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Office of the Secretary  
U.S. Department of Transportation  
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*November 5, 2018*

**RE: Docket No. DOT-OST-2018-0150 (Notice of Request for Comments: Scope of the Study on the Impact of Automated Vehicle Technologies on Workforce)**

Securing America's Future Energy (SAFE) is pleased to submit the following in regard to the request for comments on the *Scope of the Study on the Impact of Automated Vehicle Technologies on Workforce* ("Study").

In the last several years, the development and adoption of autonomous vehicles (AVs) has emerged as a central policy subject, both in the United States and across the world. Some have expressed concern about the long-term impacts of the technology, most intensely with regard to the question of the potentially far-reaching impacts on the U.S. labor force. SAFE appreciates the Secretary's interest in these impacts, and we believe that the Department of Transportation and Department of Labor's report is a necessary and critical undertaking that will serve as a foundational document for policymakers as they prepare for the widespread deployment of autonomous vehicles.

Over the last several years, SAFE have taken a leadership role in studying and promoting autonomous vehicles, while also working with industry and other stakeholders to advance sound public policy solutions. We have found that AVs can provide significant societal benefits around safety, enhanced energy security, and accessibility.

First, it is broadly recognized that AVs hold the potential to meaningfully reduce the roughly 40,000 annual fatalities on U.S. roads. While vehicles have become incrementally safer since the 1960s, these developments have not eliminated a contributing cause of 94 percent of motor vehicle collisions—driver error. Autonomous vehicles promise to eliminate the observational errors made by drivers who are distracted, incapacitated, inattentive, or who make erroneous judgments that lead to collisions and often fatalities. SAFE has presented a number of best-practice recommendations for the safe and early deployment of AVs in its 2017 paper, *Commission on Autonomous Vehicle Testing and Safety*.<sup>1</sup>

SAFE research also indicates that AV technology can serve our economic and national security goals by enabling fuel efficiency gains and serving as a market-driven accelerator for alternative fuel platforms such as electric vehicles. Such a trend, if fully realized, will meaningfully reduce U.S. oil consumption. AVs may also substantially increase access to employment within a commutable range. For workers who cannot find a job appropriate for their skills or cannot easily utilize vehicle transportation, access to a broader range of jobs can mean the difference between gainful employment and poverty. For employers, access to a broader pool of skilled workers can translate into success and growth.

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<sup>1</sup> SAFE, *Commission on Autonomous Vehicle Testing and Safety*, January 2017.

Perhaps underappreciated, AVs are the only near-term technology with the potential to offer accessible mobility for many who do not have it today—groups such as those with disabilities and seniors. SAFE analysis in *Self-Driving Cars: The Impact on People with Disabilities* described how mitigating transportation related obstacles for individuals with disabilities would enable new employment opportunities for approximately 2 million individuals with disabilities.<sup>2</sup>

While these are just a few narrowly defined potential benefits, it is important to recognize that the deployment of AVs could take many pathways. In order for a successful transition to occur, and to ensure that the societal benefits of the technology are maximized, it is imperative that AVs do not impose significant costs or cause unnecessary disruption to the labor market. As mentioned above, many are concerned about the potential for AVs to significantly, and perhaps negatively, impact the employment landscape across the United States. While SAFE believes that AVs have the potential to positively transform the entire U.S. economy, it is critical that AV-related labor displacement concerns—many of which have been exaggerated or expressed sensationally—be addressed seriously rather than merely dismissed out of hand or repeated without verification or critical evaluation.

To begin this process, SAFE commissioned a panel of highly regarded economists to conduct a fact-based and rigorous assessment of the economic benefits and costs of AVs, including labor impacts. The experts were given a broad mandate to study a set of key questions, including: 1) what precedents can we rely on in thinking about the impacts of AVs?, 2) what is the scale of concrete benefits AVs can offer to the broader population?, and 3) how can we inject rational, well-researched perspectives into the emotionally-charged yet critical conversation around the potential job impacts of AVs?

SAFE's panel of experts included Dr. Erica Groshen, Dr. John Paul MacDuffie, Dr. Susan Helper, Dr. Richard Mudge, and Dr. David Montgomery. The panel was given technical assistance and were provided access to SAFE and industry expert views on AV technology. Most importantly, they were asked to impartially investigate and report their findings. The panel delivered three reports comprising over 300 pages of findings, each addressing one of the questions above. The study, including both the brief and the reports, are available separately at [www.secureenergy.org/AVLaborImpacts](http://www.secureenergy.org/AVLaborImpacts). Following its release, the study was widely covered in the media and one of the economists' report, "Preparing U.S. Workers and Employers for an Autonomous Vehicle Future," received positive reviews from prominent economists such as Lawrence Summers, Alan Krueger, Michael Strain, and David Autor.<sup>3</sup>

### Summary of Findings from *America's Workforce and the Self-Driving Future*

SAFE's study found that AVs would likely lead to significant productivity gains and economic growth—bringing to mind the rapid economic growth that accompanied the post-Second World War expansion, building of the Interstate Highway System, and suburbanization of the United States. The overall economic and social impacts of deploying AVs are very likely to be similarly significant and positive. SAFE's analysis found that AVs will add between \$3 to \$6 trillion in cumulative consumer and societal benefits to the U.S. economy. The SAFE study showed that AVs could lead to \$800 billion annually in economic and societal benefits on full deployment (See Figure 1).

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<sup>2</sup> SAFE, *Self-Driving Cars: The Impact On People With Disabilities*, January 2017.

<sup>3</sup> See, e.g., Graham Rapier, "Self-driving cars could wipe out 4 million jobs — but a new report says the upsides will be easily worth it," *Business Insider*, June 13, 2018.

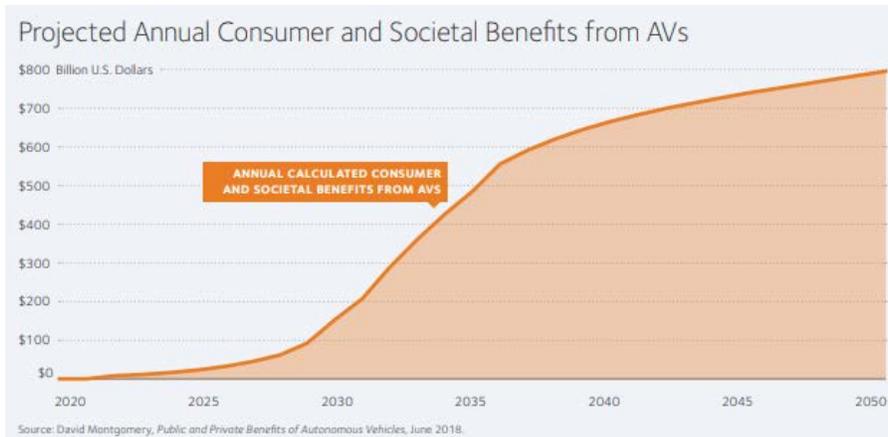


Figure 1

While some reports have warned of rapid and massive job losses<sup>4</sup>, SAFE’s analysis found a relatively measured impact on the labor market perhaps as far as several decades in the future and temporary in duration. AV-related job loss is expected to contribute far less than one percent to the U.S. unemployment rate. SAFE modelling suggested that AVs could result in an addition to unemployment of 170,000 to 380,000 workers at peak impact around the late 2040s. In context, today’s labor force employs approximately 160 million workers (See Figure 2).

### Marginal Contribution to Unemployment Rate in Historical Context

Event	Timing of Peak Impact	Marginal Increase in Unemployment at Peak
Autonomous Vehicle Deployment	Between 2045 and 2055	0.06–0.13 percent
Great Recession	2010	4.9 percent
Early 2000s Recession	2003	1.3 percent

Note: Marginal Increase in Unemployment at Peak assumes a baseline of 4.7 percent unemployment before event impact  
Source: Data on AV deployment from Groshen employment study; Data on historical annual unemployment rates from FRED.

Figure 2

SAFE’s study found that new jobs are expected to be created in three broad categories. First, AV technology will make transportation cheaper and easier, leading to increased demand and new jobs in transportation. Second, AVs will spawn a new ecosystem for their development, manufacturing, and deployment, leading to a range of new AV-related jobs. Finally, the use of AV technology to save consumers money will lead to additional spending elsewhere and economic growth and jobs in sectors unrelated to AVs.

To balance the transformative potential of AVs with the need to protect workers and vulnerable populations during a transitional period for the workforce, SAFE recommends an approach that combines the pursuit of a rapid deployment of AVs, while at the same time investing in policies and measures that would upgrade our ability to mitigate costs to workers.

<sup>4</sup> Center for Global Policy Solutions, *Stick Shift: Autonomous Vehicles, Driving Jobs, And The Future Of Work*, March 2017.

While SAFE believes the above findings are a significant contribution to any rational discussion regarding the economic and labor impacts of AVs, there remains more work to be done. We are encouraged that the Department of Transportation and Department of Labor will be conducting a comprehensive study on the topic. Below we offer our specific comments to the statement of work, which were drafted with significant input from the authors of *America's Workforce and the Self-Driving Future*.

## Specific Comments Regarding the Statement of Work

### 1. Is the SOW in line with public interest?

Although they are not yet in widespread commercial use, the general public remains intrigued by the near-term possibility of AVs and what they might mean for their lives. While much of the focus has been on the broad societal benefits this technology can offer, AVs have the potential to influence society in profound ways. In this context, societal anxiety about the workforce implications of AVs—and artificial intelligence more broadly—looms large.

SAFE believes that the Statement of Work (SOW), as proposed, is strongly in the public interest and, upon execution, offers the potential to address a key source of anxiety in the AV transition. If a significant portion of the population opposes AV deployment, it can delay or even prevent many of its benefits from being realized.

The proposed study will help policymakers better understand how they should understand, plan for, react to AV development and its potential workforce implications. This will help ensure the nation captures the positive benefits while mitigating or addressing any negative outcomes. SAFE looks forward to working with the Departments throughout the duration of the study and is willing and able to provide its expertise and knowledge on the topic.

### 2. Should the SOW be expanded or reduced to include or exclude any topic(s)?

The Secretary's proposed scope for the Study on the Impact of Automated Vehicle Technologies on Workforce ("Study") would significantly improve our understanding of the impacts of AVs on the workforce. This would, in turn, allow both the private sector and the government to make more focused investments in training and policy, respectively, to both correctly contextualize and mitigate any negative impacts on the workforce.

Therefore, SAFE offers these comments on the scope of the Study as suggestions to help the government better accomplish its goals. The comments are organized according to the four areas of inquiries proposed by the Department. We offer these comments to the Department as suggestions that we believe will enhance this study and increase its relevance and impact for stakeholders including automated driving technology developers, professional drivers, labor representatives and public officials.

#### Acknowledgement

SAFE sought input on the scope of a workforce impact study from many of the economists it worked with in preparing its report *America's Workforce and the Self-Driving Future*. In particular SAFE acknowledges the input of Drs. Erica Groshen, Sue Helper, J.P. MacDuffie, Dick Mudge, and David Montgomery in its response to this request for comments.

## 1. Labor Force Transformation/Displacement

**Scenario Analysis:** The first area of study looks at the pace of potential job displacement from AV adoption as well as the segmentation of drivers into useful categories. In its report, *America's Workforce and the Self-Driving Future*, SAFE formulated a set of scenarios for the adoption of AV technology which were tailored to allow for easier input into models considering the impact of AVs on the labor force. Specifically, SAFE created two scenarios in the light-duty vehicle space, one where personal vehicle ownership continues to dominate personal transportation, and the other concentrating on a scenario in which most personal mobility would be provided by on-demand fleets of AVs. These scenarios allow for testing the sensitivity of labor market impacts to the specifics of AV deployment. Similarly, SAFE divided the heavy-duty scenarios into three broad phases of technological developments, based on their likely job impacts. These categories roughly corresponding to driver assist, highway-only automation, and near-full automation.

In particular, as our study found that the majority of jobs impacted would be in the trucking space, that analysis should be expanded upon to include intermediate phases between highway and full automation. This might include several different models for how Level 4 AV trucks might operate within the broader logistics system. For example, several approaches are currently pursued, ranging from “transfer hubs” where AV trucks only operate autonomously on highways and transfer their freight to non-AVs just off limited-access highways at specialized locations. Another approach is to utilize a teleoperator for some of the journey, especially off-highway segments. These models may have distinct impacts on the workforce, including on required skillsets and the number of positions gained or lost.

SAFE recommends the Department expand the scope of the study to include a broad range of technological and deployment scenarios with an eye to uncovering the key levers determining the impact of AVs on the workforce.

**Intersection of Automation and Human Labor:** One of the most important questions in determining the impact of automation is the amount of human labor that will be required for a given task. Today, it is fairly straightforward to assume that driving a single car or truck takes at least one driver at all times the vehicle is in motion, in addition to additional jobs elsewhere in the value chain (dispatch, maintenance, etc.). Fully quantified, there is more than one person being paid for each mile driven by a professional—the driver and others in the value chain. In a world with AVs, while there will be lower demand for human drivers, there may be other aspects of the driver's job that cannot be automated. For example, the SAFE report modeled, based on expert input and industry surveys, that only 50 percent of a heavy-duty truck driver's job responsibility is actually driving the vehicle, with the remainder of time being spent on other tasks. To better understand the impacts of automation on jobs, it is essential to understand the skill sets and responsibilities of current drivers in all professional driving sectors, as well as others in the value chain.

There are several plausible future pathways for the evolution of labor in driving. Even if there is no professional driver in a vehicle, there may be someone on-board for certain applications such as long-haul trucking (perhaps to safeguard and monitor the freight, for example) or for specialized paratransit services (to help passengers with disabilities embark or disembark), though these jobs could be at a lower skill and pay level than current driving jobs. Additionally, AVs will likely have higher maintenance, fleet management, and monitoring requirements than today's vehicles. Some reports or analysis have made the mistake that the deployment of AVs implies that driving a mile will require zero human labor

input. Adopting this assumption will lead to catastrophic overestimates of the impact of AVs on the workforce. For example, even though some manufacturing sectors have high degrees of automation, there are no “lights out” factories which have no human input.

We suggest that the Department expand the scope of the study to examine the future labor requirements for driving under various implementations of AVs in both the personal and commercial sectors.

**Modal Shift:** While a straightforward analysis suggests that automation will decrease the labor and skill requirements for driving in an AV, there are also likely to be broad structural changes to the transportation sector that increases the total number of miles driven in a revenue-earning context. When these two factors are considered in unison, the impacts on the workforce are less clear.

Therefore, it is essential to consider the impacts of AVs within the broader context of how they will impact transportation. Today, shared, on-demand transportation and public transit make up only a small percentage of household travel.<sup>5</sup> The vast majority of household travel—which takes place in personal vehicles—does not support any professional driving jobs because they are performed by private individuals who do not earn any wages. Therefore, if AVs precipitate a broad shift to on-demand transportation, this has significant potential to create jobs in supporting large fleets of AVs. This may be true even if AVs require fewer driving skills than today’s taxis, because these may be counterbalanced by an increased need for supporting roles such as maintenance, fleet management, remote monitoring, technology creation, and other aspects of AV fleet management.

A similar dynamic could play out in the trucking sector. For example, in a deployment of AV trucks that makes long-haul trucking cheaper and more competitive with other modes, there could be increased need for medium-haul and last-mile deliveries which could offset some jobs lost to automating the long-distance application.

SAFE does not suggest that induced demand will fully offset any job loss. However, a deeper understanding of where jobs will be created and in what quantity will be essential to crafting a targeted and commensurate policy response to AV impacts on the workforce.

SAFE recommends that the Study scope be expanded to examine new sources of labor demand in a broad variety of AV implementations, specifically in the relationship between automating labor in driving applications and resulting induced demand and job creation in other applications.

## Segmentation

The Study seeks a reasonable segmentation scheme for differentiating different subpopulation of drivers with respect to the impacts of AVs. This will be a particularly powerful tool for identifying which subpopulations of drivers will be impacted more than others. SAFE recommends that this segmentation include capturing the demographic and geographical distribution of drivers in each segment, as this will be helpful in forecasting the impact of each segment on the basis of AV deployment timelines and use cases. For example, when conducting its own study, SAFE wished to differentiate the risk of automation related job loss based on the average age of drivers serving short- and long-haul applications, on the

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<sup>5</sup> SAFE, *Transportation Network Companies: Broadening Access and Improving the Efficiency of Travel*, August 2018.

basis that it will take longer for meaningful automation of short-haul routes on more dense and complicated roadways. However, this information was not readily available.

Additionally, as was noted earlier, driving takes place in the context of a broader logistics system, which will not remain static as automation technologies improve. Complementary innovations which further increase the productivity of labor are likely, and may occur in concert with the deployment of automation. For example, matching freight to drivers, deliveries, inspection, and other transactions are currently very labor-heavy processes. Technological development is likely to streamline these processes and may act as a second-order impact, along with AV deployment, on the workforce.

Therefore, SAFE recommends that the driver population be segmented using a methodology that facilitates differentiating the impact of automation based on both the deployment and specifics of AV deployment and on the demographics of driver subpopulations. For each segmentation, the study should consider the potential for complementary innovation in logistics and other areas that could impact the workforce as well.

## 2. Labor Force Training

**Consider non-driving professions:** SAFE strongly recommends carefully expanding the scope of the study beyond driving occupations. We believe that this is consistent with the Congressional intent to understand the future evolution of driving professionals. As referenced earlier, the advent and deployment of AVs will cause a convergence of what are today “driving jobs” and what are now “support jobs”, as driver responsibility will evolve towards including more roles that are currently distinct from driving jobs today (e.g. maintenance, fleet operating, teleoperation).

Additionally, the long-term trajectory of driving jobs is strongly tied to the evolution of jobs in other sectors of the economy. In the model used by the SAFE report, many professional drivers are re-employed in professions that are not driving- or even transportation-related. To understand and best support the transition of drivers to other opportunities, it will be important to understand how AV deployment might impact the long-term evolution of a broader range of professions.

We recognize that historical career paths may not necessarily be a good indicator of future career paths after AV disruption; however, they remain an important springboard from which to think further about policies which can mitigate the effects of AV disruption.

SAFE recommends expanding the scope of AV impacts to other professions beyond drivers. This will help identify where transitional opportunities for all impacted parties are, including for drivers, and will allow the crafting of more specific retraining policies. Additionally, SAFE recommends studying the career paths of former drivers: specifically, in what industries unemployed drivers find new jobs, what occupations they adopt, the duration of their unemployment, and how their wages change. Such an analysis would improve the precision of predictions of AVs’ workforce impacts and inform the design of retraining programs for drivers.

**Data Requirements:** As governments seek to map out policy options for mitigating the impacts of AVs on the workforce, it will be essential to implement a tracking and evaluation pipeline to ensure that any policies implemented are effective and to allow for targeted and more effective policy interventions. This would represent a new area in scope for the Study, but one we believe would add considerably to its long-term efficacy and impact.

The research question can be formulated as: What information is needed about drivers (including numbers, demographics, working conditions, training, employment status, and location) and employers (employment, market segment, plans, training programs, etc.) and their dynamics in order to inform stakeholders, training providers, and policy makers?

The methodology would assess currently available federal statistics and other data sources to identify necessary modifications and additions to fill gaps between the ongoing information needed and what exists.

SAFE recommends expanding the scope of the Study to ensure the adequacy of data for tracking conditions, doing research, and evaluating programs related to the impact of AVs on the workforce.

**Case Studies of Technology Development:** The SAFE study identified examples where the implementation of new technologies was done in conjunction with frontline workers, such as the integration of machine tooling into manufacturing. This history suggests that, at least on some occasions, the participation of impacted workers can create optimal outcomes for both technology and jobs.

SAFE recommends an expansion of the scope of the study to identify other technology advancements that have incorporated frontline worker input into product development and lessons learned from these occurrences. Specifically, case studies should inform policymakers and the private sector how to best integrate input from frontline workers, including appropriate organizational structures for incorporating such input.

#### 4. Quality of Life Effects Due to Automation

**Better Quantify Impacts on Disability Community:** The Study seeks to quantify the impact of AVs on transportation-disadvantaged populations. SAFE's 2017 report *Self-Driving Cars: The Impact on People with Disabilities* suggested that as many as 2 million persons with disabilities could gain access to employment opportunities with better transportation options.

SAFE believes that further analysis is required to realize this positive outcome. In particular, SAFE a study which details the demographics and location of people with disabilities, their transportation needs, and proximity to job centers would help assess the economic feasibility of serving this transportation-disadvantaged community through AVs or other transportation technologies. This "market-sizing" study would help guide both policymakers and the private sector in developing technology and services to better serve the disability community.

SAFE recommends expanding the scope of the Study to include a study of the specific transportation needs of persons with disabilities, their geographic distribution, and the potential cost of serving the mobility needs of this community in a variety of AV deployment and technology scenarios.

**Better Health Outcomes:** Reducing vehicles accidents will have significant positive health impacts on the American worker. NHTSA estimated that, as far back as 2010, \$100 billion of household and market productivity was lost due to vehicle crashes.<sup>6</sup> Reducing crashes through automation can reduce absenteeism and its cost on the economy.

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<sup>6</sup> NHTSA. *The Economic and Societal Impact Of Motor Vehicle Crashes, 2010*, May 2015.

SAFE recommends expanding the scope of the Study to quantify increases in worker productivity that would result from the deployment of improved safety technology and its impact on a range of professions.

**Increased Access to Jobs:** SAFE's report *America's Workforce and the Self-Driving Future* conducted analysis of how AVs might enhance the productivity of commuting workers and enable residents of economically disadvantaged areas to commute more easily to a broad range of jobs.

Widespread introduction of AVs has the potential to reduce unemployment and improve productivity by extending the range of tolerable commuting distances, and these benefits should be properly analyzed. For example, geographic information system (GIS) databases can be used to estimate increases in the radius of job searches for a sample of cities, based on increases in average speed and lower penalties for travel times. By using available job search models and occupation data for businesses and households, we can estimate how AV implementation will reduce average job search times and create a larger, improved pool of opportunities for job matching.

SAFE recommends expanding the scope of the Study to better understand how AV technology can foster more productive commutes for workers and how access to easier commutes might influence employment trends at national, regional, and local levels.

### **3. Are there specific literature or studies that have been conducted on this subject that DOT and DOL should review before initiating this comprehensive analysis?**

As the notice of request for comments acknowledges, SAFE has already conducted significant work examining AVs potential impact on the workforce. We encourage the Departments to review *America's Workforce and the Self-Driving Future* in full ([https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future\\_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf](https://avworkforce.secureenergy.org/wp-content/uploads/2018/06/Americas-Workforce-and-the-Self-Driving-Future_Realizing-Productivity-Gains-and-Spurring-Economic-Growth.pdf)), as well as the underlying studies authored by the economists themselves (<https://avworkforce.secureenergy.org/economist-reports/>).

In addition to what is available on SAFE's website, we have additional unpublished material, literature reviews, and data from our underlying models used in the study. We believe that these materials may be of use when conducting the upcoming workforce study. SAFE may be able to provide additional information or underlying data that may be of assistance to the Departments and looks forward to a dialogue on the topic.

### **Conclusion**

SAFE looks forward to working with the Office of the Secretary and the Department on this critical study and other topics related to vehicle automation. We would welcome the opportunity for further discussion.

Thank you for considering SAFE's comments. Should you have any questions related to these comments, please direct them to Dr. Amitai Bin-Nun at [abinnun@secureenergy.org](mailto:abinnun@secureenergy.org).

Respectfully submitted,

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