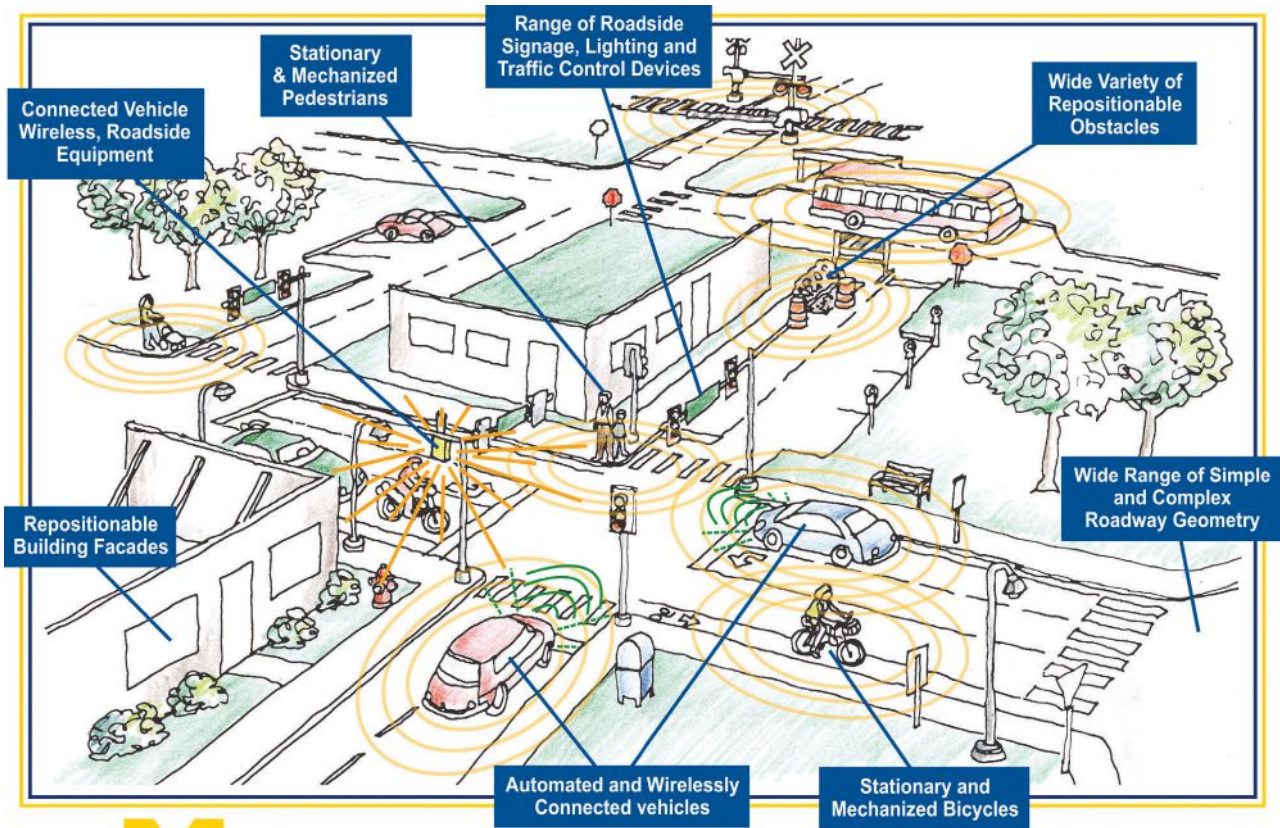


Connected Vehicles and Autonomous Vehicles:

Where Do ITE Members Stand?

BY PEI-SUNG LIN, PH.D., P.E., PTOE, RICHARD BEAUBIEN, P.E., PTOE, JOHN A. LOWER, PTP, AND KENNETH O. VOORHIES, P.E., PTOE

The topic of Connected Vehicles and Autonomous Vehicles is not new, yet advances in computing power, wireless capabilities, and software development are taking implementation predictions from the not-too-distance future and placing them in the here and now. Emerging vehicle technologies foreshadow a world in which sensors and software will replace humans in the driver's seat. Already, car manufacturers are advertising vehicles that brake by themselves in an emergency, and while Google is making headlines with its self-driving car, other automated cars are in test mode. Missing from the headlines is how these advances will impact the infrastructure of surface transportation systems and the transportation engineers and professionals that operate and manage them.



Mobility Transformation Facility

Artist's conception of a novel test facility that University of Michigan researchers will use in work aimed at ushering in a new era of connected and automated vehicles. Covering more than 30 acres, the facility will make it possible to evaluate the performance of advanced vehicles operating on 3 lane-miles of roads with intersections, traffic signs and signals, sidewalks, benches, simulated buildings, street lights, and obstacles such as construction barriers.

Upcoming NHTSA Decisions

The questions surrounding connected and autonomous vehicle technologies are centering less on “if” and more on “how” implementation will impact transportation engineers and professionals. Despite its 6-month extension of the 2012–2013 Connected Vehicle Safety Pilot Model Deployment taking place in Ann Arbor, MI, USA, the National Highway Traffic Safety Administration (NHTSA) still plans to move forward with its original timetable for announcing a 2013 rule-making decision on putting the technology in new light-duty vehicles. The decision will answer whether NHTSA will advance connected vehicle technology through the regulatory process, additional research, or a combination of both. NHTSA is basing the decision on the results of the pilot study, which is aimed at showing whether the connectivity helped avert crashes. Additional tests are further examining the technology on motorcycles and vehicle-to-infrastructure applications—the results of which will help inform a NHTSA decision on heavy vehicles in 2014.

Meanwhile, plans for an automated vehicle test environment in Ann Arbor are underway. A new Michigan Mobility Transformation Facility is being planned at the University of Michigan (UM) Mobility Transformation Center that will allow researchers to test emerging concepts in connected and automated vehicles and

vehicle systems in both off-road and on-road settings. The facility will expand upon the current Connected Vehicle Safety Pilot and will include urban street settings, straightaways, and on and off ramps to simulate driving conditions and for testing connected and automated vehicles. The UM Board of Regents recently approved plans to proceed with the design of the facility, which is scheduled for completion in Fall 2014. The University of Michigan Transportation Research Institute plans to use the facility to test autonomous vehicles through a model deployment similar to the connected vehicle safety pilot it is currently conducting.

2015 FHWA Deployment Guidance

The NHTSA decisions will be major milestones in the broad scale implementation of connected vehicle communications systems in the United States, and will be followed with the Federal Highway Administration (FHWA) commitment to deliver Vehicle-to-Infrastructure (V2I) deployment guidance in 2015. FHWA will develop the 2015 FHWA Deployment Guidance based on the research for NHTSA's 2013 and 2014 decisions, the Connected Vehicle Safety Pilot, the American Association of State Highway and Transportation Officials (AASHTO) National Connected Vehicle Field Infrastructure Footprint Analysis (scheduled for 2014 completion),

applications research, and the input of a new workgroup. The FHWA 2015 V2I Workgroup's goal will be to produce:

- Infrastructure planning: policy statement and guidance;
- Practitioner toolbox for deployment;
- Regulatory implementation language;
- Non-regulatory implementation guidance; and
- Marketing plan that is an extension of current Connected Vehicle plan.

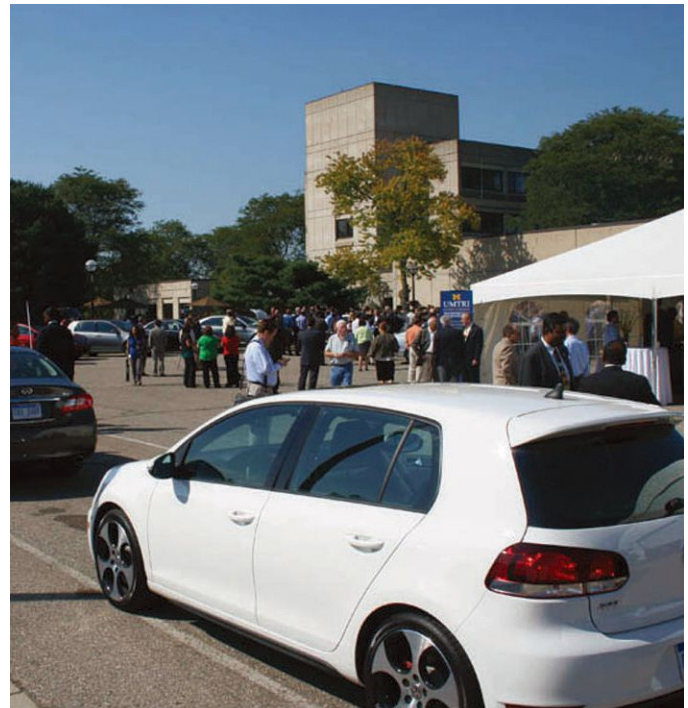
Currently, FHWA is developing internal outreach for this effort and is planning workshops for external stakeholders. The guidance will not be regulation, and it is expected that it will be continually updated as more information develops. As these workshops are announced, now is the time for ITE members to become involved and voice our practitioner perspectives, especially as FHWA initiates development of a Practitioner Toolbox for V2I Infrastructure Planning, Policy, and Deployment guidance. With only 10 percent of traffic signals managed by state departments of transportation (DOTs), there is a large role for ITE members in local governments to play in coordinating signals with connected vehicle infrastructure.

Where Do ITE Members Stand?

The Institute of Transportation Engineers Management and Operations (M&O)/Intelligent Transportation Systems (ITS) Council provides a forum for ITE members to discuss connected and autonomous vehicles and V2I infrastructure issues. In August 2013, the council sponsored and moderated a roundtable discussion, *Implication of Connected Vehicles and Autonomous Vehicles*, at the ITE 2013 Annual Meeting and Exhibit. This session explored the many questions surrounding connected vehicles and autonomous vehicles, while reporting on ITE's current efforts and evoking member viewpoints.

Results of ITE M&O/ITS Council Survey on Connected Vehicles

As the topic of connected vehicles and autonomous vehicles gains prominence in discussion forums across the industry, conversations range from the differences and convergences between the technologies to how transportation engineers should prepare for the technologies' ultimate impact on infrastructure. ITE as a whole is examining what role to play in the transformation these technologies promise to deliver. The ITE M&O/ITS Council's mission is "to engage in activities to expand the professional/practitioner capacity and further develop the M&O/ITS discipline, and to promote dialogue and innovation in deployment of transportation solutions that maximize the use of existing infrastructure to benefit society." Part of promoting and fostering that dialogue relies on understanding the viewpoints and needs of ITE members. To that end, the council conducted a survey of its 1,000-plus membership in August,



The Connected Vehicle Safety Pilot Model Deployment queue area at the University of Michigan Transportation Research Institute

IMAGE COURTESY OF THE UNIVERSITY OF MICHIGAN.

the results of which were shared at the Annual Meeting roundtable for discussion and feedback.

The survey showed that while more than 90 percent of respondents believe that the transportation management and operations profession will be impacted by connected vehicle technologies in the near future, they feel they are on the sidelines in the creation of these technologies. Opinions differed on how soon that impact would be felt. In responding to the statement that "2013 is widely believed to be the breakout year in terms of professional, political, and public awareness of what is being called the connected vehicles ecosystem," 45 percent agreed and 55 percent disagreed. Much will depend upon the upcoming NHTSA decision as 2013 comes to a close.

In discussing the survey results, the roundtable participants found that there is disparity in what is considered the "near-future" for implementation. Participants agreed that infrastructure must be compatible with connected vehicles, whenever that future may be. Research is needed on the infrastructure implications of connected vehicles. Through the discussion, ITE M&O/ITS Council members found agreement that ITE must work towards a better overall understanding of connected and autonomous technologies, looking at them from both auto manufacturer and data processing perspectives. Although autonomous and connected vehicles have developed independently, they now appear to be merging. While the Google car is close to autonomous, it is not connected. In order to prepare

for implementation, ITE must work with original equipment manufacturers to understand the capabilities of connected vehicles and autonomous vehicles.

Some of the questions raised during the discussion were, “How do we get to standards for the field equipment needed to implement autonomous and connected vehicles?” and “How do we transition from analog to digital?” Now is the time to start addressing those questions as an organization. ITE members have an opportunity to share data on traffic signal phasing and timing, work zones, and signing, understanding that both connected and autonomous vehicles will need data from traffic management centers or traffic operations centers. While the auto industry and users are driving the development of autonomous technologies, ITE members have an opportunity to get onboard. Now is the time to reach out to the auto industry to learn what is needed from transportation professionals.

Another key question from the survey involved the interactions between autonomous vehicles and manually operated vehicles, with 88 percent agreeing that these interactions would need to be managed. Having manually operated vehicles on the road with autonomous vehicles would significantly reduce the benefits of

autonomous vehicles, opening the questions of creating specific lanes for autonomous vehicles with speed limits that match their capabilities. ITE has the opportunity to lead transportation professionals on how to design an infrastructure that accommodates connected and autonomous vehicles with manually operated vehicles still on the roadways, as a full fleet turnover is estimated to take more than 20 years. ITE can help address design and operation issues, while providing input to the policies needed to guide the transition. While the questions are many, so are the opportunities for ITE members to begin answering them. **itej**



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John A. Lower, PTP chairs the ITE Management & Operations/ITS Council. He is associate vice president of Iteris, Inc., a leader in providing intelligent information solutions to the traffic management market. John previously served as the City of Anaheim traffic & transportation manager for 20 years, where his responsibilities for both the planning and operations of city transportation projects resulted in transportation planning with sustainable maintenance and operations in focus. He is an ITE Fellow.




Kenneth (Kenny) O. Voorhies, P.E., PTOE is a principal with Cambridge Systematics in Atlanta, GA, USA, and has 40 years of experience in traffic engineering, traffic operations, and transportation planning. He has managed a wide range of projects, including managing TMC operations, data archiving, performance measurement, and ITS planning.

Kenny has bachelor's and master's degrees in civil engineering from Georgia Tech. He was the Southern District Director on the ITE International Board from 2006 to 2008 and was the ITS Georgia State Chapters Representative to ITS America from 1997 to 2012. He is a registered Professional Engineer in seven states and a certified Professional Traffic Operations Engineer. He is an ITE Fellow.



Welcome
**Edward
Tahmazian,**
P.Eng

Urban Systems is pleased to welcome Edward Tahmazian, P.Eng to our Calgary office. Edward brings a wealth of experience in project management, transportation planning, traffic engineering, and functional and final design of transportation infrastructure to Urban Systems' transportation practice in Western Canada.





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