



# THE FUTURE OF OUT OF HOME ADVERTISING IN A SELF-DRIVING AMERICA

April 17, 2017



# THE FUTURE OF OUT OF HOME ADVERTISING IN A SELF-DRIVING AMERICA

*Chan Lieu, Michael Signorelli, Emma Blaser, Rob Hartwell\**

© 2017 VENABLE LLP

This white paper is published by the law firm Venable LLP. It is not intended to provide legal advice or opinion. Such advice may only be given when related to specific fact situations that Venable LLP has accepted an engagement as counsel to address.

\*Chan Lieu is a Senior Legislative Advisor in the Automated Vehicle Innovation Practice at Venable LLP. Michael Signorelli, Emma Blaser, and Rob Hartwell are attorneys in the Privacy and Automated Vehicle Innovation Practices at Venable LLP.







The Foundation for Outdoor Advertising Research & Education (FOARE) is proud to commission this initial report on trends in automation of the driving function.

As unprecedented advances in technology affect virtually every aspect of commerce and communication, we also anticipate significant changes in future mobility.

The primary author of this report, Chan D. Lieu, is a former executive at the National Highway Traffic Safety Administration (NHTSA) who now focuses on emerging mobility trends as senior legislative advisor at the law firm Venable in Washington, DC.

Key points of this independent report include:

- Safety is a main policy goal pushing development of autonomous driving, to reduce fatalities, injuries, and property loss
- Full automation of the driving function is a long way off; meanwhile, advances in technology will continue to assist human drivers
- Multiple factors complicate the path to full automation, such as liability, legal issues, and consumer acceptance
- The out of home advertising industry, like other sectors of the economy impacted by changes in mobility, will discover new opportunities derived through technological advances

On behalf of the FOARE Board of Directors, we hope you will find this report informative and useful.

Sincerely,

*Paul Cook, Wolverine Sign Works,  
Foundation for Outdoor Advertising  
Research & Education, Chairman*





# Table of Contents

01	Executive Summary
02	Introduction
03	AVs' Disruptive Effects Across Industries
05	Current Technology Landscape
05	▪ Levels of Automation
06	▪ Prospects for Deployment
07	▪ Vehicle-to-Infrastructure Communications
08	Legal and Policy Environment
08	▪ Administration Position
09	▪ Legislation
10	▪ Other Factors Impacting Deployment
11	Business Models and Opportunities
11	▪ OOH Advertising Is, and Will Be, Relevant
13	▪ Opportunities for Collaboration
13	▪ Planning and Research
16	References



## Executive Summary

Fully automated vehicles ("AVs") are the future of transportation and mobility, and will be a disruptive force across the economy. As businesses prepare for the shift to a self-driving America, it is important to remember that it is likely to take several decades for fully autonomous cars, trucks, and buses to comprise the majority of vehicle traffic on public roads. During this time, the existing out of home ("OOH") advertising model can continue to thrive. This timeline presents the industry with an opportunity to begin planning, researching, and embracing potential new ways for the OOH advertising ecosystem to succeed. In the age of AVs, businesses can be expected to adapt successfully to engage with strategic partners across various industries and, ultimately, with consumers in new and innovative ways. This report explores the potential impact of AVs on various industries; the technology that drives AV innovation; the current policy debate regarding AVs; and finally how the OOH advertising industry, through thought leaders like the leading trade association the Outdoor Advertising Association of America ("OAAA"), can begin to plan for the future of AVs and the industry.

Our discussion of the many industries impacted by the advent of AVs shows that the OOH advertising industry is not alone in facing disruption. The auto industry will face shifts in consumer demand as AVs make public transportation and vehicle sharing more efficient and attractive to consumers. Other industries that also will have to grapple with the eventual shift in consumers' engagement with vehicular travel include commercial radio, insurance, digital advertisers, and taxi companies. As AVs gradually become the main transportation option for consumers, other industries, including the OOH advertising industry, can begin a gradual transformation in order to remain as vibrant as they are today.

The likely timeline for broad market adoption of AVs allows the OOH advertising industry time to adapt. While some vehicles currently on the road incorporate automated technology features, it is clear that widespread full-scale commercial deployment of AVs is decades away. Even after AVs become commercially available initially, this will be the beginning of a decades-long transition as older vehicles pass through their life cycles and the AV industry works to overcome barriers to adoption by educating consumers about the benefits of AV technology. Moreover, the AV industry faces hurdles at both the federal and state level as regulators seek to adapt legal frameworks to a dynamic new technology.

This extended timeline for the arrival of a widespread fully AV vehicle fleet in both the commercial and consumer markets gives the OOH a window of opportunity to begin the research, cross-industry outreach, and planning that will position the OOH advertising industry to continue to flourish. We explain why the existing inventory of OOH will continue to be a valuable source of consumer engagement in coming years, as well as how some segments of the OOH advertising industry are starting to diversify their inventory to include new innovative placements such as "smart benches" and "smart bus stops." We also review potential opportunities for the OOH advertising industry to collaborate with other industries to expand audience reach. These opportunities include enhancing the data sharing that is already occurring, and developing strategic relationships with marketers and brands to develop "across screen" marketing messages that could be triggered through "smart" OOH inventory.

To seize the opportunities available today, and those that will present themselves in the future, industry-trade groups like OAAA can work with their members to promote new ideas and technologies that will benefit the industry. OAAA is already collaborating across industries, working with such groups as the Digital Advertising Alliance's ("DAA") to ensure that the OOH advertising industry has a voice in shaping the digital advertising ecosystem. Industry could also begin to forge relationships with AV manufacturers and with other data-driven marketing companies to foster collaboration and to ensure that the OOH advertising industry is taken into account as the broader economy plans for the shift to AVs. By working with such strategic partners, OAAA and its members will be positioned to provide industry leadership to drive the OOH ecosystem into the future.



*Connected bus stops provide information and entertainment for waiting passengers.*

# Introduction

Rapid advancements in vehicle-related crash avoidance technologies have pushed automated vehicles ("AVs") from a fanciful concept to a discernible reality. Vehicles equipped with advanced driver assist systems, such as lane keep assist and adaptive cruise control are already on the road, paving the way for more advanced technology that requires less (and eventually no) input from the human driver.<sup>1</sup> A number of companies already have begun testing AVs (also known as "self-driving cars" or "fully automated vehicles") on public roads, and several major automobile manufacturers have announced their intention to deploy these vehicles within 5 years.<sup>2</sup>

- *Automated vehicles are already being tested in select communities.*
- *Manufacturers expect to begin initial commercial deployment within 5 years.*
- *The majority of cars on the road will likely be automated by 2040–2045.*

This shift in the way consumers approach transportation and mobility will have a disruptive effect across industries. However, while AVs may begin to be seen on the road within a few years, large-scale market adoption is several decades away, giving affected industries time to plan and adapt as necessary. The ripple effect of the self-driving revolution is being contemplated across several industries. The out of home ("OOH") advertising industry is not alone in planning for that disruption, and this paper outlines initial stages of industry-wide planning.

This report is presented as an outline for potential future paths that the OOH advertising industry could take. Through early engagement with the emerging AV marketplace and infrastructure, OOH advertising companies can develop innovative technology and business models to reach consumers through the existing OOH inventory, as well as through new touchpoints in AVs and other consumer devices.

*"In the seven-and-a-half years of my presidency, self-driving cars have gone from sci-fi fantasy to an emerging reality with the potential to transform the way we live." - President Barack Obama*

There is significant support across the auto industry and government to advance AV technology in order to realize the potential societal benefits of AVs. Officials from the U.S. Department of Transportation and the National Highway Traffic Safety Administration ("NHTSA") often cite two significant statistics that "exemplify the need [for highly automated vehicles]. First, 35,092 people died on U.S. roadways in 2015 alone. Second, 94 percent of crashes can be tied to a human choice or error."<sup>3</sup> Whether they are distracted, fatigued, impaired, speeding, or making a poor driving decision, humans are the most fallible component in driving. Consequently, removing humans from controlling the driving task is expected to result in a considerable decrease in roadway fatalities. Moreover, AVs can provide tremendous opportunities for communities with limited mobility options, such as low-income or aging populations, or persons with disabilities that currently prevent them from operating a motor vehicle.

In addition to safety advancements, AVs are poised to change the way consumers and businesses experience mobility and transportation. When driver distraction concerns are obviated by automated technology, all vehicle occupants will be more free to engage with stimuli both in and outside the vehicle. Increased efficiency may eventually lessen the time consumers spend in traffic. Ultimately, however, AVs may increase time spent in vehicles as consumers find longer commutes more tolerable, convenient, and perhaps even enjoyable, and more consumers may choose to use AVs over non-automotive transportation options. As AVs are able to drop off or pick up passengers on-demand at precise locations, this efficiency and convenience could result in increased ridership of public transportation. These gains should reduce demand for personal vehicle ownership and the need for city parking, which could spur changes in urban infrastructure and open new spaces that were previously dedicated to vehicle infrastructure to OOH advertising.

We will review the current technology landscape surrounding AVs, the developing legal and policy framework relating to AVs, and the opportunities presented for OOH advertising by the inevitable deployment of AVs. By embracing the challenges and opportunities that AVs represent, the OOH advertising industry can evolve with the marketplace, meeting consumers where they are, and providing marketers and advertisers with valuable access to advertising real estate and services in America's self-driving future.



## I. AVs' Disruptive Effects Across Industries

AVs have the potential to reshape the way consumers, auto manufacturers, and other industries approach transportation and mobility. As consumers move to adopt AVs, either as a personal vehicle or through a fleet-based ride or car sharing service, the former driver will become yet another passive passenger. AVs undoubtedly will introduce several disruptive elements into the market, forcing adaptation across multiple industries and creating several ramifications for driver and rider behavior.

However, the current research does not paint a unified picture of the future of driver and rider behavior, the overall impact of AVs on travel times, the use of public transit, or vehicle ownership. For example, some research posits that drivers will engage in various types of entertainment or work activity in an AV, while other research suggests that consumers may eschew cars altogether and instead choose to rely on public transit and pedestrian modes of travel.<sup>4</sup> This section outlines select studies that have considered how consumers, auto manufacturers, and city planners will grapple with the disruptive nature of AVs.

One topic of study has been how consumers will spend their time while riding in an AV. Since drivers will no longer be focused on managing the multiple tasks driving requires, some researchers theorize that consumers may fill their time with other activities, such as work, conversation, using mobile devices, or consuming content (i.e., reading or watching videos.)<sup>5</sup> Other commentators have noted that AVs could allow a driver to engage more fully with the surrounding view because they would be freed from the driving task.<sup>6</sup> Even if drivers are no longer focused on the road in the AV future, they will have new viewing options and screens within an AV, allowing OOH and mobile app advertisers to coordinate messages across digital billboards and smart phone screens.

AVs could also shift travel choices. Consumers may be more willing to take long road trips instead of flying, or leverage efficient AV public transportation for short distances instead of walking to the corner store.<sup>7</sup> If so, this increased use of vehicular transportation, both for long and short trips, will put more travelers on the roadway, even if travelers split their time between a screen and the roadway view. AVs will also offer individuals who are unable to drive, such as the elderly and the disabled, the chance to enjoy greater mobility and independence.<sup>8</sup> This could increase the number of consumers on the road, and expose a different group of consumers to OOH advertising messages.



Automation allows for new, more social seating arrangements.

- *AVs could cause shifts in transportation habits that increase the use of cars and AV public transportation by consumers that previously did not use those modes of transportation.*
- *It is unclear what impact AVs will have on driver or rider behavior, but the short term impact will be relatively minor as fully self-driving vehicles are decades away.*
- *AVs will shift how cities use land, highways, and pedestrian spaces, leading to major disruption across a variety of marketplaces.*

Additionally, existing research demonstrates the differing impact self-driving cars may have in the near and long term on the volume of cars on the road and time spent in those cars. In the long term, some researchers believe that AV travel time efficiency is one of the greatest potential benefits of this new ecosystem.<sup>9</sup> Less time in cars could potentially reduce the time spent viewing OOH advertising. However, other experts suggest that, during the transition to a fully automated fleet, the mix of human and AV traffic will cause increased congestion, thus increasing drive time and exposing OOH advertising to consumers for longer.<sup>10</sup>

The effect of AVs on land use will also be relevant for the OOH advertising industry. It is possible that as vehicles become automated, and consumers transition from personally-owned vehicles to fleets and

ride-share options, there may be less demand for multi-lane roads, which would lead to reclaiming land that is no longer needed for driving.<sup>11</sup> As AVs, whether for ridesharing or personal use, may be constantly in use or summoned from remote locations, they are expected to reduce the need for city parking, allowing new development that may offer additional real estate for OOH advertising. Space that was previously needed to be reserved for cars could be

repurposed into urban residential and commercial opportunities (such as parking garages being reused as mixed use spaces).<sup>12</sup> As with the current urban renewal movement, where consumers are moving into previously industrial areas and revitalizing the neighborhoods, pedestrians can then be exposed to OOH advertising in these settings.



*Automated vehicles can provide convenient short-distance shuttle services.*

Also, as large highways contract due to the efficiency of AVs, more "green space" will open up to cities and counties.<sup>13</sup> To offset the cost of upkeep for this new green space, parts of that land may become available to advertising.<sup>14</sup> Potentially, this newly developed green space can expand the footprint of OOH advertising along newly created, but slimmed down, highways.

AVs also hold promise for an increase in the use of mass transit through the deployment of automated buses.<sup>15</sup> Traditional buses have seen a drop in ridership, even in cities with well-functioning transit systems like New York City.<sup>16</sup> This drop in ridership often is attributed to the unreliable nature of busing

systems, a challenge that automated buses are uniquely suited to address.<sup>17</sup> In both urban and suburban areas, automated mass transit can offer more convenient and reliable transportation options. Additionally, a fully automated fleet that includes buses can ease traffic flow and encourage consumers to share rides on public transportation, exposing mass transit advertising to more consumers. Consumers that would have previously chosen to drive may begin to opt for public transit, spending slightly more time on the ride in exchange for comfort and productivity.<sup>18</sup>

In addition to replacing existing mass transit with an AV fleet, AV buses may no longer follow fixed routes.<sup>19</sup> As AV buses move through neighborhoods that previously lacked a bus stop, new consumers can see advertising on the sides of moving buses, and consumers inside the bus will see advertising they previously would not be exposed to—both inside the bus and on the newly traveled streets. These smaller, smarter buses, may also increase in number to meet demand with a smaller on road footprint. For example, some prototype AV buses hold about 12 riders.<sup>20</sup> With the larger number of buses on the road, and potentially more consumers choosing to use this convenient, on-demand public transportation, advertising could grow in volume and consumer engagement.

The OOH advertising industry is not alone in the challenge of adapting to these disruptions. Other industries are assessing how best to grapple with the change that AVs will bring. For example, while consumers may spend more time in vehicles, the broadcast radio industry will face new competition for passenger attention.<sup>21</sup> Passengers may choose to watch videos or play games during their commute, which could decrease rider engagement with the radio.<sup>22</sup> Digital advertising companies may see connected cars as a major opportunity for data collection and advertising, adopting a view of the car as "a one-ton cookie."<sup>23</sup> But in order to gain access to those consumers, advertisers will likely have to work with the auto manufacturers.<sup>24</sup> Also, the insurance industry is working to understand the impact to its risk models, especially as it tries to account for the shift from personal ownership to fleet and commercial use.<sup>25</sup> While the insurance industry anticipates consumer premiums to drop, it also likely has to manage new questions of liability when the car is "driving" itself.<sup>26</sup>

The auto industry as well is working to understand how best it can leverage the coming disruption. A fully automated fleet may lead to a decline in private car ownership as ride sharing and public transit use increase. This likely will usher in a shift to fleet and commercial sales.<sup>27</sup> Some commentators have estimated that a rise in the use of AVs will result in an 8.6-percent decline in vehicle sales, caused by increased vehicle life and a higher occupancy rate.<sup>28</sup> The anticipated decline in auto sales will force the auto industry to adapt, seeking new and innovative ways to raise vehicle sales outside of the consumer market, such as increased fleet sales to car sharing companies or sales to cities that may develop government-run AV fleets for public transportation.

Reviewing the research and industry reports shows that the impact of AVs on driver and passenger behaviors, on multiple affected industries, is far from settled and will likely change throughout the gradual deployment required to reach a fully AV fleet. Given this timeline, there is opportunity for the OOH advertising industry to explore these potentials and to develop new technology and business models to meet the demands that AVs will present. This paper discusses these opportunities in Section IV.



## II. Current Technology Landscape

- Levels 0-5 represent the generally accepted levels of automation. Levels 4-5 do not require a human driver.
- Testing of Level 4/5 vehicles has already begun.
- Commercial deployment of AVs is expected to begin within five years.
- Significant hurdles remain before companies can deploy AVs on a wide scale.

### A. Levels of Automation

To help understand the impact highly automated vehicles will have on the attention of drivers, this section describes the difference between levels of automation. The most common system for classifying vehicle automation is set forth by the Society of Automotive Engineers ("SAE"), which NHTSA adopted in September 2016.<sup>29</sup> The SAE scale includes Levels 0-5.<sup>30</sup>

LEVEL	NAME	STEERING, ACCELERATION & DECELERATION	MONITORING OF DRIVING ENVIRONMENT	FALLBACK PERFORMANCE OF DYNAMIC DRIVING TASK
0	NO AUTOMATION	HUMAN	HUMAN	HUMAN
1	DRIVER ASSISTANCE	HUMAN AND SYSTEM	HUMAN	HUMAN
2	PARTIAL AUTOMATION	SYSTEM	HUMAN	HUMAN
3	CONDITIONAL AUTOMATION	SYSTEM	SYSTEM	HUMAN
4	HIGH AUTOMATION	SYSTEM	SYSTEM	SYSTEM
5	FULL AUTOMATION	SYSTEM	SYSTEM	SYSTEM

SAE International Automation Scale. Copyright © SAE International and J3016

- Level 0 involves no automation. Human drivers are responsible for all driving tasks in all situations.<sup>31</sup>
- Level 1 (driver assistance) is the lowest level of automation, providing limited driver assistance for a single driving task. Cruise control is the most widespread example of Level 1 automation, and drivers are comfortable with this automation that has been available for decades. Another example of a Level 1 automation is Electronic Stability Control, which helps vehicles detect and mitigate a loss of traction. The key aspect of Level 1 automation is that only a single function is enabled and that it is focused on driver assistance, with the system expecting the driver to be in control at all times.
- With Level 2 automation (partial automation), the vehicle system is capable of combining two dynamic driving tasks. An example of this is the combination of adaptive cruise control along with "lane keep" assist. This combined functionality enables the vehicle to control its speed while also monitoring steering to ensure that it stays in its lane. Just as with Level 1, Level 2 is a partially automated system and the system still expects the driver to maintain control at all times.
- Level 3 (conditional automation) systems assume all aspects of the dynamic driving task, but require that the human driver be available to respond and assume control when requested. Even though it is considered high automation,

like the lower levels, Level 3 systems still expect the driver to be able to take control at some point. Early testing revealed that occupants of Level 3 vehicles tended to rely on the technology beyond its stated capacity, such as climbing into the backseat of the vehicle or taking a nap. Due to these challenges, many manufacturers have chosen to focus exclusively on higher levels of automation that do not require human intervention.

- Level 4 (high automation) vehicles perform all aspects of the dynamic driving task completely to the point that a human driver is not expected to take control of the vehicle. This would enable manufacturers to develop Level 4 vehicles without a steering wheel or pedals. However, a Level 4 system is limited to specifically designed use cases (e.g., limited geographic operating area; limited environmental or weather conditions for operations). Level 4 vehicles are not necessarily designed to rely on human drivers to take over the driving task. Rather, the vehicle may simply not operate in autonomous mode outside of its designated operating design domain.
- Level 5 (full automation) vehicles do not require a human in the driving task at any time. In contrast to Level 4 vehicles, these vehicles can operate all aspects of the dynamic driving task in all driving modes, without any of the limitations described in Level 4.

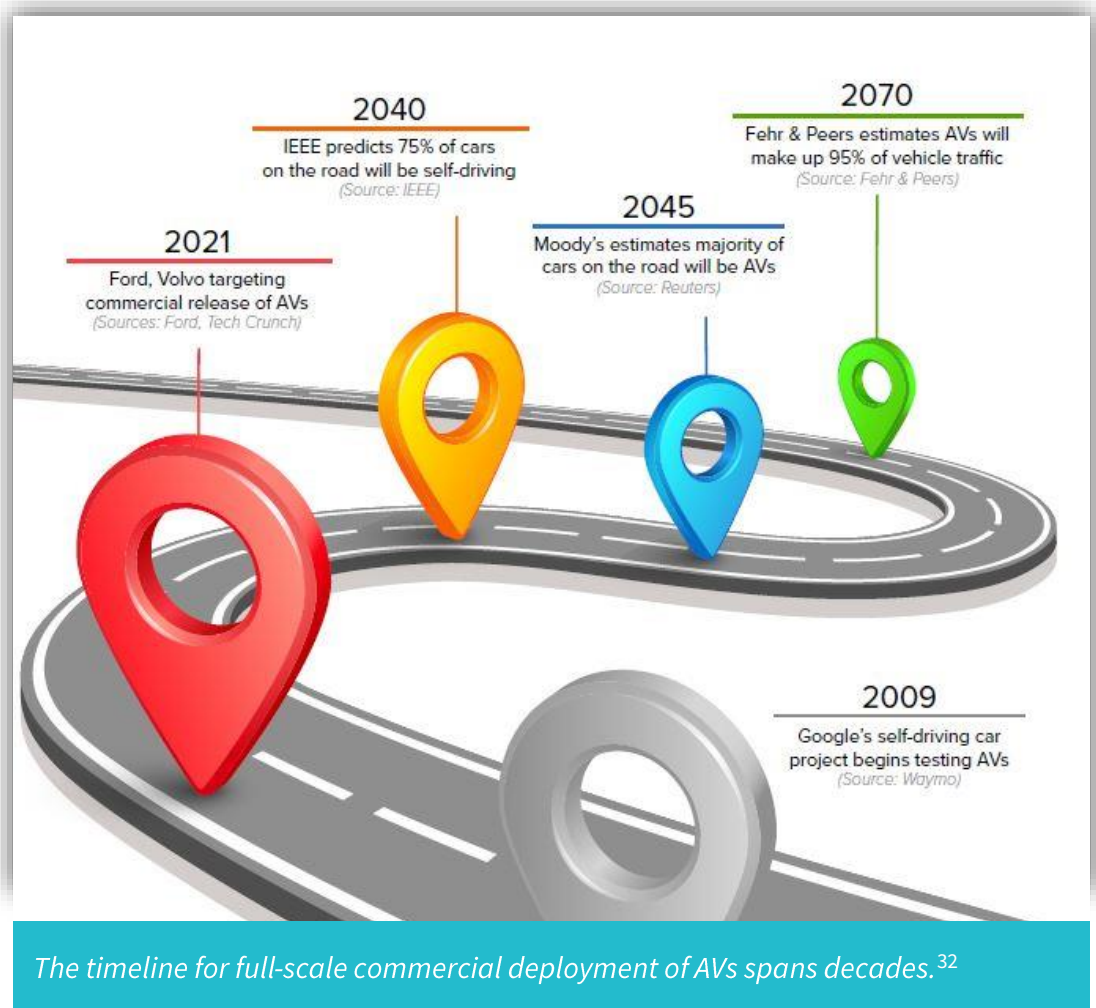
For the purposes of this paper, we will consider the impact of vehicles at Levels 3–5. Levels 4 and 5 are commonly referred to as "automated" or "self-driving" vehicles. However, Level 3 vehicles are relevant to the extent that they diminish distracted driving concerns and allow drivers to focus on tasks other than driving.

## B. Prospects for Deployment

Level 1 automation is common in modern vehicles and has been in effect for quite some time. Level 2 automation is also in place in vehicles on the road today. For instance, Tesla's "Autopilot" feature is capable of keeping the vehicle in its lane and with flow of stop-and-go traffic, without driver intervention.<sup>33</sup> As a safety precaution, and to demonstrate that the driver is still responsible for maintaining control of the vehicle, the Autopilot system requires that drivers periodically put their hands on the wheel. This is a prototypical example of Level 2 automation as it combines several driver assistance tools to perform dynamic driving tasks, but expects the driver to maintain vigilance and control.<sup>34</sup>

However, deployment of higher-level vehicles is not far off. Testing of highly automated vehicles already has begun in select communities. For example, Waymo is testing its self-driving cars in Mountain View, California; Phoenix, Arizona; Austin, Texas; and Kirkland, Washington. The cars being tested on public roads have driven more than 2 million miles.<sup>35</sup> Uber began testing self-driving cars in September 2016 for its ride-sharing service in Pittsburgh, Pennsylvania and more recently in Phoenix, Arizona.

Additionally, some auto manufacturers have acknowledged publicly their goals to achieve commercial deployment of Level 4 or 5 vehicles within 5 years.<sup>36</sup> However, this deployment may take decades before broad market adoption. A March 2016 study estimated that automated vehicles will not make up the majority of cars on the road until 2045.<sup>37</sup> Broad market adoption will not occur overnight for several reasons. First, the advent of automated vehicles will not mark the immediate demise of traditional vehicles. Even if fully automated vehicles are made available for private ownership, these features may be offered as an upgrade available at an extra cost. For example, Volvo estimates that





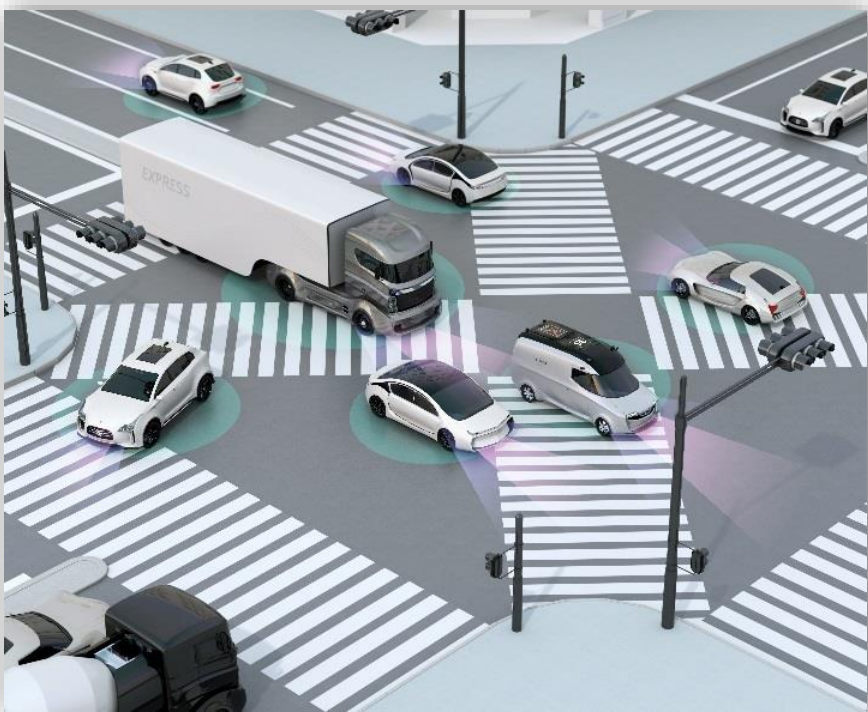
automated capabilities will add \$10,000 to the cost of the car to which those features are added.<sup>38</sup> As such, they will not be available to all consumers. Second, not all manufacturers intend to sell AVs to consumers under the traditional private ownership models. Rather, they intend to deploy AVs for ride-sharing services. Even original equipment manufacturers ("OEMs") such as Ford are contemplating such plans.<sup>39</sup> Third, vehicle life cycles typically last over 10 years.<sup>40</sup> Thus, even if automated vehicles become widely available and affordable, they will not be prevalent until non-automated vehicles currently on the road have cycled through their lifespans to allow consumers to purchase new vehicles with new technology. Finally, in order for AVs to saturate the market, they need to be available in the used car market, *i.e.*, to have cycled through their initial lifespans with initial purchasers.

Regulation will also play a role in determining the speed of deployment. At the state level, legislatures have taken varied approaches to the regulation of testing and deployment of highly automated vehicles. Some states require that human operators be present in the vehicle for testing.<sup>41</sup> California has promulgated regulations to require permits for entities that wish to test automated vehicles.<sup>42</sup> In contrast, Utah has called for studies relating to automated vehicles.<sup>43</sup> In the absence of a uniform approach, the burgeoning patchwork of state laws may serve to inhibit rapid deployment of AVs.

Moreover, at the federal level, NHTSA released voluntary guidance in September of 2016 relating to automated vehicles. The agency requested comment on the guidance but has not yet initiated a formal rulemaking. As a result, it remains unclear how federal and state regulators will encourage or inhibit deployment of AVs, and thus how quickly manufacturers will realize their goals of full-scale commercial deployment. The NHTSA guidance is described in more detail in Section III.A.2 below.

### C. Vehicle-to-Infrastructure Communications

AVs themselves are not the only connected technology to provide opportunities for collaboration with OOH advertising. Municipalities are increasingly dedicated to advancing technology and infrastructure within their communities that would facilitate deployment of AVs. This type of connected infrastructure could be leveraged to provide services that consumers value, such as broadband Internet access, and the physical structures attendant to these advancements provide additional touchpoints for OOH advertising. For instance, Boulder, Colorado implemented a smart grid across the city to help consumers and businesses track and regulate the flow of electricity.<sup>44</sup> Similarly, Pittsburgh, Pennsylvania has installed smart intersections around the city to gather data on traffic patterns and adjust signals to provide a more efficient traffic flow.<sup>45</sup>



On-board sensors permit both vehicle-to-vehicle and vehicle-to-infrastructure communications.

It is important to note that fully automated vehicles do not necessarily depend on vehicle-to-vehicle or vehicle-to-infrastructure communications in order to function. Long-term safety and automation goals would benefit from substantial investment in infrastructure to support system sensors already in development in the AV industry. However, given the investment required to embed sensors in infrastructure across the country, it is likely that such infrastructure will be implemented at a slower pace than the AV industry is able to innovate. As a result, most Level 4/5 AVs will likely contain a full suite of on-board sensors to detect and identify the surrounding area, rather than relying on external communications or messages. Nevertheless, additional data from infrastructure sensors would be helpful, and many manufacturers view vehicle-to-vehicle and vehicle-to-infrastructure communications as a complementary technology.

Communications to and from street OOH displays present additional opportunities for coordination and collaboration with vehicle communications. As we will discuss in more detail in Section IV, advertisements on street displays can take advantage of such opportunities by coordinating with in-vehicle advertisements to provide a comprehensive advertising experience, tailored to consumers in all stages of their travel.

## III. Legal and Policy Environment

Momentum of deployment of automated vehicles is strong, and regulators at all levels of government are taking action to address this new technology and its potential impact. However, while the technology is advancing at a rapid clip, legal and policy issues remain that could impact the full-scale commercial deployment of automated vehicles, thereby affecting OOH advertising. Such factors include: a new presidential administration, a burgeoning patchwork of state laws, an uncertain liability framework, and low consumer acceptance. The exact timeline for resolution of these issues is unclear as some, such as consumer acceptance and liability issues, will likely depend on consumer experiences with commercially deployed AV fleets.

### A. Administration Position

#### 1. Momentum Within the Tech Community and Other Influencers

In 2016, President Obama published an op-ed in support of the safety benefits of automated vehicles.<sup>46</sup> Specifically, the President noted the societal benefits that AVs could bring with respect to safety as well as a reduction in congestion and pollution.<sup>47</sup> In addition, he acknowledged that federal intervention in such a rapidly evolving space could jeopardize the momentum of the technology, stating: "Regulation can go too far. Government sometimes gets it wrong when it comes to rapidly changing technologies. That's why this new policy is flexible and designed to evolve with new advances."<sup>48</sup>

Priorities for the new Administration in the AV area are as yet unclear. However, President Trump has announced a trillion-dollar infrastructure plan with a focus on attracting private investment.<sup>49</sup> Such public-private partnerships could provide an opportunity for collaboration as described further below in Section IV. In addition, private companies already have made considerable investments in automated driving technology that do not depend on presidential support. As discussed, many manufacturers anticipate deployment of fully automated vehicles within the next 5 years. NHTSA during the Obama Administration took a "light" approach in establishing voluntary guidance (detailed below), and it is unlikely that a Trump Administration would take a more aggressive regulatory approach. However, if the federal government vacates the regulatory space for AVs, the states have clearly shown their interest and willingness to fill this vacuum. Such a shift would present challenges for AV adoption, as potentially conflicting state requirements would prevent a uniform approach for AV deployment.

- *The National Highway Traffic Safety Administration has started down the rulemaking path with guidance and requests for information regarding AVs.*
- *Congress is considering issues related to AVs.*
- *States are moving more quickly to adopt AV-related legislation, and a patchwork of laws is beginning to form.*
- *Tort, insurance, and liability issues are yet to be resolved.*

#### 2. NHTSA's "Federal Automated Vehicles Policy"

On September 20, 2016, NHTSA released voluntary guidance, entitled "Federal Automated Vehicles Policy," regarding the testing and deployment of "highly automated vehicles" ("HAVs"), which encompass vehicles at SAE Levels 3–5. The Policy is comprised of four sections: (1) vehicle performance guidance; (2) model state policy; (3) existing regulatory tools; and (4) modern regulatory tools. The guidance demonstrates the agency's commitment to supporting HAV deployment and establishes a pathway to deployment.

The vehicle performance guidance encourages manufacturers to provide NHTSA with a safety assessment letter highlighting how they are addressing the 15 points set forth by the agency, including a section on data recording and sharing. Standards surrounding data sharing are likely of critical importance for collaboration between vehicle manufacturers and advertisers. The guidance states: "Data sharing is a rapidly evolving area that requires more research and discussion among stakeholders to develop consensus on data standards."<sup>50</sup> The Outdoor Advertising Association of America ("OAAA") is one such relevant stakeholder that may consider joining discussions regarding standards for data sharing, such as through OAAA's membership on the Digital Advertising Alliance's ("DAA") Communications & Advisory Committee where companies across the digital marketing ecosystem discuss and develop industry self-regulatory codes.<sup>51</sup>



In addition, NHTSA and the Federal Trade Commission ("FTC") are holding a joint workshop in June 2017 to examine the privacy and security issues surrounding "automated and connected vehicles."<sup>52</sup>

The model state policy issued as part of NHTSA's guidance identifies areas where states have a traditional role in regulation motor vehicle safety, such as driver licensing, titling, registration, insurance, and enforcement of laws regarding speed limits and rules of the road. As noted, if states opt not to align, differing approaches may create hurdles to widespread adoption of AVs. The guidance encourages states "to work together to standardize and maintain road infrastructure including signs, traffic signals and lights, and pavement markings."<sup>53</sup> The Policy's section on current regulatory tools describes the options available to the agency to determine, waive, and exempt the applicability certain Federal Motor Vehicle Safety Standards. This section includes a commitment by NHTSA to expedite both requests for letters of interpretation and petitions for exemptions related to HAVs.<sup>54</sup> The fourth and final substantive section of the guidance, regarding modern regulatory tools, discusses new and novel regulatory approaches that NHTSA is considering in order to regulate automated technology.<sup>55</sup>

## B. Legislation

### 1. Federal Legislation

In the wake of the release of NHTSA's guidance, Congress has held several hearings to gather information about AV technology and the current regulatory landscape.<sup>56</sup> In each hearing, committee members and witnesses discussed the potential safety and mobility benefits of automated vehicles, the recently published NHTSA guidance, and policy issues surrounding the testing and deployment of AVs. In particular, majority leadership in both the House Committee on Energy and Commerce Subcommittee on Commerce, Manufacturing and Trade and the Senate Committee on Appropriations Subcommittee on Transportation, Housing and Urban Development, and agency representatives appearing as witnesses at the hearings, expressed support for the safety benefits that automated vehicles could bring and cautioned against robust regulation that could slow innovation for these life-saving technologies.<sup>57</sup> Minority committee leadership expressed concern over the effect of AV deployment on commercial driving jobs and questioned whether NHTSA's existing guidance adequately addresses safety issues.<sup>58</sup> Further hearings and legislation regarding automated vehicles are expected in 2017.



*Changing urban landscapes present additional real estate for OOH advertising.*

### 2. State Legislation

State legislatures also have been active in the automated vehicle space. Prior to the release of NHTSA's guidance, several states enacted laws regarding AVs, indicating the beginning of a patchwork of state laws that could slow the deployment of AVs. Where states have different, or even conflicting requirements, both testing and deployment could be delayed as manufacturers attempt to develop vehicles that can meet local requirements. As one example of how such conflicts can develop, in 2012, California enacted legislation requiring the California Department of Motor Vehicles promulgate regulations regarding the safe operation and testing of automated vehicles on public roads.<sup>59</sup> In contrast, Florida enacted a bill finding that "the state does not prohibit or specifically regulate the testing or operation of automated technology in motor vehicles on public roads."<sup>60</sup> Florida subsequently passed a law eliminating the state's restrictions on the operation of automated vehicles for testing purposes only.<sup>61</sup>



*AVs minimize distracted driving concerns, paving the way for eye-catching, dynamic displays.*

## C. Other Factors Impacting Deployment

### 1. Liability

Liability issues surrounding AVs remain unsettled. Such issues are historically within the domain of state authority, and NHTSA's guidance on model state policy expressly encourages states to "consider how to allocate liability among HAV owners, operators, passengers, manufacturers, and others when a crash occurs."<sup>62</sup> Indeed, states have begun to weigh in on this subject. Regulations recently proposed in California would mandate that vehicle manufacturers certify "that, to the extent that the autonomous vehicle is at-fault in any collision, the manufacturer assume any and all responsibility for liability associated with the operation of the vehicles on public roads."<sup>63</sup> Neither NHTSA's guidance nor California's proposed rules would address liability for collisions that occur during the hand-off between the AV and the human operator, or where the human operator fails to take control of the vehicle following a notification from the AV that human intervention is required. As a result, an uncertain liability regime could lead to a more hesitant roll-out of AVs by manufacturers. NHTSA's guidance suggests that a commission be established to study liability and insurance issues and develop recommendations for the states to consider.

### 2. Consumer Acceptance

Another factor potentially slowing the adoption of automated driving technology is consumer acceptance. A recent consumer perception study published by Kelley Blue Book reported that 51 percent of consumers currently prefer to maintain control over their vehicles, even if such human operation is less safe for other drivers.<sup>64</sup> Moreover, 80 percent of consumers stated that people should always have the option to drive their own vehicles.<sup>65</sup> This report stated that 64 percent of consumers felt the "need to be in control" of the vehicle.<sup>66</sup> However, consumer understanding about automated vehicle technology appears to be minimal; 60 percent of respondents claimed to know "little" or "nothing" about automated vehicles. As such, regardless of how quickly technology and regulation develops, AV deployment may be delayed by consumers' hesitation to give up control over their vehicles.



## IV. Business Models and Opportunities

As outlined in this paper, AVs will reshape the way consumers interact with the road and all parts of the automotive/driving ecosystem. While the deployment of AVs could take decades to reach full saturation, the OOH advertising industry need not wait to plan how it can succeed in the various phases of AV deployment. The OOH advertising industry has an extensive network of infrastructure across America, situated in urban centers, suburban towns, and rural areas that can be leveraged for more than direct display advertising.

In the near future, consumers will still be responsible for most, if not all, of their own driving. This means that existing business models and practices will continue to be viable for many years. Looking forward, the current OOH advertising inventory can be leveraged as a valuable data source for entities seeking to engage with AVs and their occupants by collecting data about devices passing by OOH installations and licensing that data to third parties. The industry can also leverage new technologies to provide tailored advertising on digital display boards, as well as public services such as safety messages and broadband Internet access. Eventually, OOH advertising locations could be part of a vibrant ecosystem of devices that exchange information, engaging consumers on billboards, in-car dashboards, and on mobile devices. To conclude this paper, we describe several potential avenues for OOH to maintain, and expand, its role in the marketplace.



*Urban landscapes provide OOH advertising opportunities regardless of who is operating vehicles on the road.*

### A. OOH Advertising Is, and Will Be, Relevant

AVs are unlikely to achieve majority status among vehicles on the road for several decades. In the immediate future, the planned uses of AVs by car sharing, technology, and automobile manufacturing companies are likely to be small scale and limited to specific geographic locations. This means that, until a significant number of AVs are on the road, drivers will continue to focus on the road and will be exposed to OOH advertising in much the way they are today. However, there are steps that, in this short term, can help grow the OOH advertising industry's reach.

The OOH advertising industry's major current consumer touchpoints—billboards, transit advertising, and kiosks—will continue to engage consumers in the coming years. In fact, when AVs are only at Level 2 and Level 3, consumers will be required to continue to drive the vehicle or be prepared take over in case of an emergency. During this time period, consumers will still engage with traditional OOH advertising. Given that Level 3 vehicles may require a human driver to take over the driving task at some point, but not continuously engaged in the driving task, Level 3 vehicles may even present additional opportunities for consumers to absorb OOH advertising, including both traditional billboards and non-roadside inventory, as they will be alert to their surroundings but less focused on the driving task. Consumers will continue to drive the roads, pedestrians will continue to walk the streets, and Tourists in urban centers will need to find directions and recommendations. In these traditional settings, OOH advertisers are already embracing innovative technologies and revenue models. As explained in Section IV.B, each of these interactions present the opportunity for OOH providers to leverage existing assets and technology to deliver an improved advertising experience, wireless connectivity, and public service messaging.



*Smart benches provide connectivity and an opportunity for dynamic OOH advertising.*

For example, in Los Angeles, companies are partnering with the city to offer "smart benches" across the city.<sup>67</sup> These benches represent new opportunities for the OOH advertising industry, as they provide pedestrians and public transit users with WiFi Internet and mobile device charging stations, as well as an opportunity to interact with OOH advertising on the benches. A similar model could be used to convert payphones, bus stops, street lights, and any number of urban-centered street furniture into consumer-focused OOH advertising centers.<sup>68</sup> For example, experiments in the UK have seen manhole covers turned into WiFi hotspots.<sup>69</sup> Beyond the traditional OOH placement opportunities, these new opportunities offer companies that own these placements and other WiFi access points the opportunity to leverage data collected from those access points as a supplemental revenue stream. These innovative deployments could also be subsidized through partnerships with local communities that desire to offer WiFi and device charging services to their communities.<sup>70</sup> Beyond the data that may be collected via the use of WiFi at these public spaces, companies may offer other data points collected by a variety of signals and devices to the marketplace, including precise location data. These WiFi and charging stations could also lead to increase pedestrian time at certain locations, offering a chance for the operators of these stations to offer local advertising to businesses in that area.<sup>71</sup>

In future years, as AVs become increasingly common on the roadways, digital signage can likewise become more interactive. When Level 4/5 AVs are deployed, safety concerns that have been voiced in connection with video signage may be alleviated. Dynamic digital signage will be able to engage consumers whose attention will no longer be required to be dedicated to driving.<sup>72</sup> When drivers are no longer focused on the driving task, local jurisdictions may be more willing to allow broader deployment of these types of billboards. Additionally, recent deployments of digital billboards have been used by local authorities to deliver safety messages, sometimes directed at the issue of distracted driving.<sup>73</sup> Delivering innovative advertising messages, for both commercial and public service purposes, will likely be a growth market as governments and drivers become less concerned with distractions and more engaged with the messages around them.



*Billboards will remain relevant for public service announcements as well as advertising. Reprinted with permission from OAAA.*

Additionally, as discussed in section I, AVs could spark a rise in the use of public transportation.<sup>74</sup> Consumers traveling on public transportation, like consumers in other AVs, will be free to attend to OOH advertising along the route. Additionally, this development could lead to an increase in consumers seeing advertising located on those public transportation vehicles. Indeed, the OOH advertising industry could partner with the manufacturers of new AV buses and trains to include digital signage to replace traditional placards. These built-in displays could provide OOH companies with access across public transportation fleets, allowing more engaging, dynamic, and relevant advertising to find consumers in new ways.



## B. Opportunities for Collaboration

While traditional advertising will continue to be a valuable part of the OOH advertising industry, AVs and new technology will present new chances for OOH providers to partner with digital marketers and publishers to deliver advanced measurement and consumer engagement data. With its nationwide reach, the OOH advertising industry is also a natural partner for the auto manufacturers and advertisers to deliver advertising to consumers in AVs. Embracing new business models and strategic partnerships with these industries to supplement and grow existing revenue and relationships is one way that the OOH advertising industry can thrive in a disrupted marketplace.

Some parts of the OOH advertising industry already have embraced this future. Using the OOH advertising industry's unparalleled physical footprint across the nation, the industry is able to be a valuable data partner for digital advertising. Consumer location is one of the most valuable data points for mobile marketers, and the OOH advertising industry is in a unique position to provide those marketers with location data and help deliver the most relevant advertising accordingly. In addition to providing advertising and public service messages, OOH infrastructure can provide advertisers and automobile manufacturers with nationwide awareness of where and what consumers in AVs are doing and seeing. Another way that OOH companies could partner with other companies is to offer access to consumers on their mobile devices within an AV. Auto manufacturers may control access to advertising opportunities through an in-car display. To create additional opportunities to reach consumers within AVs, given the OOH advertising industry's physical reach throughout the country, companies could partner with advertisers and entertainment companies to develop physical signage and mobile applications that interact with each other. For example, an interactive billboard that is displaying an advertisement for an upcoming movie could recognize a consumer's device in an AV as it passes by. The billboard provider could offer its advertising customer the ability to extend its audience reach to provide the consumer with an advertisement on their device that plays the movie's trailer or links to another interactive piece of content related to the movie. Similarly, a quick serve restaurant could reach broader audiences by advertising on a billboard that offers the ability reach consumers on a mobile device when they are most likely interested in the advertisement, such as by offering a coupon for the restaurant at the next rest stop on a highway through that restaurant's mobile application or a display ad. This type of rich data environment can be built up across the OOH advertising industry, from traditional billboards directed to suburban commuters to sensors in bench advertising that can interact with a consumer's device while they wait for a city bus.



## C. Planning and Research

While opportunities for collaboration and expansion are ripe in the near, medium, and distant future, research and planning will be required to ensure that the OOH advertising industry captures those opportunities. As the leading trade association in the industry, the OAAA could work with its members to coordinate this research, and promote new ideas and technologies to the benefit of the industry.

Initial research could be focused on developing new sensors for placement in the OOH advertising industry's existing infrastructure. These sensors could be passive data gatherers, allowing OOH companies to provide valuable data points to advertisers. Those sensors could also be active, interacting with passing mobile devices and tailoring advertising on both the mobile device and the billboard. Industry could also pursue research on how consumers interact with digital displays, developing technology that attracts consumers to a message and that responds to changing traffic and pedestrian patterns.

OOH companies can also investigate how to leverage the availability of new pedestrian spaces that may occur with AV deployment. If urban areas become less congested with vehicle traffic, more space will also be available for street furniture and other pedestrian resources where large highways once existed. OOH companies should investigate how best to migrate to these new advertising spaces, similar to pedestrian environments today, by diversifying their portfolios with a mix of roadside, transit, non-roadside inventory, and location-based advertising assets.

Working with developers and urban planners early in the process will allow the OOH advertising industry to plan, develop, and capture lucrative advertising spaces. Coupled with this process, the OOH advertising industry could engage in research of both driver and pedestrian behavior in relation to AVs, digital signage, and engagement with mobile advertising. As the industry better understands its consumers, and works hand-in-hand with city planners, the OOH advertising industry can help to ensure its growth going forward.



*Bus stops can provide connectivity and information.*

Along with research on new technologies, new consumer behaviors, and new spaces for OOH advertising, the OOH advertising industry should begin to foster relationships with AV manufacturers and data-driven marketing companies to ensure that the OOH advertising industry has a "seat at the table" as policy and business issues related to AVs are discussed. For example, industry groups like Geopath can foster collaboration across different sectors of the OOH advertising industry, and assist in outreach to other industries. OOH advertising industry groups or leaders could also develop a standard set of contractual terms that outlines data sharing arrangements between OOH companies and potential data partners. Similar terms have been developed in the online advertising industry, and help to relieve some of the complexity involved in those relationships.

As with any business opportunity based on data flows, the self-driving future of America requires that the OOH advertising industry engage in responsible data collection, use, and sharing behaviors to maintain consumer trust and engagement. To that end, the OAAA has already amended its Code of Industry Principles to address the collection and use of mobile device data that may be collected through OOH advertising touchpoints, including precise location data.<sup>75</sup> OAAA revised its code to help ensure that its members, and the OOH advertising industry as a whole, are engaged in state-of-the-art data collection, use, and sharing practices for consumer data.<sup>76</sup> As the leading industry trade association, OAAA could build on its existing Code of Industry Principles by convening cross-industry coalitions to promote, develop, and manage the various aspects of the OOH advertising industry's research and development efforts related to AVs and data-driven OOH advertising.







- <sup>1</sup> Where appropriate, this paper will use the term “highly automated vehicle” or “automated vehicle.” The National Highway Traffic Safety Administration recently defined the term “highly automated vehicle” to encompass vehicles in which the “automated system is primarily responsible for monitoring the driving environment.” National Highway Traffic Safety Administration, Federal Automated Vehicles Policy 10 (2016), <https://www.transportation.gov/sites/dot.gov/files/docs/AV%20policy%20guidance%20PDF.pdf> [hereinafter NHTSA Policy]. The term “automated vehicle” refers to vehicles which require no assistance from a human occupant, *i.e.*, SAE Levels 4 and 5, as described in detail in section II.A of this paper.
- <sup>2</sup> Press Release, Ford, Ford Targets Fully Autonomous Vehicle for Ride Sharing in 2021; Invests in New Tech Companies, Doubles Silicon Valley Team (Aug. 16, 2016), <https://media.ford.com/content/fordmedia/fna/us/en/news/2016/08/16/ford-targets-fully-automated-vehicle-for-ride-sharing-in-2021.html>.
- <sup>3</sup> NHTSA Policy at 5 (internal citations omitted).
- <sup>4</sup> Kinder Baumgardner, *Beyond Google’s Cute Car: The Time to Think through the Impact of Self-Driving Vehicles on Architecture and City Planning is Now* (2015), [http://offcite.org/wp-content/uploads/sites/3/2015/10/Baumgardner\\_Autonomous\\_Cars.pdf](http://offcite.org/wp-content/uploads/sites/3/2015/10/Baumgardner_Autonomous_Cars.pdf) [hereinafter *Baumgardner*]; Alissa Walker, *Can self-driving technology save the bus? Does autonomous, hyper-customized semi-public transportation spell an end to buses? It doesn’t have to*, Curbed (Jul. 28, 2016), <http://www.curbed.com/2016/7/28/12285810/self-driving-autonomous-bus-vehicles-transportation> [hereinafter *Walker*].
- <sup>5</sup> Todd Litman, Victoria Transit Policy Institute, *Autonomous Vehicle Implementation Predictions: Implications for Transport Planning 3* (Dec. 10, 2015), <http://slidepapers.in/wp-content/uploads/2016/03/Autonomous-Predictions-Vehicle-Implementations.pdf> [hereinafter *Litman*].
- <sup>6</sup> Andrew Hawkins, *Behind the wheel of Uber’s new self-driving car, which hits the road today: Get ready, Pittsburgh*, The Verge (Sept. 14, 2016), <http://www.theverge.com/2016/9/14/12900982/uber-self-driving-car-pittsburgh-launch-hands-on>.
- <sup>7</sup> Johanna Zmud, Ipek Sener & Jason Wagner, *Consumer Acceptance and Travel Behavior Impacts of Automated Vehicles 30-31* (Jan. 2016), <http://d2dtl5nnlpfr0r.cloudfront.net/tti.tamu.edu/documents/PRC-15-49-F.pdf>.
- <sup>8</sup> *Id.* at 4.
- <sup>9</sup> *Litman* at 4–5.
- <sup>10</sup> *Id.*
- <sup>11</sup> *Baumgardner* at 41.
- <sup>12</sup> *Id.* at 42–43.
- <sup>13</sup> *Id.*
- <sup>14</sup> *Id.*
- <sup>15</sup> *Walker*.
- <sup>16</sup> Tanay Warerkar, *As Bus Ridership Declines, Advocates Call For Major Changes: This includes more bus lanes, and an improved payment system*, Curbed (July 22, 2016), <http://ny.curbed.com/2016/7/22/12253192/nyc-bus-changes-mta-improvements>.
- <sup>17</sup> *Id.*
- <sup>18</sup> *Walker*.
- <sup>19</sup> *Id.*
- <sup>20</sup> *Id.*
- <sup>21</sup> Adam Foroughi, *Self-driving cars will seriously disrupt advertising — here’s how*, Venture Beat (May 29, 2016), <http://venturebeat.com/2016/05/29/self-driving-cars-will-seriously-disrupt-advertising-heres-how/>.
- <sup>22</sup> *Id.*
- <sup>23</sup> “Cookies,” along with other similar technology, are used online to collect data about consumer web viewing history. Christopher Heine & Marty Swant, *What Marketers Need to Know About Cars as the Next Must-Have Mobile Devices Self-driving rides are just around the bend*, AdWeek (Jan. 5, 2016), <http://www.adweek.com/news/technology/what-marketers-need-know-about-cars-next-must-have-mobile-devices-168808>.
- <sup>24</sup> *Id.*
- <sup>25</sup> Oliver Suess & Jan-Henrik Foerster, *Self-Driving Cars to Cut U.S. Insurance Premiums 40%, Aon Says*, Bloomberg (Sept. 11, 2016), <https://www.bloomberg.com/news/articles/2016-09-11/self-driving-cars-to-cut-u-s-insurance-premiums-40-aon-says>.
- <sup>26</sup> Ann Carrns, *As Self-Driving Cars Hit the Road, Innovation Is Outpacing Insurance*, N.Y. Times, (July 3, 2016), <http://www.nytimes.com/2016/07/04/your-money/as-self-driving-cars-hit-the-road-innovation-is-outpacing-insurance.html>.
- <sup>27</sup> Michele Bertoncello, *Ten ways autonomous driving could redefine the automotive world*, McKinsey&Company (June 2015), <http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world>.
- <sup>28</sup> Joann Muller, *Self-Driving Car Fleets Won’t Destroy The Auto Industry, But Here’s How Much They Could Hurt*, Forbes (July 5, 2016), <http://www.forbes.com/sites/joannmuller/2016/07/05/self-driving-car-fleets-wont-destroy-the-auto-industry-but-heres-how-much-they-could-hurt/2/#761116dd5d27>.
- <sup>29</sup> NHTSA Policy at 9.
- <sup>30</sup> SAE International, Automated Driving, [http://www.sae.org/misc/pdfs/automated\\_driving.pdf](http://www.sae.org/misc/pdfs/automated_driving.pdf).

- <sup>31</sup> Center for Internet and Society, Stanford Law School, Summary of Levels of Driving Automation for On-Road Vehicles, <https://cyberlaw.stanford.edu/files/blogimages/LevelsofDrivingAutomation.pdf>.
- <sup>32</sup> *Journey*, Waymo, <https://waymo.com/journey/>; Press Release, Ford, Ford Targets Fully Autonomous Vehicle for Ride Sharing In 2021; Invests in New Tech Companies, Doubles Silicon Valley Team (Aug. 16, 2016), <https://media.ford.com/content/fordmedia/fna/us/en/news/2016/08/16/ford-targets-fully-autonomous-vehicle-for-ride-sharing-in-2021.html>; Darrell Ehterington, *Volvo to Target Luxury Buyers with Self-Driving Car Coming in 5 Years*, TechCrunch (Sept. 29, 2016), <https://techcrunch.com/2016/09/29/volvo-to-target-luxury-buyers-with-self-driving-car-coming-in-5-years/>; Doug Newcomb, *You Won't Need a Driver's License by 2040*, Wired (Sept. 17, 2012 1:42 PM), <https://www.wired.com/2012/09/ieee-autonomous-2040/>; *Moody's forecasts U.S. adoption of self-driving cars 'several decades' away*, Reuters (Mar. 29, 2016, 1:21 PM), <http://www.reuters.com/article/us-moody-s-autos-selfdriving-idUSKCN0WV22O>; *Think*, Fehr & Pehrs, <http://www.fehrandpehrs.com/fpthink/nextgenerationvehicles/>.
- <sup>33</sup> *Tesla Press Information*, Tesla, <https://www.tesla.com/presskit/autopilot>.
- <sup>34</sup> *Id.*
- <sup>35</sup> Tim Higgins, *Google's Self-Driving Car Program Odometer Reaches 2 Million Miles*, Wall St. J. (Oct. 5, 2016 3:24 PM), <http://www.wsj.com/articles/googles-self-driving-car-program-odometer-reaches-2-million-miles-1475683321>. Google's self-driving technology company is now known as Waymo.
- <sup>36</sup> John D. Stoll, *GM Executive Credits Silicon Valley for Accelerating Development of Self-Driving Cars*, Wall St. J. (May 10, 2016, 5:48 PM), <http://www.wsj.com/articles/gm-executive-credits-silicon-valley-for-accelerating-development-of-self-driving-cars-1462910491>; Matt McFarland, *BMW promises fully driverless cars by 2021*, CNN Money (July 1, 2016, 12:30 PM), <http://money.cnn.com/2016/07/01/technology/bmw-intel-mobileye/>.
- <sup>37</sup> *Moody's forecasts U.S. adoption of self-driving cars 'several decades' away*, Reuters (Mar. 29, 2016, 1:21 PM), <http://www.reuters.com/article/us-moody-s-autos-selfdriving-idUSKCN0WV22O>.
- <sup>38</sup> Darrell Ehterington, *Volvo to Target Luxury Buyers with Self-Driving Car Coming in 5 Years*, TechCrunch (Sept. 29, 2016), <https://techcrunch.com/2016/09/29/volvo-to-target-luxury-buyers-with-self-driving-car-coming-in-5-years/>.
- <sup>39</sup> Press Release, Ford, Ford Targets Fully Autonomous Vehicle for Ride Sharing In 2021; Invests in New Tech Companies, Doubles Silicon Valley Team (Aug. 16, 2016), <https://media.ford.com/content/fordmedia/fna/us/en/news/2016/08/16/ford-targets-fully-autonomous-vehicle-for-ride-sharing-in-2021.html>.
- <sup>40</sup> Press Release, IHS Markit, Average Age of Light Vehicles in the U.S. Rises Slightly in 2015 to 11.5 years, IHS Reports (July 29, 2015 7:00 AM), <http://press.ihs.com/press-release/automotive/average-age-light-vehicles-us-rises-slightly-2015-115-years-ihs-reports>.
- <sup>41</sup> See, e.g., Nev. Rev. Stat. § 462A.070; D.C. Code §50-2352.
- <sup>42</sup> California DMV, Art. 3.7, 227.00 *et seq.*
- <sup>43</sup> Utah Code § 41-26-102.
- <sup>44</sup> Lisa Fletcher and Andrea Beaumont, *Boulder, Colo.: America's First 'Smart Grid City'*, ABC News (Nov. 15, 2008), <http://abcnews.go.com/GMA/SmartHome/story?id=6255279&page=1>; Dominick Yoney, *Boulder to Become First Smart Grid City*, autoblog (Mar. 13, 2008 6:53 PM), <http://www.autoblog.com/2008/03/13/boulder-to-become-first-smart-grid-city/>.
- <sup>45</sup> Matt Belagner, *More 'Smart' Intersections Coming to Pittsburgh*, WTAE (May 2, 2014 1:39 PM), <http://www.wtae.com/news/more-smart-intersections-coming-to-pittsburgh/25763136>.
- <sup>46</sup> Barack Obama, *Barack Obama: Self-driving, yes, but also safe*, Pittsburgh Post-Gazette (Sept. 19, 2016 8:00 PM), <http://www.post-gazette.com/opinion/Op-Ed/2016/09/19/Barack-Obama-Self-driving-yes-but-also-safe/stories/201609200027>.
- <sup>47</sup> *Id.*
- <sup>48</sup> *Id.*
- <sup>49</sup> David Z. Morris, *Trump's Surprising Transportation Priorities*, Fortune (Nov. 12, 2016 11:17 AM), <http://fortune.com/2016/11/12/trump-transportation-priorities/>.
- <sup>50</sup> NHTSA Policy at 18.
- <sup>51</sup> Press Release, Outdoor Advertising Association of America, Outdoor Advertising Association Partners with Digital Advertising Alliance to Promote Responsible Data Principles for OOH Advertising (Aug. 1, 2016), <https://oaaa.org/NewsEvents/PressReleases/tabid/327/id/4606/Default.aspx>.
- <sup>52</sup> Press Release, FTC, FTC, NHTSA to Conduct Workshop on June 28 on Privacy, Security Issues Related to Connected, Automated Vehicles (Mar. 20, 2017), <https://www.ftc.gov/news-events/press-releases/2017/03/ftc-nhtsa-conduct-workshop-june-28-privacy-security-issues>.
- <sup>53</sup> NHTSA Policy at 39.
- <sup>54</sup> NHTSA Policy at 54, 62.
- <sup>55</sup> NHTSA Policy at 68.
- <sup>56</sup> On November 15, 2016, the U.S. House Committee on Energy and Commerce's Subcommittee on Manufacturing and Trade held a hearing entitled "Disrupter Series: Self-Driving Cars." On November 16, 2016, the U.S. Senate Committee on Appropriations Subcommittee on Transportation, Housing and Urban Development, and Related Agencies ("Subcommittee") held a hearing entitled "The Automated & Self-Driving Vehicle Revolution: What is the Role of Government?" On December 6, 2016, the House Transportation and Infrastructure Committee's Subcommittee on Highways and Transit held a round table discussion on automated vehicles.

- <sup>57</sup> *Disrupter Series: Self-Driving Cars: Hearing Before the H. Comm. on Energy & Commerce Subcomm. on Commerce, Mfg. & Trade*, 114th Cong. (2016), <https://energycommerce.house.gov/hearings-and-votes/hearings/disrupter-series-self-driving-cars>; *The Automated & Self-Driving Vehicle Revolution: What is the Role of Government?: Hearing Before the S. Comm. on Appropriations Subcomm. on Transp., Housing and Urban Dev., and Related Agencies*, 114th Cong. (2016), [http://www.appropriations.senate.gov/hearings/the-automated-and-self-driving-vehicle-revolution\\_what-is-the-role-of-government](http://www.appropriations.senate.gov/hearings/the-automated-and-self-driving-vehicle-revolution_what-is-the-role-of-government).
- <sup>58</sup> *Disrupter Series: Self-Driving Cars: Hearing Before the H. Comm. on Energy & Commerce Subcomm. on Commerce, Mfg. & Trade*, 114th Cong. (2016), <https://energycommerce.house.gov/hearings-and-votes/hearings/disrupter-series-self-driving-cars>; *The Automated & Self-Driving Vehicle Revolution: What is the Role of Government?: Hearing Before the S. Comm. on Appropriations Subcomm. on Transp., Housing and Urban Dev., and Related Agencies*, 114th Cong. (2016), [http://www.appropriations.senate.gov/hearings/the-automated-and-self-driving-vehicle-revolution\\_what-is-the-role-of-government](http://www.appropriations.senate.gov/hearings/the-automated-and-self-driving-vehicle-revolution_what-is-the-role-of-government).
- <sup>59</sup> Cal. Veh. Code § 38750.
- <sup>60</sup> S 1207 (Fla. 2012), <https://www.flsenate.gov/Session/Bill/2012/1207/BillText/er/PDF>.
- <sup>61</sup> HB 7207 (Fla. 2016), <https://www.flsenate.gov/Session/Bill/2016/7027/BillText/er/PDF>.
- <sup>62</sup> NHTSA Policy at 45.
- <sup>63</sup> California Department of Motor Vehicles, Proposed Regulations § 227.38(b)(1), [https://www.dmv.ca.gov/portal/wcm/connect/caa2f466-fe0f-454a-a461-f5d7a079de49/avexpressterms\\_31017.pdf?MOD=AJPERES](https://www.dmv.ca.gov/portal/wcm/connect/caa2f466-fe0f-454a-a461-f5d7a079de49/avexpressterms_31017.pdf?MOD=AJPERES).
- <sup>64</sup> Kelley Blue Book, *Future Autonomous Vehicle Driver Study* 6 (Sept. 2016), <http://mediaroom.kbb.com/future-autonomous-vehicle-driver-study>.
- <sup>65</sup> *Id.* at 8.
- <sup>66</sup> *Id.*
- <sup>67</sup> Jeffery Spivak, *How Cities, Property Owners Are Integrating Wi-Fi, Charging Stations*, UrbanLand (May, 13, 2016), <http://urbanland.uli.org/infrastructure-transit/something-in-the-air/>.
- <sup>68</sup> See, e.g., *id.*
- <sup>69</sup> *Id.*
- <sup>70</sup> *Id.*
- <sup>71</sup> *Id.*
- <sup>72</sup> See, e.g., *Are Digital Billboards Dangerously Distracting?*, Association for Psychological Science (May 4, 2016), <http://www.psychologicalscience.org/news/motr/are-digital-billboards-dangerously-distracting.html>.
- <sup>73</sup> Robert Kara, *The LAPD Hopes Digital Billboards Can Reach Distracted Drivers Clear Channel Outdoor's signs will flash safety messages*, AdWeek (Nov. 16, 2015), <http://www.adweek.com/news/advertising-branding/lapd-hopes-digital-billboards-can-reach-distracted-drivers-168111>.
- <sup>74</sup> See Walker.
- <sup>75</sup> Outdoor Advertising Association of America, *Code of Industry Principles* (2016), <https://www.oaaa.org/About/OAAACodeofIndustryPrinciples.aspx>.
- <sup>76</sup> OAAA took just this type of industry leading initiative to collaborate with a broad set of actors when it updated its Code of Industry Principles in 2016 to address new practices related to the responsible use of location data and joined the DDA's Principles & Communications Committee. The DAA was created by the leading advertising trade associations, and its Self-Regulatory Principles are a model of effective industry self-regulation. By partnering with the DAA, OAAA has ensured that the OOH industry has a seat at the table as innovate digital marketing continues to evolve, both on screens and out of the home. Press Release, Outdoor Advertising Association of America, Outdoor Advertising Association Partners with Digital Advertising Alliance to Promote Responsible Data Principles for OOH Advertising (Aug. 1, 2016), <https://oaaa.org/NewsEvents/PressReleases/tabid/327/id/4606/Default.aspx>.



OAAA and FOARE will periodically update this report as new, relevant information is made available.



Venable LLP  
600 Massachusetts Avenue NW  
Washington, DC 20001