NATIONAL
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State Fiscal Implications of

Intelligent Transportation Systems/ Commercial Vehicle Operations

Deployment

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State Fiscal Implications of

Intelligent Transportation Systems/ Commercial Vehicle Operations

Deployment

By Thorn Rubel

Since their initial meeting in 1908 to discuss interstate water problems, the Governors have worked through the National Governors' Association to deal collectively with issues of public policy and governance. The association's ongoing mission is to support the work of the Governors by providing a bipartisan forum to help shape and implement national policy and to solve state problems.

The members of the National Governors' Association are the Governors of the fifty states, the territories of American Samoa, Guam, and the Virgin Islands, and the commonwealths of the Northern Mariana Islands and Puerto Rico. The association has a nine-member Executive Committee and three standing committees-on Economic Development and Commerce, Human Resources, and Natural Resources. Through NGA's committees, the Governors examine and develop policy and address key state and national issues. Special task forces often are created to focus gubernatorial attention on federal legislation or on state-level issues.

The association works closely with the administration and Congress on state-federal policy issues through its offices in the Hall of the States in Washington, D.C. The association serves as a vehicle for sharing knowledge of innovative programs among the states and provides technical assistance and consultant services m Governors on a wide range of management and policy issues.

The Center for Best Practices is a vehicle for sharing knowledge about innovative state activities, exploring the impact of federal initiatives on state government, and providing technical assistance to states. The center works in a number of policy fields, including agriculture and rural development, economic development, education, energy and environment, health, social services, technology, trade, transportation, and workforce development.

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Executive Summary

As states begin to consider full-scale deployment of intelligent transportation system (ITS) technologies to support commercial vehicle operations (CVO), Governors and state legislatures will need answers to the following questions.

- What savings and additional revenues from increased efficiency can the state expect to accrue from these initiatives?
- How much will the state need to invest in ITS/CVO deployment?

To help states answer these questions, the National Governors' Association (NGA) Center for Best Practices developed a state ITS/CVO fiscal analysis model. With funding from the Office of Motor Carriers in the Federal Highway Administration, NGA contracted with Apogee Research, Inc., to develop this model and prepare case studies of the ITS/CVO experience in eight representative states that applied the model to their operations.

Case Study Findings

The case studies to test the viability of the state ITS/CVO fiscal analysis model generated these findings.

- States vary in their approaches to administering and enforcing CVO regulations. As a result, state expenditures, savings, and revenues associated with ITS/CVO deployment will vary.
- Electronic credentialing, the in-house administration function of ITS/CVO, consistently produced net savings to the administering agency or agencies.

. The cost of deploying electronic safety and clearance systems-the roadside management functions of ITS/CVO-exceeds the anticipated increase in administrative savings or revenues. The decision to deploy these ITS/CVO functions will more likely rest on the economic and safety benefits that would accrue from this additional investment; these benefits were not quantified in the analysis.

- The extent to which the state realizes the potential benefits of ITS/CVO is directly proportional to the percentage of the motor carrier industry that participates in ITS/CVO programs.

Issues for State Consideration

Although the fiscal analysis model should not be used in isolation to determine whether a state should proceed with ITS/CVO deployment, it can be one of several inputs into the decisionmaking process. The case study findings raise the following policy issues that Governors must consider and state legislatures will debate.

- In designing and deploying ITS/CVO technologies, states should take the opportunity to change their regulatory climate and processes. Merely automating existing regulatory procedures, especially if they are inefficient, will lessen the economic benefits of deployment that accrue to states and motor carriers and could negatively affect participation.

- Interstate cooperation on ITS/CVO deployment will maximize motor carrier participation rates, and it can reduce per-state investments. Working together will require compromise and accommodation to ensure that the interstate ITS/CVO systems are seamless.

. Incentives will encourage more rapid participation in state ITS/CVO programs by the motor carrier industry. Incentives may include discounts on motor carrier fees and premium services for carriers that take advantage of electronic credentialing.

. States should consider outreach and education programs to ensure that motor carriers understand the benefits of participating in ITS/CVO programs, such as time savings and better fleet management.

- The deployment of ITS/CVO technologies may require a net increase in agency funding or funding from outside sources. The conservative fiscal analysis generated by the model does not take into account economic benefits to motor carriers or related societal benefits, especially the benefits that would accrue from enhanced safety practices. ITS/CVO deployment may requite cost sharing with the motor carrier industry, which is a direct beneficiary of the technologies, or the shifting of resources from other state functions.

Introduction

The decision to develop and deploy ITS/CVO technologies to improve the delivery of public services rests on the answers to the following questions.

- Do the technologies provide a solution to a real business problem?
- Are the technologies feasible?
- What are the fiscal implications for states?

State participation in the design and deployment of intelligent transportation systems, especially activities associated with commercial vehicle operations, has provided many answers to the first two questions. Through a series of federally sponsored studies and operational tests, states have examined how ITS technologies can be used to improve the way states regulate the motor carrier industry. These demonstration projects also have tested the feasibility of various technologies, including weigh-in-motion, automated vehicle identification, electronic credentialing, and safety monitoring systems.

As states begin to contemplate full-scale deployment of ITS technologies for the full range of administrative and roadside management functions of their motor carrier programs, the issue of cost moves to the fore. Even with the federal government's projected investment of $150 million during the next six years, states will have to make significant investments in the operations and supporting infrastructure of the national ITS program.

Although many state and national studies have identified the potential costs and benefits of nationwide ITS systems and networks, none directly addressed the fiscal implications for states of participating in these systems and networks. For this reason, the National Governors' Association Center for Best Practices approached the Office of Motor Carriers in the Federal Highway Administration about conducting a cost-benefit analysis of ITS/CVO deployment from the state perspective. This report presents the findings of a

What Is ITS/CVO?

The nation's economic future increasingly depends on the ability of American businesses to compete successfully in a global economy. States have used regulatory reform to support improvements to the productivity of U.S. firms. The commercial motor carrier industry is among the most regulated segments of the economy. State regulation of motor carriers falls Into **two** general categories.

- The assessment of a motor carrier's general operations related to the safe operations of its vehicles and the qualifications of its drivers.
- The collection of registration fees and fuel taxes through which motor carriers reimburse states for the use of publicly maintained highways.

The majority of complaints about state regulation and taxation of commercial motor carriers have focused on the excessive administrative burden and costs to comply with each state's requirements rather than with one national entity. To address these concerns, states, in consultation with the motor carrier Industry, have developed base state systems, such as the International Registration Plan and the International Fuel Tax Agreement, to support the concept of a "seamless" national highway system.

Concurrent with the development of base state and reciprocal agreements, new technologies have emerged that are designed to replace manual administrative processes with automation and electronic substitutes. The ability to send and receive information from commercial motor vehicles at highway speeds and to disseminate that information along the vehicle's entire route is an essential element of the vision of seamless highways. In addition, the ability of a carrier to electronically request and receive credentials or to file tax reports with its base state eliminates the need for state employees to enter information manually. Equally important, this electronic data can more easily be shared with other states in which the carrier operates.

Collectively, these advanced information and communications technologies are known as intelligent transportation systems/commercial vehicle operations. ITS/CVO covers three general areas of state motor carrier regulation: safety assurance; administration of the credential process (e.g., vehicle registration); and commercial vehicle clearance at ports of entry and weigh stations.

study to determine the fiscal implications of state deployment of these technologies. It also discusses the policy issues that states should consider as they make decisions about shifting from existing CVO systems to ones that rely heavily on ITS components.

The expenditure-revenue analysis was conducted through a contract with Apogee Research, Inc., of Bethesda, Maryland. Apogee Research was assisted by Castle Rock Consultants and the Center for Transportation Research and Education (CTRE) at Iowa State University. To ensure that the research accurately reflected state ITS experience, NGA assembled a project technical advisory group composed of representatives of state government, government associations, and the motor carrier industry. Appendix A lists the members of this technical advisory group.

The technical advisory group realized that any analysis providing national averages of the costs and benefits of ITS/CVO deployment would be of limited value to individual states. The group agreed on the need for an expenditure-revenue model that enables each state to conduct its own fiscal analysis. To test the model, the group also asked the consultants to generate expenditure and revenue projections for a representative sample of states. The findings draw on case studies of eight states that have participated in one or more of the ITS/CVO operational tests or demonstrations-California> Colorado, Connecticut, Delaware, Florida, Kentucky, Minnesota, and New Jersey.

State Case Study Findings

State Regulatory Approaches Vary

States vary in their approaches to administering and enforcing CVO regulations. Much of the variation results from differences in geographic size, the level of motor carrier traffic within a state's borders, and the organization of the state's regulatory system. Table 1 summarizes the baseline characteristics of the eight case study states.

Table 1
Baseline Characteristics of the Case Study States

	State							
Baseline Characteristic	*California*	*Colorado*	*Connecticut*	*Delaware*	*Florida*	*Kentucky*	*Minnesota*	*New Jersey*
Number of Administering Agencies	5	3	3	1	2	1	2	1
Number of Applications Processed Annually (in thousands)	176	43	150	48	150	114	82	181
Amount of Revenue Generated (in millions)	$243	$15	$24	$10	$56	$55	$47	$16
Number of Administrative Staff	150	100	40	15	50	50	50	50
Number of Vehicles Weighed/Cleared Annually (in millions)	14.5	5	.2	.2	5	.8	1	.2
Number of Vehicles Inspected Annually (in thousands)	380	48	17	3	70	70	28	50
Number of Weigh Facilities*	184	29	35	5	175	198	39	111

Note: *Includes both fixed and portable facilities.

States also vary greatly in how they organize their regulatory functions. In addition, the states process a different number of applications, and this number does not necessarily equal the number of trucks registered in a state. In most states, a carrier can register more than one vehicle or an entire fleet on a single application for certain credentials. Other credentials require that a single carrier register for a new permit for every trip it makes. Oversize/overweight permits comprise the bulk of administrative applications, between 40 percent and 90 percent of total applications in every state.

Fiscal Impacts Are Tied to State Characteristics

Differences in the baseline characteristics of the case study states help account for differences in ITS/CVO investment requirements and fiscal benefits. For example, the high number of weigh stations in California would have an impact on total state investment if these facilities were converted to use weigh-in-motion technology. Similarly, a low volume of applications processed may not provide the threshold of activity that maximizes the fiscal benefits of electronic credentialing. Table 2 provides total discounted expenditures and savings associated with ITS/CVO deployment based on the lower end of the range of expenditures and savings. Table 3 provides the same data for the higher end of the range of expenditures and savings. These tables assume standard investment decisions based on existing facilities that may or may not reflect individual state decisions. In both cases, different investment scenarios would substantially change the resulting savings-to-expenditures ratios.

Both tables document the very different fiscal implications of electronic credentialing functions compared with roadside management functions. The underlying cause for this difference is the amount of startup expenditures required for each regulatory function. The startup costs for electronic credentialing consist largely of computer hardware and software development costs. Compared with the physical infrastructure (e.g., weigh-in-motion scales and improved roadside facilities) that could be deployed at the outset of ITS/CVO roadside management, the startup costs for electronic credentialing are considerably less.

Electronic Credentlaling Is Cost-Effective for States Agencies

Based on the ratio of savings to expenditures associated with electronic credentialing, deployment of ITS/CVO technologies to support in-house administrative functions can be justified solely by the net savings to the administering agency or agencies. Seven of the eight case study states would experience significant savings through the deployment of ITS/CVO technologies to conduct electronic credentialing.

Table 2
State Expenditures and Savings Over Ten Years (Discounted)
Low Range of Expenditures and Revenues
(dollars In millions)

	State							
Function	*California*	*Colorado*	*Connecticut*	*Delaware*	*Florida*	*Kentucky*	*Minnesota*	*NewJersey*
Electronic Credcntialing								
Expenditures	$2.1	$0.8	$1.0	$0.9	$1.0	$0.8	$1.4	$1.0
Savings	$16.0	$4.6	$2.6	$0.9	$4.5	$3.0	$3.1	12.7
Net Savings	$13.9	$3.8	$1.6	$0	$3.5	$2.2	$1.7	$1.7
Savings-to Expenditures Ratio	7.55	6.02	2.54	1.0	4.37	3.84	2.19	2.78
Roadside Management								
Expenditures	$95.7	$14.7	$30.6	$4.1	$71.4	$40.6	$38.7	$26.5
Savings*	$14.1	$2.3	$1.6	$0.4	$8.4	83.2	81.8	$2.7
Net Savings	$-81.6	$-12.4	$-29.0	$-3.7	$63.0	s-37.4	8-36.9	$-23.8
Savings-to-Expenditures Ratio	.15	.16	.05	.10	.12	.08	.05	50

Note: 'Excludes safety benefits and direct economic benefits co carriers.

Table 3
State Expenditures and Savings Over Ten Years (Discounted)
High Range of Expenditures and Revenues
(dollars in millions)

	State							
Function	*California*	*Colorado*	*Connecticut*	*Delaware*	*Florida*	*Kentucky*	*Minnesota*	*NewJersey*
Electronic Credentialing								
Expenditures	$2.9	$1.1	$1.6	$2.1	$1.8	$1.8	$2.0	$1.7
Savings	$19.4	$7.2	$3.3	$1.1	$5.6	$4.0	$4.1	$3.6
Net Savings	$16.5	$6.1	$1.7	$-1.0	$3.8	$2.2	$2.1	$1.9
Savings-to-Expenditures Ratio	6.64	6.39	2.09	0.53	3.06	2.28	2.08	2.12
Roadside Management								
Expenditures	$187.6	$27.3	$75.4	$9.2	$140.4	876.0	$76.2	$50.1
Savings*	$17.6	$2.6	$1.8	$0.6	%8.8	$3.9	$2.0	$3.1
Net Savings	$170.0	$-24.7	S-73.6	$-8.6	S-131.6	$72.1	874.2	847.0
Savings-to-Expenditures Ratio	.09	.10	.02	-07	.06	.05	.03	.06

Note: *Excludes safety benefits and direct economic benefits to carriers.

Only Delaware would just break even under the low-cost scenario and would have less than a dollar of savings per dollar of investment under the high-cost scenario. Delaware processes a smaller number of applications than most of the other case study states. Its

workload does not provide the economies of scale needed to generate administrative savings through automated systems alone. In this case, a state may want to consider other factors in the fiscal analysis model, including a carrier's cost of doing business with the state.

Roadside Management Return on Investment Is Limited for State Agencies

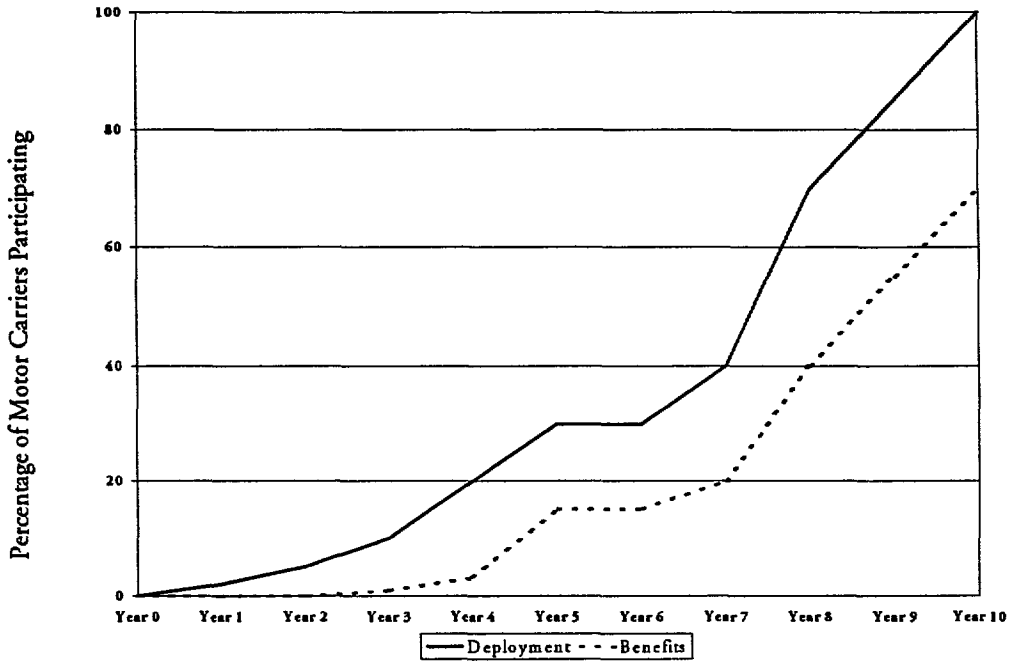
It is the higher startup costs of roadside management functions that drive the limited return on state investment in these operations. In all eight states, the savings-to-expenditure ratios are significantly less than one, ranging from a high of. 16 in Colorado to a low of .02 in Connecticut, depending on the rate of investment. This finding suggests that the benefits of ITS/CVO roadside management systems, including safety enhancements, accrue to parties other than the state administering agency when viewed from the narrow perspective of direct return on investment. However, systems such as the Inspection Selection System have demonstrated the capacity to target unsafe carriers and reduce the inspection burden on proven safe carriers. By focusing on less safe vehicles and drivers, states can use resources more efficiently.

Benefits to State Depend on Carrier Participation

The extent to which the state maximizes the net benefits associated with ITS/CVO systems is directly proportional to motor carrier participation in these systems. As motor carrier participation increases, the number of transactions reaches the threshold at which ITS/CVO systems approach cost-effectiveness. At the same time, the number of carriers that rely on existing, manual systems decreases, relieving state agencies of the burden and residual expense of maintaining dual compliance operations.

Regardless of the level of motor carrier participation, states should be aware that the percentage of motor carriers that adopt ITS/CVO systems will lag behind the deployment of these systems. This is true for both electronic credentialing and roadside management. The relationship between passive deployment of roadside management technologies and the extent to which motor carriers take advantage of this deployment is presented in the figure.

Lag Between Deployment and Motor Carrier Participation



Key Deployment Policy Considerations For States

The fiscal analysis model can provide states with information about the expenditures and savings associated with different ITS/CVO technologies, but it is only one input into the decisionmaking process. State decisions to proceed with the deployment of ITS/CVO technologies will be based on other factors. Four policy considerations should help focus the debate in state capitals about investments in ITS/CVO.

In designing and deploying ITS/CVO technologies, states should take the opportunity to change their regulatory climate and processes. Merely automating existing regulatory procedures, especially if they are inefficient, will reduce the economic benefits of deploy.= ment. This approach may also be a disincentive for motor carrier participation in the state ITS/CVO program. In contrast, creating one-stop permit offkes and simplified forms while the state begins to design and deploy its ITS/CVO systems can increase the perception that the new technologies have improved the state agency's ability to satisfy client needs. To ensure that one-stop permit offices meet this client satisfaction objective, states should review their current regulatory environment climate and processes before designing these offices.

The criteria by which the eight case study states were selected included organizational structure. This variable was included to determine whether the levels of state investment and return on investment from ITS/CVO increase or decrease based on the number of agencies involved in the administration of state motor carrier regulatory programs. The evidence from the fiscal analysis is inconclusive. An initial assumption was that ITS/CVO benefits would be relatively higher in states with centralized motor carrier regulatory administration. However, ITS/CVO information systems can create comparable "virtual organizations" by using uniform data elements, even when program administrators remain physically and organizationally scattered throughout state government.

Interstate cooperation on ITS/CVO deployment will maximize motor carrier participation rates, and it can reduceper-state investments. The benefits to motor carriers of a seamless, interoperable regulatory framework diminish if the benefits associated with electronic credentialing for one program are countered by the lack of similar systems for other licensing requirements. Similarly, the productivity benefits associated with electronic screening in one state decrease if the carrier must stop at weigh stations or ports of entry in adjoining states. For this reason, interstate cooperation to ensure that state boundaries are seamless to interstate carriers can be a major incentive for higher levels of carrier participation.

In addition, interstate cooperation can result in shared costs for ITS/CVO deployment and operations. The ability to share data as commercial vehicles traverse interstate highways can reduce a state's investment in weigh stations and related infrastructure. Further, current data on the status of a carrier's credentials and the safety condition of the carrier's fleet facilitates a division of labor among states and the elimination of duplicative reviews of the same vehicle as it moves from state to state.

However, interstate cooperation requires compromise and accommodation to ensure that the interstate ITS/CVO system is seamless. Sharing data requires conformance with data standards and transmission protocols to ensure that state systems can communicate regardless of the operating platforms (e.g., mainframes and client/servers). At the outset of ITS/CVO deployment, states may face increased programming costs to comply with the national ITS architecture and standards.

Incentives will encourage more rapid participation in state ITS/CVO programs by the motor carrier industry. The voluntary nature of ITS/CVO programs for both states and the motor carrier industry raises the real possibility of dual state systems-automated and manual-for regulating motor carrier operations. While the state invests in ITS/CVO technologies to support those carriers that choose to take advantage of the benefits, it must also continue to provide traditional processes for carriers that choose not to take advantage of the benefits.

The maximum cost savings or increased revenues that result from ITS/CVO deployment diminish if the state must continue to provide manual services to nonparticipating carriers. Therefore, it is in a state's interest to promote higher levels of carrier participation in ITS/CVO programs. States can offer incentives to encourage participation in the new system or disincentives to discourage carriers from sticking with the traditional system.

States need to consider both monetary and nonmonetary incentives and disincentives. In terms of monetary incentives, states could discount application and licensing fees for carriers that apply for credentials online. Conversely, they could charge carriers that continue to request credentials through manual procedures an application surcharge.

In terms of nonmonetary incentives, states could disseminate information about the economic and safety benefits and increased productivity associated with electronic credentialing and electronic clearance. State officials should not assume that all carriers are familiar with ITS/CVO options or the potential benefits from participation. States could increase the effectiveness of these outreach and education programs by identifying "lead" or "champion" carriers that can testify to the financial benefits and administrative convenience of ITS/CVO.

States can also influence carrier behavior through nonmonetary disincentives, such as stepped-up roadside inspection for high-risk carriers. ITS/CVO provides a greater level of confidence in carriers that are electronically cleared because that clearance decision is based on more timely data. The only way to achieve a similar level of confidence in nonparticipating carriers is to increase the frequency of physical checks or raise the number of carriers randomly stopped.

The deployment of ITS/CVO technologies may require a net increase in agency funding or funding from outside sources. Application of the fiscal model in the eight case study states clearly demonstrates that there are differences in fiscal impacts between the deployment of ITS/CVO systems for in-house administrative functions (e.g., credentialing and reporting) and those for roadside management functions (e.g., electronic clearance and safety review). In the case of electronic credentialing, the positive savings-to-expenditures ratios

suggest that it is in states' financial interest to deploy systems that allow motor carriers to apply for **licenses** and permits and satisfy reporting requirements electronically. The magnitude of these ratios further suggests that these systems will generate savings even at modest levels of motor carrier participation.

In contrast, the upfront investment in ITS/CVO roadside management infrastructure exceeds the fiscal benefits that could be realized from any administrative savings or increased revenues as a result of enhanced enforcement of registration and revenue reporting. Consequently, to make a case for deploying a roadside management system, decisionmakers must look at factors outside of the fiscal analysis.

The NGA project quantified only the expenditure and revenue effects on state agencies. Fiscal impacts represent only one element of a more comprehensive analysis of the benefits that can accrue from ITS/CVO deployment. Other studies have quantiied the economic benefits to the motor carrier industry and the ancillary benefits to society of increased protection of public health and safety. A bibliography of these related cost-benefit studies is provided in Appendix B.

Despite the negative fiscal findings associated with roadside management functions, state officials may elect to proceed with ITS/CVO deployment based on the economic and societal benefits of this investment. In this case, decisionmakers must decide how to generate the resources to offset the financing differential. For example, if the regulated industry is the major beneficiary of ITS/CVO roadside management programs, the state could ask the motor carriers to contribute to deployment by paying higher licensing fees ***or*** new transaction fees. An example of this approach is the per-transaction fee that HELP, Inc., bills a carrier when one of its vehicles is electronically cleared through a state PrePass program site.

Societal benefits, especially those related to safety enhancements, can result in cost savings for other state government functions (e.g., health care). The state may choose to supplement traditional transportation resources with a portion of the savings from other programs supported through general revenues. For example, if the state's expenditures can be

reduced by 5 percent as a result of reduced deaths, injuries, or loss of property from motor carrier accidents, the state could dedicate half of the projected savings to ITS/CVO deployment.

Three other factors can improve the fiscal outlook for ITS/CVO deployment. First, the fiscal projections generated by the Apogee Research model include all costs. Federal support, such as that provided to the Commercial Vehicle Information Systems and Networks prototype and pilot states, would reduce state investment needs. This would change the savings-to-expenditures ratio if viewed only from the perspective of state revenues and costs.

Second, experience in ITS/CVO deployment suggests that states can incorporate ITS/CVO improvements as part of other maintenance and expansion activities, significantly reducing the expenditure of an ITS/CVO-only improvement. For example, the installation of fiber optics and drop boxes or the addition of new lane capacity for receivers and cameras to identify vehicles in support of CVO activities during regularly scheduled shoulder reconstruction would be less expensive than new construction.

Third, the cost estimates ***are*** based on the current costs of technologies. The trend of more value for less money is expected to continue or accelerate in coming years. Consequently, total project costs could decrease during the deployment timeframe.

Conclusions

Based on their experiences in operational tests and demonstration projects, many states have determined that ITS/CVO technologies can improve the efficiency and effectiveness of motor carrier industry regulation. The final report, the fiscal analysis model developed by Apogee Research, and the technical guidance document that accompanies the fiscal model address two questions: How much will states need to invest in ITS/CVO systems? What savings and additional revenues will accrue as a result of the deployment of these systems? (These materials can be found at <http://www.nga.org>).

This report examines the fiscal implications of ITS/CVO deployment only for eight states. Although the case studies demonstrate economic benefits from credentials administration, they also suggest that full-scale ITS/CVO deployment may be a unique enterprise for state government. Rather than an introduction of new regulatory programs, ITS/CVO represents a shift in the administration of existing programs that will add value for the state, the regulated industry, and the general public. In this sense, the state operates in a fashion similar to private information service providers who repackage public information in more accessible and user-friendly ways.

As stated by Joel Anderson of the California Trucking Association at an October 1997 ITS/CVO symposium, the roadside management functions place the state in the position of "taking a public works project and turning it into a business." The negative savings-to-expenditures ratios should not, ***prima*** facie, deter states from considering the deployment of ITS/CVO roadside management infrastructure and systems. Instead, the negative ratios suggest that the state needs to link the benefits associated with ITS/CVO more directly to the beneficiaries. If the state can successfully make this case, it increases the potential of financing deployment through cost sharing or through a shift of other state resources saved as a result of enhanced safety and increased efficiency.

Finally, the report addresses the effect of the voluntary nature of ITS/CVO participation for both states and the regulated industry. To achieve a threshold level of participation that maximizes benefits and shifts some associated costs to industry, states must include education and marketing elements in their deployment strategy.

Appendix A: Technical Advisory Group Members

State Members

Nancy Brown
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Appendix B: Related Cost-Benefit Studies of ITS/CVO

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