



## Pooled fund effort eases the decision-making process

**T**ransportation professionals who must make difficult decisions about when and where to invest in the deployment of expensive technological devices now have a resource to guide their decisions. Modeled after the concept for traffic-signal warrants, a group of 13 public transportation agencies have teamed together to begin to develop warrants for the deployment of technology devices (commonly referred to as intelligent transportation systems or ITS). This concept is in the early stages, but already some state departments of transportation are using these warrants in their daily decision-making process.

Transportation agencies at the state, county and local levels often use advanced technology applications and devices to assist in managing traffic and maintaining the infrastructure, as well as to inform travelers about travel conditions and options. Some of the earliest examples of applying these advanced technologies date back more than 30 years and include coordinated traffic-signal control and ramp metering. In the 1990s, the ITS concept blossomed as an industry.

For many years, ITS operational tests and proofs of concept demonstrated what was technically possible in order to understand the true potential for ITS technologies and approaches. In 2008, the ITS industry is still very active, and the technology innovations continue to push the envelope. However, there has been a change in the industry. Whereas ITS technologies were earlier thought of as add-on components to the transportation infrastructure, transportation agencies now approach deployment of these technologies and devices much like infrastructure deployments.

Often, ITS devices are included with the new construction of roads, bridges or other infrastructure. As a result, transportation agencies considering the deployment of technology devices (either as add-ons to existing infrastructure or as new construction) often must perform cost/benefit analyses during the planning and design phase to justify the costs of these devices. While the cost is easily quantified, it is often difficult to assign dollar-value equivalents to the benefits of such devices. For example, the costs of deploying a closed-circuit television (CCTV) camera on the roadside are easily quantified. The use of camera images has many benefits to traffic managers, emergency responders and travelers; however, quantifying these benefits for comparison against the costs is not nearly as straightforward.

### A new enterprise

The ENTERPRISE Pooled Fund Study ([www.enterprise-prog.org](http://www.enterprise-prog.org)) is a collaboration of nine U.S. states, one Canadian province, the Federal Highway Administration, Transport

Canada and the Dutch DOT. Together, these 13 transportation agencies fund and perform projects that are most suited to collaborative group efforts. In 2007, the ENTERPRISE group began development of a limited set of warrants for technology devices used to support transportation operations and maintenance (ITS warrants). Transportation planners and engineers commonly use warrants defined by the *Manual on Uniform Traffic Control Devices (MUTCD)* to perform initial assessments on the deployment of traffic signals. The intent of the ENTERPRISE group's effort was to develop a similar set of warrants dedicated to ITS devices.

Ray Starr of the Mn/DOT Office of Traffic, Security and Operations, commented, "Most areas of transportation have warrants, standards and guidelines to give strong guidance for deciding what transportation facilities or traffic-control devices a specific situation merits. This type of guidance has been missing in the area of intelligent transportation systems. Generally accepted ITS warrants will remind designers to consider ITS devices where appropriate and will reduce the deployment of ITS devices that are not effective in a specific application. This will be good for ITS."

The concept behind the warrants for deployment of operations and maintenance devices is to support state, county and local transportation agencies in determining if the deployment of devices at specific locations is justified (warranted). To date, the ENTERPRISE Pooled Fund Study has developed a set of warrants for four devices:

- Dynamic message signs (DMS);
- CCTV;
- Highway advisory radio (HAR); and
- Road weather information systems (RWIS).

The intent of these warrants is to support the initial step in determining if deployment of a device is justified. It is not to replace the engineering study that will follow at the location. Through this initial project, the ENTERPRISE group of states has collaborated to develop the warrants and are now testing and refining the warrants based on actual use of the warrants in the member states.

### Warrants issued

The warrants are structured such that they are easy to use, can be implemented

quickly (the goal is less than 30 minutes) and do not require considerable data collection or processing. For each device, separate warrants were developed for the different purposes of the device. For example, there are eight warrants defined for DMS, each addressing different purposes for the device. For example:

- DMS Warrant No. 1: Weather information describes a set of criteria for installing DMS for the purpose of providing road weather information to drivers; and
- DMS Warrant No. 2: Traffic information describes a set of criteria for installing DMS for the purpose of providing current traffic status information (incidents, congestion, travel time, road work) to drivers.

The separation of these "purposes" and the creation of multiple warrants are intended to allow for the many different roles that devices may play in the overall network. For example, a DMS being considered on a rural mountain highway would most likely not be warranted according to DMS Warrant No. 2, however it might be warranted according to Warrant No. 1. This approach allows agencies to consider one, several or all of the warrants when considering deployment of a device. Meeting the criteria of just one warrant would suggest that the consideration of the device continue at this location.

### Testing 1-2

The structure of the ENTERPRISE Pooled Fund Study supported the testing of warrants by numerous agencies and individuals. The intent of the warrant testing is twofold:

- To test the accuracy and value of the warrants in helping agencies determine if device warrants are justified; and
- To test the text and structure of the warrants to determine if they are easy to use and as unambiguous as possible.

The accuracy and value of the warrants were tested by agencies considering deployment of ITS devices and by agencies that have recently deployed ITS devices. An online testing website allows agencies to quickly answer questions about each candidate deployment location and receive an answer to whether or not the



**VDOT now uses the device warrants as one consideration when developing deployment plans for RWIS devices.**

device is determined to be warranted for the location. The results of each warrant test are tracked for review and analysis. Verbal feedback from the test locations then verified whether the warrants produced results that agree with local opinions.

The second test of the warrants is intended to tighten the language of the warrants and avoid ambiguous ques-

tions. For this testing, two or more transportation professionals familiar with the site in question are asked to execute the warrants, and the outcome of their tests are compared to determine if they interpreted the questions in a consistent manner.

The first state agency to formally test the warrants was the Michigan Department of Transportation (MDOT). MDOT had recently completed a strategic plan for ITS deployments throughout the state, including numerous locations where ITS devices are being considered. This provided a challenging test bed to try the warrants against actual deployment sites. In total, the warrants were trialed for five devices in five different locations throughout Michigan, resulting in four devices being identified as warranted and one device identified as not warranted. In each case of warrant testing, the tests allowed further development and refinement of the warrants based on actual feedback and comments from traffic engineers familiar with the local situations.

Annjanette Kremer from MDOT participated in testing the warrants and said, "Based on our testing of the warrants, we can see how the warrants will be a valuable resource in selecting future locations and device types for deployment."

A second set of warrant tests was conducted in southeastern Minnesota. CCTV cameras are being considered for deployment along I-35 at the interchange of Trunk Highway 19 (near Northfield, Minn.), and at the interchange with I-90 (near Albert Lea). In addition, the CCTV warrant was tested at a site in the city of Rochester, Minn., that is prone to a high number of merges and traffic congestion. These tests offered a perspective from rural areas and small urban areas.

The ENTERPRISE group is testing the warrants in various locations, from rural areas such as I-35 in southern Minnesota to small urban areas such as the city of Rochester to major metropolitan areas such as Minneapolis and Seattle. Typically, each time a warrant is tested, the feedback has resulted in slight changes to it (either the context of the warrant or the text describing the warrant). As a result, the warrants have improved and now better represent the agencies that have contributed toward them.

According to Bill Legg with the Washington State Department of Transportation: "Based on input from our regional

traffic engineers, we feel the warrants have the potential to assist in key decision-making. We look forward to continuing to refine and develop these and other warrants with other states"

### Weather permitted

The Virginia Department of Transportation (VDOT) operates approximately 41 RWIS devices throughout the state to monitor weather and road conditions in real-time. Each device communicates

The intent of these warrants is to help decide whether deployment of a device is justified.

data back to VDOT offices, and the weather and road condition reports are used to support VDOT maintenance activities and traveler information dissemination systems. VDOT continues to add RWIS devices as needs are understood and funding allows. Future deployment plans for RWIS are determined through coordination with district maintenance offices and regional operations partners.

After preliminary testing of the RWIS-device warrants, VDOT now uses the device warrants as one consideration when developing deployment plans for RWIS devices.

The structure of the warrants has allowed maintenance engineers to answer the warrant questions quickly. When device deployments are proposed or requested, VDOT engineers now sit down and execute the warrants for the locations being considered.

Gene Martin with the VDOT Operations and Maintenance group commented, "RWIS devices have proven to help our operations and maintenance activities tremendously. The RWIS warrants are helping us as we follow a logical decision process to select the best locations for deployment of these systems."

### Warrant watching

The ENTERPRISE Pooled Fund Study efforts to develop warrants for an initial set of devices represent a first step toward defining and using warrants for the deployment of operations and maintenance devices. For this project, four devices were selected, and a set of warrants was defined for each device. This is not meant as an all-inclusive set of devices or warrants, but rather enough to test the concept of warrants for operations and maintenance devices.

The ENTERPRISE Pooled Fund Study has established a website that includes text descriptions of the warrants as well as an online interactive website where agencies can test the warrants online. The benefits of this online testing tool is that each time a warrant is tested, the results of the test, together with any information about the device location or agency offered, are stored in a database. Therefore, it is possible to poll each warrant and receive a report describing the number of times the warrant has been tested and the number of times the device was warranted or not warranted.

The ENTERPRISE Pooled Fund Study is hoping this initial phase of warrant development will continue beyond this initial demonstration and deployment phase. The group recognizes that national or international acceptance and use of the warrants would need continued support from a national agency. The online project website and testing tool represent a start toward the continued expansion that will be needed as new warrants are developed for additional devices and purposes.

Currently, the ENTERPRISE members are considering adding to the number of devices covered by the warrants, beginning with additional traffic-detection devices. Members of the transportation community are invited to test the warrants, use the warrants and give any feedback while the development and refinement process is still ongoing. The warrants project website can be found at [www.acconsultants.org/itswarrants](http://www.acconsultants.org/itswarrants).

**TME**

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