentivize agencies to budget for implementation and O&M and include ITS projects in their Transportation Improvement Programs (TIPs). For example, the recently announced Mobility Services for All Americans (MSAA) planning grants enable participating Metropolitan Planning Organizations (MPOs), Travel Management Coordination Centers (TMCCs), and other public agencies to work together to plan for human service transportation (HST) systems that utilize ITS capabilities to be included in their TIPs.
6. **Rulemaking can be an important tool** for motivating changes in behavior, and can encourage (or mandate) ITS deployment. However, a very strong societal benefit-cost case needs to be made before requiring technology adoption.
7. **Conducting KTT** is a very important role for Federal agencies in incentivizing ITS deployment. KTT includes: training, technical assistance, guidance documents, and peer to peer exchanges. Training courses have been shown to be effective in answering some of the questions of state and local agencies about ITS technologies that may have impeded decisions to implement. Reducing the uncertainty about the risks and benefits of ITS is key to promoting adoption. In addition, delivering practical guidance and direct technical assistance on how to plan, analyze, and implement these technologies through guidance documents and state of the practice manuals or handbooks assists in standardizing procedures and creating a community of practice that will encourage deployment. These efforts should include mechanisms for peer exchanges, whether in-person or virtual, as research has shown that peer influence is an important factor in the decision to deploy ITS. The Every Day Counts (EDC) program shows how focused KTT, fully supported by the administration and agency leadership, is critical to influencing adoption of ITS technologies. Deployment of adaptive signal systems had been lagging in the U.S., but the EDC program helped to turn this around.
8. **Demonstrating and communicating the benefits of ITS technology** was most often cited as the factor influencing adoption. This applies to agencies, vehicle manufacturers, the trucking industry, and ultimately, the consumer. Telling the story of how ITS can be most cost-effectively employed in combination with non-ITS improvements to increase safety, mobility, and operational efficiency is critical to expanding adoption of innovative technologies in surface transportation. The information must be communicated at the right level of detail and in ways that are easy to understand and compelling in terms of developing the business case for deployment.

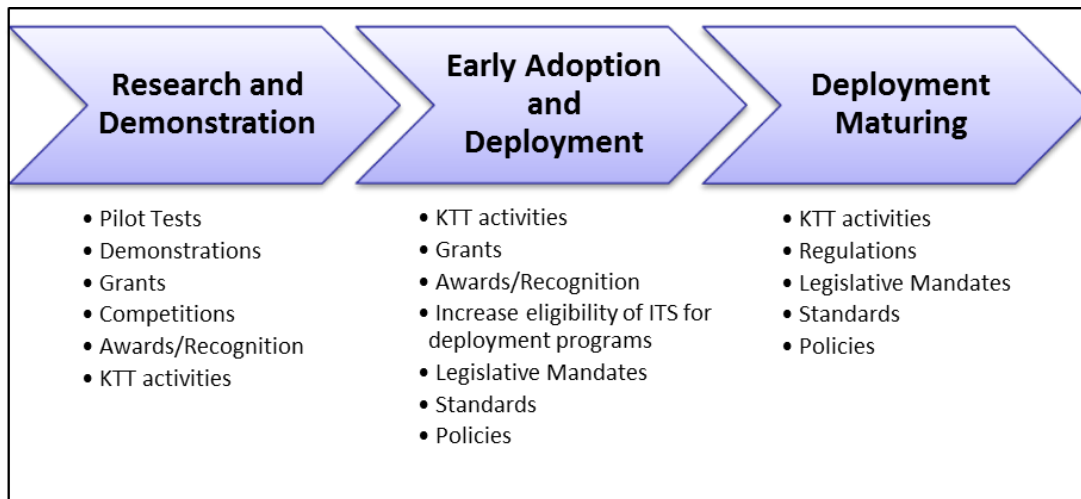
9. Looking to the future, CV deployment depends on consumer adoption of the technology. **The Department is considering exploring the concept of providing incentives for consumer adoption**, including consumer education efforts such as NHTSA's New Car Assessment Program (NCAP), The Environmental Protection Agency's (EPA) Energy Star program, and working with Congress and the Treasury Department to consider tax credits for purchasing the technology, as was done with electric vehicles and some Energy Star purchases.

## 2 Using Incentives to Meet ITS Deployment Challenges

### 2.1 The ITS Technology Adoption Lifecycle

The ITS technology adoption lifecycle plays an important role in deciding which incentive to choose to motivate deployment. During the research and demonstration stage, the ideas for the technological innovation are generated and concepts are refined. As these concepts become ready for testing in a real-world environment, state agencies may compete for and receive grants to assist a pilot testing and demonstrating the technology. Demonstrations are often done at multiple sites to engage more stakeholders, demonstrate the benefits of the technology, and test for readiness in different institutional and local transportation environments. These stakeholders often become the early adopters of the technology. In limited cases, once the technology is proven and ready for deployment, Congress or the Department may use a directive to mandate its use if there is a significant public benefit, but more commonly, the Department works with the early adopters, industry stakeholders, and agencies to promote voluntary adoption through KTT activities such as training, workshops, technical assistance, guidance, stakeholder forums or coalitions, and other mechanisms to increase awareness and understanding and encourage adoption of the technological innovation. This process is depicted in Figure 2-1.

The bulleted lists in the figure represent the types of deployment incentives most often used by the Department during the different stages of ITS development and deployment. The Department sees its role in testing, validating, and proving technologies before seeking widespread deployment, as experience shows that states and the private sector are slow to deploy and adopt new technologies unless it is proven cost effective. In general, the Department sees its role as to not impede technology with regulations, unless there is a proven societal benefit. Although KTT activities are shown throughout the lifecycle, their prominence typically increases as more and more agencies begin to adopt and deploy the technology. As the adoption and deployment of technology increases, there is less of a need for demonstrations and grants to be used, while the use of incentives to encourage mainstreaming the technology into transportation agency practice becomes more important.



**Figure 2-1: ITS technology development and deployment stages**

## 2.2 ITS Deployment Challenges

Using the technology adoption lifecycle as a guide, the most important barriers to deployment were identified through review of the literature, previous survey results, interviews with Federal officials, and facilitated discussion with various stakeholder groups. These include: [2]

- Securing funding when competing for attention with “ribbon-cutting” projects that have higher visibility than ITS deployments (e.g., opening a new roadway)
- Ensuring interoperability with existing systems
- Cost
- Complexity in developing, operating, and maintaining ITS
- Finding qualified staff
- Cultural and organizational barriers
- Lack of data on the benefits and cost-effectiveness of ITS and related tools
- Communicating the benefits of ITS to decision makers
- Looking solely to peers’ experience when making deployment decisions
- The need to influence consumer behavior in adopting next ITS technologies such as in-vehicle safety systems and traveler information
- Stimulating agency adoption of next generation infrastructure technology in a resource constrained environment.

The use of deployment incentives can help overcome some of these barriers when applied in the appropriate way. Large scale field trials and demonstrations, funded by grants, can show the benefits of the technology and capture lessons learned for other agencies to emulate. Since agencies often take a conservative approach to technology adoption, demonstrations and grants are powerful motivators for these agencies to take on the risk of implementing a new technological innovation. Training and technical assistance can bridge the gap where skilled personnel are initially lacking. The promotion of a systems engineering approach to ITS deployment, the creation of a regional architecture, and the use of standards can assist with the issue of interoperability. In fact, an analysis commissioned by the ITS JPO found that non-financial factors such as the presence of a regional architecture and the use of complementary technologies had a positive effect on increasing ITS deployment [3].

## 2.3 Deployment Incentive Strategies

Table 2-1 below contains a characterization and listing of the different types of deployment incentives identified to address these challenges. Most deployment incentives can be characterized under one or more of these categories:

- **Rewards or Penalties** – These strategies use financial or other rewards or penalties such as public recognition to motivate agencies to deploy ITS.
- **Eligibility of ITS for Federal-aid / Deployment Programs** – These incentives focus on changing the eligibility criteria to allow funding dollars to be used for ITS investment.
- **Directives** – These strategies focus on official instructions such as legislation, rulemaking, or standards that increase the use of ITS. Use of standards can either be voluntary or mandated.
- **KTT** – These are the tools and techniques that further ITS deployment through advancing understanding of how to use ITS technologies, systems, models, and strategies to improve transportation operations. KTT also focuses on demonstrating the value of ITS by disseminating evaluation results, lessons learned, and facilitating peer exchange.

**Table 2-1: Incentives Strategies by Category**

Incentive Category Groups			
Rewards or Penalties	Eligibility of ITS for Federal-aid Deployment Programs	Directives	KTT
<ul style="list-style-type: none"> <li>• Demonstrations</li> <li>• Grants</li> <li>• Competitions</li> <li>• Awards/Recognition</li> <li>• Performance-based rewards</li> <li>• Performance-based penalties</li> <li>• Reduce taxes</li> <li>• Provide tax credits</li> <li>• Reduce administrative burden</li> </ul>	<ul style="list-style-type: none"> <li>• Expand to more programs</li> <li>• Cover long-term O&amp;M costs</li> <li>• Ease eligibility criteria for matching grants</li> <li>• Provide higher Federal share for ITS</li> <li>• Explore other Federal agency programs for funding opportunities</li> </ul>	<ul style="list-style-type: none"> <li>• Legislative Mandates</li> <li>• Regulations</li> <li>• Standards</li> <li>• Policies</li> </ul>	<ul style="list-style-type: none"> <li>• Training</li> <li>• Tools</li> <li>• Technical Assistance</li> <li>• Guidance</li> <li>• Workshops</li> <li>• Peer-to-Peer activities</li> <li>• Multi-state Deployment Coalitions or Forums</li> <li>• Collaborative Research Environment</li> </ul>

Section 3 details the Department's goal, associated objectives, and guiding principles for the use of incentives, and details how each of these incentives can be used most effectively by the Department to increase cost-effective deployment of ITS.

# 3 ITS Deployment Incentives Plan

## 3.1 Goal and Objectives

The Department has set forth the following goal and objectives for the use of ITS deployment incentives:

***The Department will encourage deployment of ITS technologies by using incentives as appropriate in order to improve the performance of the NHS.***

The associated objectives are:

- Apply the appropriate incentives for the different stages of technology adoption.
- Integrate proven ITS technologies into the daily activities of transportation agencies.
- Demonstrate how ITS can improve the cost-effectiveness of highway operations.

## 3.2 Guiding Principles

In working toward achievement of this goal, the Department will follow these principles to employ the right incentives for motivating ITS adoption and deployment.

- Encourage the consideration of various types of incentives to assist ITS related program areas in meeting their goals.
- Offer incentives appropriate to the stage of development and maturity of the specific ITS technology being considered.
- Design incentives to complement the existing and anticipated statewide and metropolitan transportation rules and regulations.
- Encourage the evaluation of ITS incentive programs to gather and report data on the effectiveness of the incentives.
- Coordinate ITS deployment activities across modal administrations to provide consistent messaging and efficiencies.
- Promote outreach and KTT efforts, including communicating the benefits of ITS technology, technical assistance, and guidance to influence adoption.
- Look beyond traditional incentives and consider innovative ways to incentivize consumer, commercial industry, or application developer investments.

## 3.3 ITS Deployment Incentives

The Department actively uses incentives such as demonstration programs, competitive grants, expanding eligibility for ITS investments and ongoing O&M costs under the Federal-aid program, legislative mandates, rulemaking and related policy and guidelines, and KTT activities such as training, technical assistance, and guidance. In other areas, such as competitions and tax credits, it is

looking at other Federal agency efforts for successful examples to emulate. This section describes each incentive type in use or being considered for use, with examples of Department or other Federal agency programs and initiatives that use these incentives to encourage ITS deployment. The incentives are organized by the categories outlined in Table 2-1.

The programs described by no means represent an exhaustive list of deployment incentives in use, but instead reflect the various approaches taken to encourage ITS adoption.

### 3.3.1 Rewards or Penalties (financial or otherwise)

The Department uses incentives in the form of competitive demonstration grants primarily to motivate state and local agencies to increase deployment of ITS technologies. Financial rewards are the most direct way of implementing incentives; there are very few instances where penalties are used. Non-financial types of rewards include public recognition and streamlined administrative processes. In the future, the Department may seek to influence consumer or manufacturer behavior towards the adoption of safety technologies. Financial incentives in the form of tax credits would be powerful tools for this purpose.

#### 3.3.1.1 *Demonstrations and Planning Grants*

The Department views demonstrations awarded through competitive grants as one of its most effective tools to incentivize deployment. Demonstrations move innovative ITS research into deployment by:

- **Building Confidence in the Technology**—The primary role of a demonstration is to show that innovative technology works as intended in a real world environment. Implementation of ITS technologies may significantly impact overall operations, and transportation managers are justifiably cautious in their approach to their adoption. Demonstrations, especially when accompanied by KTT outreach efforts, can ease those fears and accelerate adoption.
- **Capturing the Benefits of Technology**—With some exceptions, the Department's approach has been to demonstrate the value of a particular technological innovation, rather than dictate its adoption. The Department requires that ITS demonstrations include an evaluation task to assess whether the technology implementation has provided safety, mobility and environmental benefits and makes that data available to others through its Knowledge Resources (KR) database. Articulating and showing benefits helps to increase awareness, deployments, and technology adoption.

Prior to 2012, demonstrations were perhaps the most frequently used method to incentivize ITS deployment. Some of the more successful examples include:

- ITS Metropolitan Model Deployment Initiative
- ICM pioneer site demonstrations in Dallas and San Diego
- Urban Partnership Agreement (UPA)/Congestion Reduction Demonstration (CRD) programs
- MSAA deployment planning grant
- CVISN
- Positive Train Control (PTC)
- CV Safety Model Deployment

Through the Department's **ICM** program, two pioneer sites, San Diego, CA and Dallas, TX are demonstrating promising multimodal strategies that enable agencies to manage a corridor as an integrated asset in order to improve travel time reliability and predictability, and manage congestion. In the spring of 2013, the San Diego, CA and Dallas, TX sites launched their demonstration and evaluation phases, following a five-year period where three sites investigated the potential of active and integrated ICM strategies to enhance corridor performance. Based on modeling results, the three sites reported potential ten-year net benefits of ICM ranging from \$82 million to \$570 million [4].

**The UPA/CRD programs** are good examples of successful ITS-related demonstration deployment incentive programs. Competitive solicitations were used to select cities with aggressive congestion-relief programs to receive program funds to assist with deploying and operating demonstrations of congestion pricing and other strategies aimed at reducing congestion. The Department sought applicants to aggressively use four complementary and synergistic strategies (referred to as the "4Ts") to relieve urban congestion: Tolling, Transit, Telecommuting, and Technology. As a result, six congestion pricing projects were awarded through a competitive application process. These projects are being evaluated by an independent third party hired by the Department to determine the effectiveness of the deployments and pricing strategies. The Minnesota UPA evaluation found the projects achieved an overall benefit cost ratio of 6:1 [5]. One of these deployments, in San Francisco, used pricing strategies to manage parking in real-time. The concept has since expanded and several cities are now actively doing or planning to implement parking pricing.

An example of the successful use of deployment incentives occurred with **MSAA** deployment planning grants. In 2008, the FTA, using funds provided by the ITS JPO, funded eight locations to plan and subsequently down-selected three locations to demonstrate the effectiveness of TMCCs to coordinate HST trips. A simulation analysis showed that coordinating HST across funding sources can increase passengers per revenue hour by ten percent [6]. In 2014, the ITS JPO and FTA extended the project and a second wave of planning grants will be awarded for the deployment planning of TMCCs to support interoperable, coordinated HST systems.

Examples of the successful use of demonstration deployment incentives in the freight domain are the Truck Parking, and CVISN programs. **Truck Parking** was authorized by Section 1305 of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This discretionary program made \$6.25 million per year available for eligible parking systems including truck parking, detection, and notification to the drivers. Seven states/corridors received funding. Program managers consider these funds to be "technology transfer" investments to assist in bridging the gap from research to implementation. **CVISN** awards grants to state offices to support improved information technology exchanges between government agencies and the motor carrier industry to enhance motor carrier safety and other efforts. CVISN grants may be used to purchase equipment, for training, and for technology transfer. As of January 2014, all 50 States have either deployed or are in the process of deploying CVISN, with 33 States rated "Core CVISN Compliant" and 17 States plus the District of Columbia rated as "Deploying Core CVISN Functionality."

In rail, deployment incentives were used to accelerate the use of **PTC** technology. PTC uses advanced communications technology to automatically stop or slow a train before accidents occur. Starting in the late 1990s, the FRA funded a demonstration of PTC for passenger rail and ultimately applied the technology to high speed rail service; however, in this case, demonstrations alone did not promote widespread adoption. In 2008, Congress passed the Rail Safety Improvement Act of 2008 (RSIA) which mandates PTC in passenger rail by 2015 and established a grant program to fund the deployment of rail safety technologies. This program was authorized to offer up to \$50 million in grants to railroads each year for fiscal years 2009 through 2013.

### **3.3.1.2 Competitions**

In March 2010 the White House Office of Management and Budget issued guidance for the increased use of challenges and prizes to develop new tools and approaches to improve open government. The memo stated that the Administration strongly encourages agencies to: “utilize prizes and challenges as tools for advancing open government, innovation, and the agency’s mission.” [7]

Federal examples related to transportation include the Defense Advanced Research Projects Agency Grand Challenges in 2004 and 2005 which offered cash prizes to designers of robotic technologies that advanced the state of the art of driverless vehicles. In another example, The Department of Energy (DOE) issued grants to support the outreach and educational efforts of the nonprofit X Prize Foundation, which is conducting a contest for the successful development of vehicles with 100 miles per gallon fuel efficiency.

To date, the Department has made limited uses of competitions, with small prizes primarily targeted to students. The CV Technology Challenge awarded a trip to the 2011 ITS World Congress for the most innovative use of dedicated short range communications (DSRC). The Data Visualization Student Challenge offered a prize of \$4,000 to encourage students to develop data visualization to aid in decision making about transportation investments.

### **3.3.1.3 Awards / Recognition**

The EDC Program administered by FHWA's Center for Accelerating Innovation is designed to focus on a finite set of initiatives that reduce the time it takes to deliver highway projects, protect the environment, and enhance safety. Teams from FHWA work with state, local, and industry partners to deploy the initiatives and develop performance measures to gauge their success. So far, two sets of innovations EDC-1 (2010) and EDC-2 (2012) have been identified and selected for deployment. These innovations provide ways of improving the work of highway planning, design, construction and operation.

The key to the success of the EDC program was the visible leadership support from the Department Deputy Secretary Victor Mendez, Acting FHWA Administrator Gregory Nadeau, and other top officials. The top down approach was central to elevating the conversation and brought national attention to the topics at the decision maker level. By hosting regional summits, giving presentations across the country, and developing marketing tools and other activities, the FHWA teams spread the word and increased the credibility of the EDC innovations. The Center is now moving into the third round of EDC innovation awards. Thirteen innovations have been selected, each with its own technical team.

### **3.3.1.4 Performance-Based Rewards / Penalties**

The Department has encouraged state and local agencies to adopt performance contracting as an alternative to low bid contracts and as means to increase innovation and problem solving. As explained in FHWA's Performance Contracting for Construction: A Guide to Using Performance Goals and Measures to Improve Project Delivery, “Under a performance contract, agencies specify performance goals and contractors have flexibility in how they carry out the work to meet those goals.” [8]

For example, the Michigan Department of Transportation (MDOT) received \$1 million in project funding from FHWA's Highways for LIFE program to complete a \$3.8-million repaving and bridge reconstruction pilot project on M-115 in Clare County. Performance goals for the 2008 project focused on the measures MDOT and its stakeholders selected in the following categories: date open to traffic,

completion of construction and related cleanup, pavement performance, worker safety during construction, work zone crashes, and motorist delay. Among the incentives were the potential for a \$98,000 bonus for reopening 14 days early, and a \$7,000 per day penalty for reopening late. The contractor who won the award included innovations such as bridge prefabrication, a temporary traffic lane that provided two-way traffic during major construction stages, and a 24-hour roadside patrol. The project was completed and the roadway reopened to traffic 20 days early.

### **3.3.1.5 Reducing Administrative Burden**

The Department has seen early success in the Technology and Innovation Deployment Program (TIDP) created by MAP-21. TIDP provides incentive funding for eligible entities to accelerate the implementation and adoption of innovation in highway transportation. Projects eligible for funding utilize proven innovative practices or technologies, including infrastructure and non-infrastructure strategies or activities, which the applicant intends to implement and adopt as a significant improvement from their conventional practice. The FHWA has annual funding award goals of up to \$14 million available to State Departments of Transportation (DOTs) and up to \$1 million available to Federal Land Management Agencies and tribal governments. The amount of the award may be up to the full cost of the innovation in the project, but only to a maximum of \$1 million.

The awards under TIDP have proven to be very popular, in part because of the streamlined process for making these awards. The application form is very short, and the Center uses a rolling application process, so agencies can apply at any time. Evaluation criteria are clear and condensed.

### **3.3.1.6 Tax Credits**

Tax credits made directly to manufacturers or consumers can be very effective in influencing the purchase of products incorporating innovative technology. The U.S. Department of Treasury offers incentives in the form of tax credits directly to consumers to encourage the purchase of energy efficient vehicles and homes. The Alternative Fuel Motor Vehicle Credit was enacted by the Energy Policy Act of 2005 and includes separate credits for four distinct categories of vehicles [9]:

- Qualified Hybrid Vehicles--expired
- Qualified Fuel Cell Vehicles
- Qualified Alternative Fuel Motor Vehicles and Heavy Hybrids--expired
- Advanced Lean-Burn Technology Vehicles--expired

For vehicles acquired after December 31, 2009, the credit is equal to \$2,500 with additional credits for certain types of advanced technology energy efficient batteries. The total amount of the credit allowed for a vehicle is limited to \$7,500. During the time of the tax credit from 2005 to 2009 the market share of hybrid vehicles in the U.S. grew from 1.2 to 2.8 percent [10].

Similar results were achieved through the Energy-Efficient New Homes Tax Credit for Home Builders that provides tax credits up to \$2,000 for home builders of all energy-efficient homes [11]. The tax credit was started in 2006 and ran through 2009, then was retroactively reinstated for 2010 to 2012. The results were as follows:

- In 2006 0.8 percent of new homes built were compliant with the Federal tax credit.
- In 2009 ten percent of new homes built were compliant with the Federal tax credit [12].

The Residential Energy Efficiency Tax Credit applied to energy improvements in existing homes and purchases of high efficiency heating and cooling equipment, water heaters, building insulation, windows, doors, roofs, and biomass stoves [13]. The results were:

- From 2006 to 2007 there was a large increase in the total consumer spending on tax credit eligible improvements: \$1.189 million increase in spending on exterior windows and \$184 million increase in metal roofing.
- In 2004, one year before the tax incentive started for Energy Star Compliant Windows, 47 percent of the market share was made up of Energy Star windows. With the tax incentives available, by 2008 Energy Star windows had 57 percent of the market share, and by 2011 averaged over several regions the Energy Star market share reached 89 percent [14].

In 2007, The American Transportation Research Institute (ATRI) conducted an analysis of incentives to motivate the trucking industry to adopt Onboard Safety Systems [15]. The trucking industry indicated the highest preference for tax-based incentives, such as:

- Subsidizing the cost on a one-time per unit basis through tax credits or grants.
- Modifying tax policy to remove certain taxes for trucks equipped with onboard safety systems.
- Changing the depreciation schedule for trucks equipped with safety technologies.

### 3.3.2 Eligibility of ITS for Federal-Aid / Deployment Programs

Over the past decade, the Department has removed most barriers regarding **ITS eligibility for Federal-aid program funding**. This constituted a big improvement in that Federal-aid funds can now be used for ongoing ITS O&M expenditures. ITS projects are explicitly considered to be eligible for large programs such as the STP, Congestion Mitigation and Air Quality Improvement (CMAQ) Program and the National Highway Performance Program (NHPP).

Transit agency recipients of Section 5300 funds may also use these funds for ITS implementation, typically through their regional transportation planning process. Transit agencies have used Federal funding to implement AVL and CAD systems on buses. These systems, now in widespread use across the U.S., have resulted in improved service and safety, with on-time bus performance improving by as much as 80 to 90 percent.

However, for CMAQ funded projects, there is a three-year limit on the use of that funding for ongoing system operations and management/maintenance. The long term costs associated with maintaining ITS such as Adaptive Signal Control Technology (ASCT) have been cited by transportation managers as a factor inhibiting their adoption. The importance of **sustainable funding for ongoing O&M** is critical to more widespread ITS deployment. The Department staff also articulated the importance of engaging MPOs earlier in the process and using planning grants to allow agencies to budget for implementation and O&M. MPO staff indicated that more could be done to encourage jurisdictions to work together to integrate and coordinate regional, multi-agency, multi-modal projects.

An example of **providing a higher Federal-aid share for ITS technologies** comes from the FHWA's Center for Accelerating Innovation which administers the Innovative Project Delivery Methods program under MAP-21 (Section 1304). This program allows states to increase the Federal-aid match by five to 85 percent or more if they are using innovative practices on the project. So far, this program has only been used by two states, Michigan and Georgia, but there have been numerous inquiries by other states. The Department expects the use of this program to expand in 2014 and beyond.

As mentioned earlier in this report, some state and local agencies make use of **other Federal agency programs**, such as Department of Homeland Security (DHS) grant funding to increase deployment of CCTV cameras, expand or upgrade their communication networks (especially in the area of traffic incident response), and improve security of transit vehicles. These grants can expand deployment of ITS technologies, but ongoing O&M must be addressed.

### 3.3.3 Directives

A directive is an official instruction through legislation, regulation, policy, or standard requiring agencies, manufacturers, or individuals to take specific actions. The U.S. Congress and the Department sometimes use directives in place of incentives, usually when there is a strong safety rationale for doing so.

#### 3.3.3.1 Legislation

An example of legislation encouraging ITS adoption is the Real-Time System Management Information Program provision in Section 1201 of the SAFETEA-LU.<sup>6</sup> The legislatively mandated program aims to provide the capability to monitor in real-time the traffic and travel conditions of the major highways across the U.S. and provide a means of sharing these data with state and local governments and with the traveling public. A Final Rule was published on November 8, 2010, establishing the provisions and parameters for the Program to be established on all Interstate routes within four years and on other significant roadways as identified by the States and local agencies within six years. These requirements compel state DOTs to implement a monitoring system or have some other way to comply, such as partnering with the private sector.

Another provision of SAFETEA-LU required new passenger vehicles to be labeled with safety rating information published by the NHTSA under its NCAP. NHTSA's NCAP star rating system provides incentives for motor vehicle manufacturers to make safety improvements in their vehicles. In 2007, NHTSA sought to improve the dissemination of NCAP ratings by issuing a Final Rule requiring manufacturers to place NCAP star ratings on the Monroney sticker (automobile price sticker). The new 5-Star Safety Rating allows consumers to compare safety ratings of crashworthiness and rollover safety by model, class, and manufacturer.

In addition, the new performance-based management requirement in MAP-21, particularly those related to operations and congestion management, will likely serve to increase the deployment of ITS in order to capture the relevant performance measures.

#### 3.3.3.2 Regulation

The Department **rulemaking activities** have also been used to facilitate, guide, or promote ITS deployment. For example, 23 Code of Federal Regulations Rule 940<sup>7</sup> requires the establishment and maintenance of a regional ITS architecture for regions deploying ITS with Federal-aid money as well as use of systems engineering analysis for development of ITS projects. As noted earlier, an ITS JPO-sponsored study found that the presence of a regional architecture correlated strongly with increased ITS deployment and that the effect was more pronounced for technologies that were less mature [16]. FTA staff members have expressed concern that not all ITS projects require establishment of a

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<sup>6</sup> Real-Time System Management Information Program, <http://www.ops.fhwa.dot.gov/1201/>

<sup>7</sup> ITS Architecture Implementation Program [http://ops.fhwa.dot.gov/its\\_arch\\_imp/](http://ops.fhwa.dot.gov/its_arch_imp/)

regional ITS architecture as intended by The Final Rule 940. Specifically, ITS projects that are funded with DHS funding or other Federal funding sources can be excluded from this requirement.

#### **3.3.3.3 Standards**

Since 1996, the Department has had a well-defined ITS standards program to encourage the widespread use of ITS technologies in surface transportation systems. ITS standards are based on open, non-proprietary technology to facilitate the deployment of interoperable ITS systems, and make it easier for state and local ITS agencies to develop and implement regionally integrated transportation systems. The ITS Standards Program is teaming with standards development organizations to accelerate the development and testing of nearly 100, consensus-based, ITS standards while working with state and local highway and transit agencies on standards-based ITS implementation strategies. To date, the ITS program has promoted voluntary use of standards by state and local agencies, rather than requiring their use.

An example where the use of standards encouraged deployment was when RSIA required FRA to prescribe standards, regulations, guidance, or orders by October 2009 for railroads to implement rail safety technologies in areas of track without signals or PTC. In January 2010, FRA issued final regulations on PTC implementation. Among other things, the regulations describe the requirements of a PTC system; require railroads to submit PTC development, implementation, and safety plans and FRA to review and approve them; require railroads to implement PTC by December 31, 2015; and establish a schedule of civil penalties for violations. These factors have led to more rapid adoption of the technology, although not all trains will be in compliance by 2015.

### **3.3.4 KTT**

The Department staff and stakeholders interviewed pointed to the full range of deployment incentives offered including: demonstrations and grants, followed by KTT activities such as training, technical assistance and implementation guidance, as having the greatest impact on technology adoption.

The ICM program is an example of the effective use of KTT incentives to accelerate adoption of promising strategies that enable agencies to manage a corridor as an integrated asset in order to improve travel time reliability and predictability, and manage congestion. In the spring of 2013, the San Diego, CA and Dallas, TX sites launched their demonstration and evaluation phases. This followed a five-year period where they produced a Concept of Operations and requirements and performed analysis modeling and simulation. This project contained a significant KTT component, requiring development of a resource compendium, guidance documents, as well as training and outreach. As a result of these efforts, the 2013 Deployment Tracking Survey shows a high level of awareness of ICM, with 30 percent of TMCs indicating they are participating in an ICM; freeway agencies (25 percent), arterial agencies (26 percent) and transit agencies (16 percent) also indicate participation in ICM [17].

#### **3.3.4.1 Training**

The Department provides extensive training opportunities through many of their individual research programs. In addition, the ITS Professional Capacity Building Program (PCB) delivers training and learning resources to the ITS workforce in several ways including online classes, webinars, classroom training courses and blended training. In 2014, the ITS PCB program will reach over 16,000 transportation professionals with ITS training resources.

Multiple Department staff and stakeholders articulated the importance of training, especially training for agency staff involved in ITS procurement, project management, O&M. Generally speaking, transit

agencies' ITS expertise, particularly in smaller agencies, and staff availability is very limited. Staff members pointed to the ITS PCB Program's Talking Transportation Technology (T3) webinar series as a good example of low cost technical training for state agency staff.

### **3.3.4.2    *Technical Assistance (including Peer-to-Peer Assistance)***

The peer-to-peer technical assistance, funded as a part of the ITS PCB program, has been well received and valued by many agencies. A Department staff member emphasized the power of peers, stating, "We met with a traffic technician who refused to consider adaptive signals no matter how much we told him it would improve the operation of the system. However, when we sent him to speak to peers, he not only realized the benefits to system users, but also understood the maintenance benefits and decided it was worth the equipment upgrades."

### **3.3.4.3    *Tools and Guidance***

The Department produces a number of tools and guidance documents to encourage ITS deployment. The Department through the Strategic Highway Research Program 2 (SHRP2) was involved with American Association of State Highway and Transportation Officials (AASHTO) in developing the Transportation Systems Management and Operations Guidance, a set of strategies to anticipate and manage traffic congestion, and minimize the other unpredictable causes of service disruption, delay, and crashes. This guidance provides an online tool with self-evaluation and best practice experience that managers can use to identify key program, process, and institutional preconditions to achieve more effective TSM&O. The One-Minute Evaluation feature and Guidance have formed the basis for a series of agency self-assessments and TSM&O improvement implementation plans, sponsored initially by SHRP2 and now FHWA, expected to number nearly 40 by the end of 2014.

The U.S. has developed model systems engineering documents for ASCT systems. These documents assist agencies in applying the systems engineering process required by Federal regulation (23 CFR 940.11) to substantially reduce the level of effort and address many of the risks associated with procurement of ASCT. The process helps an agency confirm that its expectations are realistic and achievable before committing to a system, improving the likelihood of a successful ASCT implementation.

The Transit Operations Decision Support Systems (TODSS) project implemented at Pace suburban bus service in Chicago is another example of a demonstration project with extensive KTT. This demonstration phase is completed and the system remains operational. KTT activities included a T3 Webinar, presentations, peer meeting workshop, a self-evaluation, and publications. FTA is currently funding the TODSS guidance project which is now developing guidance to help transit agencies to procure TODSS systems. The guidance document will be completed by end of 2014.

Many program areas sponsored by the Department have developed guidance documents in order to inform the community about best practices and lessons learned in the deployment and operations and management stages.

#### **3.3.4.4 Stakeholder Engagement**

The Department makes a concerted effort to share the results and benefits of its demonstration projects such as the workshops, Transportation Research Board (TRB) annual meeting, and through AASHTO. Sharing information and results allows others to build on initial results for future projects.

#### **3.3.4.5 Deployment Coalitions / Collaborative Research Environment**

Deployment coalitions have been used effectively to incentivize ITS adoption. Examples include the 511 coalition which played an important role in the rapid and widespread adoption of this traveler information technology between 2000 and 2012, and the I-95 corridor coalition which is having similar success in the collection and analysis of real-time data from vehicles in the roadway.

The 511 program also provides an example of successful peer-to-peer assistance. 511 provides a standard 3-digit telephone number for obtaining traveler information. In addition to planning grants, the Department worked with AASHTO, the American Public Transportation Association (APTA), the Intelligent Transportation Society of America (ITS America), and other organizations to form the 511 Deployment Coalition. The goal of the coalition was “the timely establishment of a national 511 traveler information service that is sustainable and provides value to users.”<sup>8</sup> The intent was to implement 511 nationally using a bottom up approach facilitated by information sharing and a cooperative dialogue through the national associations represented on the Policy Committee, the governing body of the program. As of February, 2014, 511 had been deployed across 36 States, as well as portions of California, Hawaii, Missouri, and Texas.

The Department has successfully partnered with the Crash Avoidance Metrics Partnership (CAMP) Vehicle Safety Communications 3 (VSC3) Consortium to research, develop, and test the technologies that form the framework for Vehicle-to-Vehicle communication systems. The CAMP VSC3 Consortium consists of the Ford Motor Company, General Motors LLC, Honda R&D Americas, Inc., Hyundai-Kia America Technical Center, Inc., Mercedes-Benz Research and Development North America, Inc., Nissan Technical Center North America, Inc., Toyota Motor Engineering & Manufacturing North America, Inc. and Volkswagen Group of America.

Department staff suggest that incentives could be used to increase multi-state peer-to-peer networks such as regional operations forums or coalitions to build on the power of peer influence to increase adoption of ITS.

### **3.4 Measuring the Effectiveness of Deployment Incentives**

Evaluating the effectiveness of deployment incentives needs to be considered at two different levels:

1. **Project/System Level:** Measuring the impact of the deployments or demonstrations associated with the incentive on the surface transportation system. This involves the determination of how effective the deployed technology application was in addressing the transportation problem (for example, benefit-cost analysis measuring reduction in delay,

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<sup>8</sup> See [www.fhwa.dot.gov/trafficinfo/511what.htm](http://www.fhwa.dot.gov/trafficinfo/511what.htm) for details.

fatalities and injuries, or emissions and energy consumption against the costs associated with the project.)

2. **Program Level:** Measuring the overall effectiveness of the deployment incentive as a tool in encouraging agencies to deploy the ITS technology.

The first evaluation level is an assessment of a particular project or system. One of the requirements for ITS demonstration grants and the EDC initiatives is that the projects are evaluated and results reported. Funding recipients must include performance measures, collect data, and submit results as part of the final report. Evaluations are conducted to determine whether the technology/system was effective in solving the problem, and as a baseline for expected results for other agencies to emulate. Some examples of performance measures collected from ITS evaluations are provided below:

- Reduce Congestion
  - Travel time
  - Travel time reliability
  - Delay
  - Number of miles managed
  - Percent of congested miles
- Enhance Safety
  - Number of crashes/number of fatalities
  - Number of secondary crashes
  - Roadway clearance times
  - Incident clearance times
  - Number of Safety Service Patrol Stops
  - Transit vehicle/passenger accident rate
- Improve Air Quality
  - Daily emissions
  - Fuel use reduction
  - Ambient air quality standards
  - Improve Economic Opportunity
  - Surface Freight Movement
- Level of Satisfaction
  - Transit service delivery – reliability
  - Transit ridership
  - Safety Service Patrols
- Value of Transportation Assets
  - Deployment Tracking – number of assets
  - Maintenance of assets

The **ITS KRs** (a web-based tool provided by the Department) contain over 20 years of data on the benefits, costs, level of deployment, and lessons learned from the implementation of ITS. As of April 2, 2014, there were over 1,600 summaries of evaluation data in the ITS KR databases from the U.S. and around the world. The KRs show that deployment of ITS technologies have proven to be very successful, with benefit-cost ratios ranging from 14:1 to 39:1 for mature technologies such as electronic payment and pricing. Newer technologies such as ASCT and ICM also show high benefit-cost ratios. Recent implementations of ASCT showed benefit cost ratios ranging from 1.58:1 to 28.2:1. The ten-year net benefits of ICM based on modeling results were reported as ranging from \$82 million to \$570 million at three pilot sites [18].

The second level of evaluation is performed at the program level, and is critical to providing the Department with information on the effectiveness of deployment incentives in encouraging deployment of ITS. Department staff provided information on how they assessed the effects of their ITS programs and tracked the status of adoption and deployment across the country. Typical metrics include:

- Number or percentage of agencies deploying the technology
- Extent of deployment (for example, the percentage of roads are covered with the system, or the number of bus fleets equipped with the technology)
- Number or percentage of agencies that are planning to deploy the technology
- Number of agencies and individuals trained
- Number of agencies with committed funding in their TIPs demonstrating their commitment to long-term O&M and management of the systems

Demonstration and grant programs need to be well defined with clear goals, objectives, evaluation criteria, and measures of success.

# 4 Looking Ahead

## 4.1 Steps to Move Forward

The Department will follow a three-part plan for attaining the goal of encouraging deployment of ITS technologies through the use of appropriate incentives to improve the performance of the NHS.

First, it will continue to employ incentives that have proven successful at the appropriate stage of the technology adoption lifecycle. These incentives are summarized in detail in Section 3, but include:

- Demonstrations and grants, so early adopters can demonstrate the value of the technology, accompanied by intensive post-demonstration KTT efforts to increase more widespread adoption. Early state research demonstrations and grants are particularly important for catalyzing adoption of CV and other emerging technologies. The ICM program provides a successful practice to follow to maximize the deployment payoff from demonstration and grants.
- Better use of deployment planning grants, as were used in the MSAA program. In 2014 the project has been extended and a second wave of planning grants is being awarded for the deployment planning of TMCCs to coordinate HST trips.
- Demonstrations of innovative personal vehicle, freight, roadway to rail, and transit technologies with the potential for life saving safety benefits.
- Funding of demonstrations of innovative ITS technologies where there is high risk in research and development and initial prototyping and demonstration.
- Building upon Congressional efforts to expand the eligibility of ITS for Federal-aid. For example, ITS projects are considered eligible for the STP, CMAQ Program and the NHPP, and transit agency recipients of Section 5300 funds may also use these funds for ITS implementation.
- Continued rulemaking where directed by MAP-21 and other legislation, and development of guidance to state agencies as they engage in collection of real-time and archived data for use in reporting transportation system performance measures.
- Continued KTT efforts delivered at the appropriate stage of the technology adoption lifecycle.
- Demonstration of the value of ITS through the ITS Evaluation program, including an increased focus on providing information on the most cost-effective combination of ITS and other improvements for addressing specific transportation needs.
- Encouragement of deployment coalitions and pooled fund studies as a method of leveraging resources and learning from peer experiences with ITS adoption, following successful examples in emerging technologies such as TMCs, Maintenance Decision Support Systems, and Cooperative Transportation Systems. Combining resources in this way allows for higher impact projects to be funded.

Second, the Department will increase the use of incentives designed to reduce barriers to deployment by:

- Expanding recognition of ITS benefits through the next round of the EDC program.

- Addressing the sustainable funding for O&M issues by providing additional guidance on O&M that might be covered under the Federal-aid highway program. In addition, FHWA intends to further outreach guidance on using the capability maturity model framework so agencies can gauge their technical and institutional readiness for performing in the transportation systems operations and management environment.
- Continuing efforts to reduce the administrative burden on state agencies seeking funding for innovative practices or technology through the Innovative Project Delivery Methods program under MAP-21 (Section 1304). This program allows states to increase the Federal-aid match by five to 85 percent or more if they are using innovative practices on the project. The Department will explore the possibility of expanding this program to other grant processes.
- Seeking to expand the use of collaborative research environments in the next round of the CV pilots.
- Considering standards-related rulemaking where national interoperability is a necessity for meeting safety goals, as may be the case for CV communication.
- Examining the use of tax credits to promote investment in vehicle safety technologies, with the understanding that changes in tax policy fall under Congressional purview.

Finally, the Department will continually assess and consider these approaches as it works across all modes to increase cost-effective deployment of ITS.

## 4.2 Conclusion

ITS technologies play an ever more important role as part of the solution to the Nation's transportation needs. Financial incentives, such as demonstrations and grants, as well as non-financial incentives such as KTT activities, are critical tools for accelerating deployment of innovative technology. The Department may consider using other forms of incentives such as tax credits or awards and recognition in order to influence consumer behavior in adopting the next generation of ITS technologies such as in-vehicle safety systems and traveler information. Using the plan detailed above, the Department will promote and accelerate the deployment of innovative ITS technologies in a variety of multimodal surface transportation areas.

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## APPENDIX A. Stakeholders Contacted

Stakeholder engagement sessions were conducted with several organizations and committees involved in ITS deployment and transportation systems operations, as listed below. The sessions were generally held in conjunction with meetings or conferences or conducted as webinars. In some cases, individual interviews were conducted by telephone. The information obtained from these sessions was then used in the development of the report. The table below contains the dates of the various stakeholder sessions.

Organization	Dates
ITS Program Advisory Committee (PAC)	9/18/13
Association of American Railroads (AAR)	4/28/14
American Public Transportation Association (APTA)	5/4/2014
AASHTO Subcommittee on Systems Operations and Management (SSOM)	5/7/2014
TRB Committee on Regional Transportation Systems Management and Operations (RTSMO)	6/26/2014
American Transportation Research Institute (ATRI) – (trucking industry)	7/17/14
Association of Metropolitan Planning Organizations (AMPO)	7/24/14

## APPENDIX B. Acronyms

Acronym	Meaning
AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials
AMPO	Association of Metropolitan Planning Organizations
APTA	American Public Transportation Association
ASCT	Adaptive Signal Control Technology
ATRI	American Transportation Research Institute
AVL	Automated Vehicle Location
CAD	Computer Aided Dispatch
CAMP	Crash Avoidance Metrics Partnership
CCTV	Closed-circuit television
CFR	Code of Federal Regulations
CMAQ	Congestion Mitigation and Air Quality Improvement
CRD	Congestion Reduction Demonstration
CV	Connected Vehicle
CVISN	Commercial Vehicle Information Systems and Network
DHS	Department of Homeland Security
DOE	Department of Energy
DOT	Department of Transportation
DSRC	Dedicated Short Range Communications
EDC	Every Day Counts
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Rail Administration
FTA	Federal Transit Administration
HST	Human Service Transportation
ICM	Integrated Corridor Management
IRS	Internal Revenue Service
ITS	Intelligent Transportation Systems
ITSPAC	Intelligent Transportation Systems Program Advisory Committee
JPO	Joint Program Office
KR	Knowledge Resources
KT	Knowledge and Technology Transfer
MAP-21	Moving Ahead For Progress In The 21st Century
MDOT	Michigan Department of Transportation
MPO	Metropolitan Planning Organization
MSAA	Mobility Services For All Americans
NCAP	New Car Assessment Program
NHPP	National Highway Performance Program
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
O&M	Operations and Maintenance
PCB	Professional Capacity Building
PTC	Positive Train Control

Acronym	Meaning
RSIA	Rail Safety Improvement Act
RTSMO	Regional Transportation Systems Management and Operations
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy For Users
SHRP2	Strategic Highway Research Program 2
SSOM	Subcommittee on Systems Operations and Management
STP	Surface Transportation Program
T3	Talking Transportation Technology
TIDP	Technology and Innovation Deployment Program
TIP	Transportation Improvement Program
TMC	Transportation Management Center
TMCC	Travel Management Coordination Center
TODSS	Transit Operations Decision Support Systems
TRB	Transportation Research Board
UPA	Urban Partnership Agreement
U.S. DOT	U.S. Department of Transportation
VSC3	Vehicle Safety Communications 3

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