



# State Transportation Fleet Adoption of Alternative Fuel Vehicles

## Workshop Summary Report

June 9, 2016

Hosted By: TxDOT/ODOT/U.S. DOT-FHWA  
Monday April 18, 2016  
Texas Department of Transportation, Austin, TX

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*This workshop was held as part of the Deployment of Alternative Vehicle and Fuel Technologies initiative, a joint project of Oregon Department of Transportation and other state DOTs, along with the U.S. Department of Transportation's Federal Highway Administration. The initiative is being supported by The Cadmus Group, Atlas Public Policy, and Vermont Energy Investment Corporation.*



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## Background

In June 2014, the Oregon Department of Transportation (ODOT) and the U.S. Department of Transportation's Federal Highway Administration (FHWA) initiated a pooled fund to assist state and local transportation agencies interested in promoting the use of alternative vehicle and fuel technologies at a state, regional, or corridor scale and provide tools, information, and knowledge to do so. The Deployment of Alternative Vehicle and Fuel Technologies initiative will implement a series of workshops around the country and develop a "toolkit" for state and local transportation agencies that will facilitate their deployment of alternative fuel vehicle and related technologies.



## Workshop Summary

The Texas Department of Transportation (TxDOT) hosted the third workshop under this initiative, titled “State Fleet Adoption of Alternative Fuel Vehicles,” on April 18, 2016. Attendees included federal, state, and local transportation officials; Clean Cities coalition members; industry and non-profit representatives; automakers; alternative fuel suppliers; alternative fuel infrastructure providers; and local government association members. The workshop featured presentations to provide context for alternative fuel use in state fleets and breakout sessions to focus on the challenges and opportunities state departments of transportation (DOTs) face when adopting alternative fuel vehicles (AFVs) within their fleets. All speaker presentations are available online at <http://altfueltoolkit.org>.

### Key Outcomes

The workshop consisted of presentations and breakout sessions intended to identify the barriers DOTs face in transitioning their fleets to AFVs, and opportunities to overcome these barriers. Breakout sessions in the morning were organized around types of alternative fuels commonly used in DOT fleets including natural gas, propane, biofuels, and electricity. For each group, DOTs presented their experiences with the fuels and all participants were encouraged to share in identifying issues and factors critical to successfully transitioning fleets to AFVs. In the afternoon, discussions focused on procurement and financing of AFVs; and fuel and emission reduction technologies and policies. The following are some of the key outcomes from the day as identified by workshop participants:

- Alternative fuels are being used in state DOTs in increasing quantities. AFVs’ share of the total fleet is still low in most cases, but several states are making significant investments in AFV fleet vehicles.
- The availability of fuel and vehicles that meet DOT fleet duty specifications are limiting factors in AFV adoption. Alternative fuel use patterns vary by region because of feedstock and fuel production availability, fuel performance considerations (e.g., gelling of biodiesel in cold weather), and infrastructure availability.
- A key barrier to the adoption of AFVs in DOTs is acceptance of the technology by drivers, managers, and maintenance crews at state DOTs.
- The cost to upgrade facilities for natural gas vehicle maintenance and fueling activities can be a significant barrier to compressed natural gas (CNG) vehicle adoption.
- For geographically large states, a key challenge is identifying where in the state and in which vehicle applications to use alternative fuels.
- Piloting fuels in small test fleets under controlled environments fosters the development of lessons learned and best practices, ultimately lowering the cost of AFV adoption in fleets.
- In emergency response situations (e.g., hurricane and flooding events), state DOTs need fast-fill fueling options or bi-fuel vehicles to ensure critical operations are not impeded.



- Tracking of vehicle drive cycles and daily miles (via telematics) can be an important initial step before deploying AFVs with range restrictions, like all-electric vehicles and CNG vehicles.

### ***Action Plan***

In order to address the goals, barriers, challenges, and objectives to AFV and infrastructure deployment in DOT fleets outlined in the section above, an online toolkit accompanying this workshop is available at <http://altfueltoolkit.org>. This toolkit features a resource library of guides, websites, tools, and research reports intended to provide state DOTs with relevant information related to fleet adoption of AFVs. In addition, the toolkit provides summaries of AFV programs in seven DOT fleets, a fact sheet on renewable diesel, and a guide that compares several alternative fuels in terms of their relative emissions, price, and infrastructure availability. The toolkit is accompanied by the AFV Planning Guide, an interactive guide showing a progression of actions state DOTs can take to advance through stages of engagement on AFVs, from no engagement (“Starting Points”) to advanced engagement (“Leader”).



## Workshop Proceedings

### Welcome and Introductions

#### **Dalton Pratt, Statewide Fleet Division Director, Texas Department of Transportation**

*Note: because Marc Williams, Deputy Executive Director, Texas Department of Transportation was unable to attend the workshop due to an emerging regional flooding crisis, Dalton Pratt, Statewide Fleet Division Director, TxDOT, provided remarks on his behalf.*

- Welcomed participants to the workshop.
- Indicated that TxDOT is proceeding forward by building a fleet system from the ground up that is sustainable and healthy for the air and environment.
- Highlighted that there were several bills in the last legislative session that would provide incentives for expanding the use of alternative fuels in state fleets. While these bills did not ultimately go through, TxDOT has been receptive to the message the bills sent and is prepared to act on any legislation that may be put forth in the future.
- Noted that the Texas Commission on Environmental Quality and the Texas Railroad Commission both play a big role in expanding the use of alternative fuels throughout the state.
- Highlighted that Texas natural gas production was 640 billion cubic feet in October of 2015, making it a good resource for its state fleet. Additionally, new CNG stations are frequently being installed throughout the state. The vehicle Dalton drives for the state is a bi-fuel CNG/gasoline pickup truck, which typically only uses CNG.
- Indicated that TxDOT has acquired a ten-yard CNG dump truck and is piloting it in order to learn the capabilities and challenges of using an AFV of this size. This type of truck is the most universally used piece of equipment, used for functions such as high water rescues, paving season, and snow/ice removal.
- Noted that Texas has a population of 27 million and growing, along with five metro areas that face air quality issues and an energy sector that is of concern. With a fleet of 13,000 vehicles, TxDOT has a chance to make an impact on these issues. The fleet has vehicles that use propane, CNG, biodiesel, and electricity.
- Introduced his team at TxDOT that works on alternative fuel issues: Bob White, Fleet Services Section Manager; Lee Christensen, Alternative Fuels Program Manager; Dave Irwin, Special Projects Coordinator; and Darah Waldrup, Information Specialist.

#### **Kirk Fauver, Statewide Planning Engineer, FHWA Texas Division**

*Note: Because Michael Leary, Director of Planning and Program Development, FHWA Texas Division, was unable to attend the workshop, Kirk Fauver, Statewide Planning Engineer, FHWA Texas Division, provided remarks on his behalf.*

- Provided an overview of the Congestion Mitigation and Air Quality Improvement (CMAQ) Program:
  - Program established in 1991 and provides flexible funding for transportation projects in order for states and local governments to meet Clean Air Act requirements.
  - Funding under this program includes funding for fleet conversions.
  - Fleet conversion projects are no longer required to be part of a state's state implementation plan (SIP) but they must demonstrate that the conversion reduces pollutants.
  - 80% of funding comes from federal sources and 20% comes from local sources.
- Explained that under older air quality standards, Texas had three areas categorized as being in "nonattainment." The state now had five areas out of attainment under the newer standards.
- Indicated that Texas' programs are aimed at alternative fuel purchases, conversions, and stimulating development of alternative fuel infrastructure.
- Noted that Texas recently joined 15 other states to sign a memorandum of understanding (MOU) to stimulate demand for natural gas vehicles ([see link](#)).

## **Diane Turchetta, Transportation Specialist, FHWA**

- Thanked TxDOT for hosting the workshop.
- Explained that FHWA initiated a pooled fund intended to help state DOTs and metropolitan planning organizations (MPOs) interested in accelerating alternative fuel use through a series of workshops. The contributors to the pooled fund determine the topic areas of the workshops, and both TxDOT and North Carolina Department of Transportation (NCDOT) showed an interest in discussing AFVs in fleets.
- Provided an overview of the <http://altfueltoolkit.org> website associated with the pooled fund. The website is under development, and is currently a repository for workshop materials and associated resources. Eventually it will feature an interactive tool for state DOTs and MPOs to use to see where they fall in terms of their expertise on AFVs and how to overcome barriers to AFV deployment.
- Noted that there is a provision in the Fixing America's Surface Transportation (FAST) Act that directs the U.S. Secretary of Transportation to designate alternative fuel corridors. FHWA is working with the Office of the Secretary to roll out the provision and will hold listening sessions for stakeholders to provide their thoughts on how the program should be rolled out. FHWA will develop a solicitation and criteria, and a Request for Information (RFI) will go out this summer. The alternative fuel corridor designations will be determined in the September/October timeframe.



## Overview of Alternative Fuels

Mike Scarpino, Transportation Project Engineer, US DOT Volpe Center

- [See presentation for more information](#)
- The Volpe Center's work is entirely funded by project sponsors.
- The [Energy Policy Act \(EPAct\)](#) of 1992 mandated that 75% of new light-duty vehicles acquired by covered federal and [state fleets](#) must be AFVs. This includes hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, fuel cell electric vehicles, biodiesel vehicles run on B20 or greater, and advanced lean burn vehicles.
- Overview of alternative fuels:
  - Natural gas
    - Renewable natural gas, which is produced from decomposing organic matter, has garnered interest due to its lower greenhouse gas emissions compared to conventional natural gas and because it generates Renewable Identification Numbers (RINs) under the national Renewable Fuel Standard (RFS) and credits under California's Low Carbon Fuel Standard.
    - Some of the benefits of natural gas include:
      - Abundant domestic availability
      - Low and consistent fuel prices
    - Some of the considerations associated with natural gas include:
      - Limited driving range depending on tank space
      - Infrastructure costs/availability
    - CNG is typically used for with light-, medium-, and heavy-duty vehicle applications, while liquefied natural gas (LNG) is used for heavy-duty vehicle applications.
    - More original equipment manufacturer (OEM) models are becoming available for medium and heavy duty applications.
    - Over 70% of new refuse haulers run on natural gas.
    - Some fleets prefer to own and operate their own stations while others use third-party operators.
    - Time-fill stations work well for centrally-based fleets that can fuel slowly and are much less expensive than fast-fill stations that can fuel in minutes.
    - The Kansas City Public School system replaced a portion of its bus fleet with CNG buses and are saving money each month while displacing petroleum and lowering their greenhouse gas (GHG) emissions.
  - Propane

- Similar environmental impacts as natural gas.
- More OEM products that support propane use are becoming available.
- Low mileage vehicles are typically not good candidates to be converted to propane.
- There are many medium-duty applications, such as delivery vehicles.
- Propane gas is becoming increasingly popular with school buses.
- Infrastructure costs can be low relative to CNG.
- As an example, the Indiana DOT funded a comprehensive propane project through the American Recovery and Reinvestment Act of 2009, which has led to significant cost savings.
- Biodiesel
  - Biodiesel production fluctuates with policy signal from producer tax credits, RINs in the RFS, and credits from LCFS.
  - Benefits of biodiesel include being able to use it with any diesel vehicle in up to 5 percent blends. The main disadvantages are the higher price, fuel availability in some regions, and gelling in colder months.
  - Resources exist through the [National Biodiesel Board](#) and [Department of Energy](#) to help determine whether there are engine compatibility or warranty issues with using biodiesel.
  - If storing biodiesel above ground, storage tanks should be insulated in temperatures below 30 degrees Fahrenheit.
- Electricity
  - One of the main benefits of electricity for battery storage is having zero or low tailpipe emissions. All emissions are associated with the electricity generation and transmission.
  - Some of the considerations with this fuel are higher initial vehicle costs and driver range anxiety.
  - Light-duty vehicles are the most common application, though interest in using medium- and heavy-duty vehicles has increased in recent years.
- Ethanol
  - Most ethanol in the U.S. is blended with neat gasoline at up to 10% blends (i.e. E10). E85 fuel is popular in the Midwest and is typically blended at 51-83% ethanol.
  - One of the considerations with ethanol is that it lowers fuel economy by 10-20% compared to gasoline due to its lower energy density.
  - There are 16-17 million flex fuel vehicles on U.S. roads, capable of running on E85.



- As an example, the City of Hoover, Alabama had flex fuel vehicles in their fleet and began using E85. This led to improved local air quality, decreased GHG emissions, and increased energy security.
- While it's challenging to make direct comparisons, data exists showing the life cycle GHG emissions per mile for various vehicle types.

**Question: Have there been any assessments comparing the water use of the different fuel types?**

- The U.S. Department of Energy (DOE) recently completed a [report on water consumption for light-duty vehicles](#).

**Question: Why does the ethanol credit go to the fuel producer instead of the end user?**

- Most biofuel incentives in the U.S. go to the fuel producer and fuel blender (i.e. the firm that blends the fuel with gasoline or diesel). This encourages additional production and provides a long-term signal to producers that their fuel will be used.

## Morning Breakout – Fuels

### Group A: CNG / Propane

- [See State DOT Fact Sheets for more information](#)
- Clay Norrell, Fleet Manager for the Oklahoma Department of Transportation and Dalton Pratt, Statewide Fleet Division Director for TxDOT provided an overview of their experiences with CNG within their fleets.
- During discussions that followed the overviews, the following items emerged as key highlights:
  - Planning and evaluation are crucial before making any vehicle purchasing decisions.
    - Having a mandate or guidelines to incorporate AFVs can sometimes lead to a lot of trial and error with different vendors and different vehicle types.
    - Fueling infrastructure, and access to appropriate servicing must go hand in hand when locating AFVs.
    - Conducting a thorough and comprehensive pilot with one vehicle type can provide fleet managers with the knowledge necessary to know what to outline in specifications for larger vehicle purchases, resulting in more informed and cost-effective decisions.
  - Knowing how to spec and maintain vehicles is key to their successful integration within the fleet.
  - There are many moving parts when it comes to AFV adoption within fleets, and striking the right sequencing is crucial. For example, paying mechanics to receive CNG training is a great idea, but it needs to be done in conjunction with or before upgrading facilities to allow for CNG maintenance.
  - Institutional barriers with employees showing hesitation towards trying new fuels persist.

- It's important to strike a good balance between fast-fill and slow-fill systems. While slow-fill may work well in day-to-day operations, it may not work well in emergency scenarios. In some cases, even vehicles not designated for emergency use may be needed for emergencies.
- Fleet management software and mobile apps can help fleet managers track driver behavior with AFVs and determine distribution of fuel usage in cases of bi-fuel vehicles.
- It's important for fleet discussions to transition from anecdotal to fact-driven, so that any shortcomings of a particular AFV are not automatically attributed to its characteristic of being an AFV.
- The bid process to date does not adequately take into account associated maintenance for vehicles.
- In some situations it may be more cost-effective to have vehicles receive commercial service rather than upgrading state-owned facilities to accommodate AFVs.
- Utilizing bi-fuel vehicles can be one way to overcome a shortcoming in alternative fuel infrastructure. However, bi-fuel vehicles can eliminate environmental benefits when the vehicle is run entirely on the conventional, fossil fuel.
- It's important to build redundancy with compressors in emergency operations stations.

## Group B: Renewable Fuels

- [See State DOT Fact Sheets for more information](#)
- Gina Campoli, Environmental Policy Manager for the Vermont Agency of Transportation (VTrans) and Bruce Erickson, Fleet Services Manager for the Oregon Department of Transportation provided an overview of their experiences with biodiesel within their fleets.
- During discussions that followed the overviews, the following items emerged as key highlights:
  - One challenge encountered with biodiesel can be washing out diesel tanks properly before filling with biodiesel.
  - It's important to perfect the scheduling of winter and summertime biodiesel.
  - Although many state DOT employees were initially skeptical of using biodiesel, after a few years, concerns were mitigated as drivers and maintenance crews became accustomed to working with the fuel.
  - Introduction of multiple fuels during a single year multiplies the burden on state DOTs, particularly on vehicle and maintenance crews. For example, ODOT introduced both biodiesel and low sulfur diesel in the same year, creating problems with fuel storage tanks.
  - State DOTs use varying blends of biodiesel throughout the year. For example, ODOT uses B20 during warmer months and B5 in colder months.
  - Even with the biodiesel tax credit and RFS incentives, there is still a small premium for biodiesel. For example, ODOT pays ~\$0.20/gallon more for B20 than diesel.



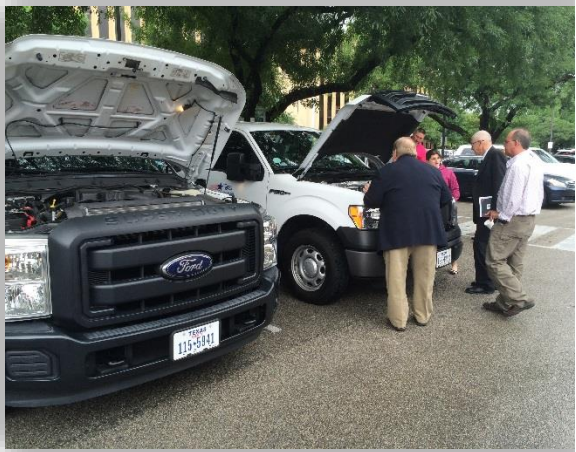
### Group C: Electric Power

- [See State DOT Fact Sheets for more information](#)
- Georgina Willner, Fleet Sustainability Coordinator for the Washington State Department of Transportation (WSDOT) and Jeremy Matsuo, Senior Equipment Engineer for the California Department of Transportation (Caltrans) Division of Equipment provided an overview of their experiences with electric power within their fleets.
- During discussions that followed the overviews, the following items emerged as key highlights:
  - Most plug-in electric vehicles in use in state fleets are light-duty vehicles. Currently, few options for large electric pickup trucks are available on the market, but availability of these types of vehicles is anticipated to increase in the future.
  - Plug-in hybrid electric vehicles which can run on either electricity or gasoline are generally easier to integrate into fleets than all electric vehicles which have more limited range. This may change in the future as more affordable all electric vehicles with 200+ mile range become available.
  - Deploying charging infrastructure at existing facilities is challenging. The best approach is to build electrical capacity in as part of new facilities or larger redevelopment projects. Caltrans is also experimenting with an off-grid solar PV option for charging. Locating charging equipment by alternating parking spaces can increase the utilization by increasing the number of spaces the charging cords can reach without overlapping.
  - State properties may be a good option for hosting public charging, most likely through public-private partnerships with utilities or other entities supporting charging infrastructure development.
  - The variety of electric vehicle charging networks presents challenges for fleets which are used to agency fueling cards. Industry is working on solutions which will allow network interoperability.
  - Outreach and training is key to ensuring proper usage. For example, WSDOT organized ride and drive events to showcase electric vehicles (EVs) and increase staff familiarity with the technology. New EV assignments were accompanied by one-on-one training sessions showing vehicle users how to operate and charge vehicles and understand range limitations.
  - Leasing instead of purchasing vehicles can allow government agencies to access tax federal tax credits of up to \$7,500 per vehicle. This approach may be especially helpful in turning over fleet use of all electric vehicles as rapid technology improvements bring enhanced range and charging options.



## ***TxDOT CNG Pickup Truck Demonstration***

Following lunch, participants had the opportunity to view two CNG pickup trucks that are part of the TxDOT fleet and discuss with Dalton Pratt and other workshop participants. For more photos, view the [Photo Gallery](#) from the workshop.



## ***Partnering with Clean Cities/Clean Cities Tools & Resources/National Fleet Programs***

**Linda Bluestein, Clean Cities Co-Director, US DOE**

- [See presentation for more information](#)
- Clean Cities works at both the local and national level.
- The mission of Clean Cities is to drive sustainability with clean fuels and advanced vehicles for energy, environment, and economic security.
- Clean Cities originally focused on the fuels mentioned in the EPAct but have since incorporated work on fuel economy, idle reduction, and smart mobility.
  - Smart mobility refers to data-driven solutions for cities, which can include working with sensors to ease traffic and congestion.
  - Clean Cities is interested in understanding how connected automated vehicles can save energy.
- Clean Cities goals were originally focused on petroleum reduction, and they have now branched out into GHG emission goals.
- The Clean Cities national program works with major national stakeholders as partners, as well as OEMs and fuel provider organizations.



- Clean Cities coalitions forge partnerships and find funding sources for projects. They also provide outreach and education, mainly to fleets.
- At the national level, Clean Cities seeks a reduction in petroleum consumption through the following five major activities:
  - Consumer information, outreach, and education
  - Technical and problem solving assistance
  - Coalition training and stakeholder coordination
  - Identification/tracking of essential program metrics
  - Competitively-awarded financial assistance
- Clean Cities offers about \$4 million in assistance per year.
- Resources and tools provided through the [Alternative Fuels Data Center](#) include:
  - Written and video case studies.
  - A petroleum reduction planning tool, which shows how building a particular type of fleet can help reduce petroleum.
  - The Alternative Fuel Life-Cycle Environmental and Economic Transportation (AFLEET) tool, which users can use to put in information about their current fleet to see petroleum use, cost of ownership, and air pollutant and GHG emission information.
  - A vehicle search tool, which can be used to compare all classes of AFVs.
  - Laws and incentives related to AFVs.
- [Fueleconomy.gov](#) is a consumer facing website for those that want to compare different types of cars and is one of the most frequently used federal websites.
- Publications and outreach materials provided by Clean Cities include handbooks for fleet managers and information for station owners.
- Clean Cities works in partnership with MotorWeek, which conducts a segment every other week that focuses on an AFV success story. These segments can provide ideas about what can be done fleet-wide.
- The [Alternative Fueling Station Locator](#) shows more than 20,000 public and private fueling and regarding stations. The map includes all alternative fuels and is compiled using data from alternative fuel providers.
- Financial assistance projects funded by Clean Cities have included community readiness projects which have resulted in long-term partnerships and best practices, and plans to incorporate alternative fuels into emergency response and preparedness operations.
- Clean Cities coalitions can help state fleets forge partnerships and find funding for AFV projects. Some coalitions are establishing programs to bring recognition to sustainable fleets.
- The National Clean Fleets Partnership (NCFP) program features 27 national private fleet partners.

- The biggest lesson learned from the program is that the partnership has bridged the gap on alternative fuels.
- The private fleets, which are very large and often distributed nationally, initially had a lot of institutional barriers. The fact that these large fleets have been able to overcome those barriers and achieve success with AFVs can serve as an inspiration for state fleets.
- Sharing fueling infrastructure and planning it in a holistic way has been very beneficial to the private fleets.
- The [NCFP website](#) features many success stories and a partner project for each of the 27 fleet partners.

***Question: How does Clean Cities balance alternative fuel work vs idle reduction/technologies work?***

- Clean Cities has an all of the above approach, though funding for idle reduction has traditionally been given out by U.S. DOT, not DOE.

***Question: Where does information provided to the Energy Information Administration end up?***

- There is a website (<https://www.eia.gov>) devoted to that information. It is used to create reports mandated by Congress.

***Question: Current funding is based on emissions reductions, but are there any sources of funding based on petroleum reduction goals?***

- Clean Cities funded a lot of petroleum reduction projects through 2009 but is now more focused on GHG reductions.
- It's important to use [grants.gov](#) as a resource, as there may be funding available from other agencies.

## ***Afternoon Breakout – Procurement / Fuel Reduction Technologies***

### **Group A: Procurement**

- During the discussion, the following items emerged as key highlights:
  - It's important to write specs in such a way that when going out to procurement, the agency gets the performance and capabilities required for a piece of equipment without dictating exact details (e.g., gear ratios) which may require changes from standard OEM practices.
  - DOTs and other fleets are searching for value in their procurement efforts to stretch limited dollars as they replace aging fleet vehicles.
  - Buy-back programs where DOTs sell fleet equipment back to suppliers after a period of time can be a cost effective way to keep fleets current.
  - Some states are procuring fueling infrastructure through Design-Build-Operate-Maintain contracts with private sector fueling providers. Typically these agreements set a pricing formula for fuels which allows DOTs to spread the cost of the infrastructure over time.



- DOTs sometimes bundle in training for maintenance staff as part of vehicle purchases. For example, WSDOT has required eight hours of manufacturer training on vehicle maintenance as part of past procurements.
- There is interest in pooled purchases of vehicles, sharing fueling stations, and developing consistent specs across DOTs.
- Public sector fleets are often limited in their ability to provide services to the public because of liability and tax collection issues. Normally fueling is done "inside their fence" or at privately-owned locations open to the public.
- It's important to take feedback from operators into consideration in procurement efforts.
- The drop in the oil prices makes AFVs more difficult to justify. For example, the price of biodiesel has been consistent so when petroleum drops there is less interest in biodiesel.
- Some states have done innovative things to adopt alternative fuels. For example in Vermont, they can justify the price of a light-duty fleet EV because they are required to meet an overall average cost for vehicle purchases, so they balance EV purchases with lower cost "basic" vehicles.

### Group B: Fuel Reduction Technologies

- Jeremy Matsuo, Senior Equipment Engineer for Caltrans, provided an overview of the agency's experience with telematics within the fleet.
- During discussions that followed the overview, the following items emerged as key highlights:
  - Using telematics terminology, as opposed to GPS, shifts conversations to focus on key data that can be gathered about fleet vehicles rather than employee tracking. Ultimately the most useful information to know about fleet vehicles are things such as idling times, not necessarily the vehicle mileage or location.
  - Piloting telematics with one particular vehicle type or portion of the fleet can cause friction among employees. Implementing telematics across the entire fleet at once can circumvent such issues so that no portion of the workforce feels like they're being targeted.
  - It's important to ensure compatibility between a telematics system and any already existing fleet management software.
  - While telematics may be initially incorporated for one reason, such as streamlining reporting, it can result in side benefits such as:
    - Fuel savings
    - Reduced speeds
    - Having a way to audit idle policy compliance

- Gaining the ability to analyze cross sections of a fleet to determine where to focus training and educational efforts
- Improvements in maintenance
- Reduction in smog checks
- Increased recovery of stolen vehicles
- Reduction in unauthorized trips in fleet vehicles
- Ability to follow up on public complaints more easily
- Some employees may be reluctant to use telematics as they may feel like they're constantly being watched (the "big brother" syndrome).
- Below are two approaches that can be taken in regards to incorporating telematics within a fleet:
  - Outlining the exact data requirements you will need and approaching companies that can prove upfront they can meet these requirements.
  - Tailoring internal procedures to meet the capabilities of the telematics software instead of trying to customize the software.
- There is growing interest in idle-reduction and truck-stop electrification.
- Other strategies to reduce fuel use that do not require conversion to AFVs are:
  - [Fuel efficiency upgrades to existing vehicles.](#)
  - Reducing vehicle use in general through sustainability measures like complete streets and encouraging alternative modes of transportation.
  - Encouraging telecommuting.
  - Car sharing among urban vehicles and using the cost savings to fund AFVs.

## ***Identify, Develop, and Refine Promising DOT AFV Fleet Transformations***

Participants were provided with a demonstration of what the online toolkits for each pooled fund workshop will generally look like and were shown a draft version of the AFV Planning Guide, which helps government managers step through the process of AFV engagement, from the early stages of learning ("Getting started") to advanced stages of engagement ("Leaders"). Participants were asked what types of resources would be helpful to have for the toolkit that emerges from this workshop. Below are highlights of their suggestions:

- Information on renewable diesel.
- Information on telematics, including how to spec systems out, what kind of data to ask for, best practices, lessons learned, and example bid language.
- Information on costs incurred to upgrade facilities for CNG vehicles.

Below are additional suggestions and comments made by participants in the final session:

- Clean Cities will be hosting a [series of workshops](#) on conducting facility upgrades for AFVs.

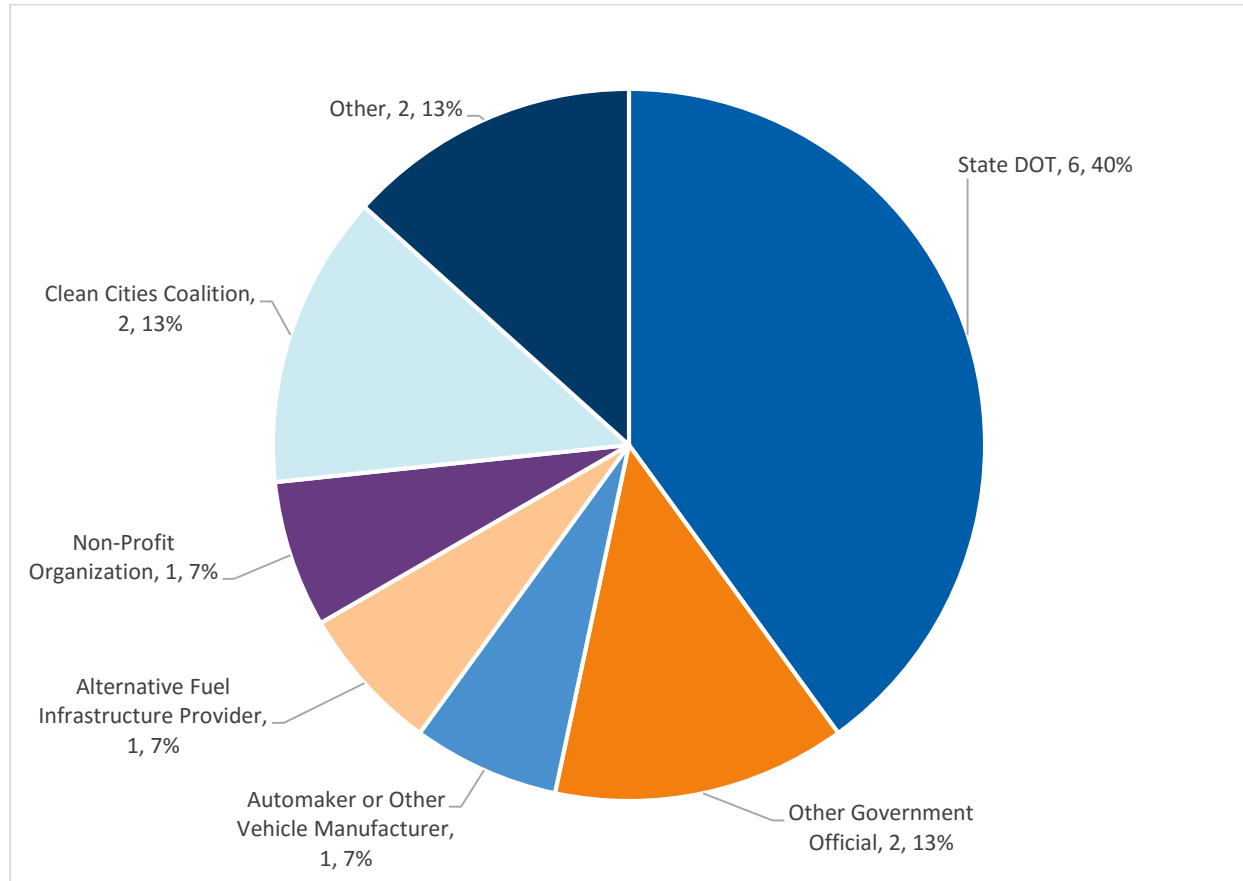


- State DOTs often host webinars on subjects related to AFVs so it would be good to get information about those webinars out to other DOTs.
- While it may be best suited as a topic for the upcoming workshop focused on the states that were signatories to the zero-emission vehicle memorandum of understanding (ZEV MOU), one issue that needs to be addressed is AFVs not contributing to the gas tax.
  - Some states are working on solutions to this issue, such as imposing end user fees on AFV drivers of launching into vehicle miles traveled-based approaches.
  - States must be prepared to address this issue, as it is on the minds of many state legislatures.
  - AFVs currently play a very minor role in the decline of contributions to the Highway Trust Fund. A larger issue is the increase in average fuel economy of light and heavy duty vehicles.
  - There needs to be a balance between AFV drivers paying their own way and incentivizing adoption of AFVs.
  - Alex Schroeder from the National Renewable Energy Laboratory created a primer about this topic which is accessible at [http://www.afdc.energy.gov/uploads/publication/motor\\_fuel\\_tax\\_primer.pdf](http://www.afdc.energy.gov/uploads/publication/motor_fuel_tax_primer.pdf).
- The fleet manager contact list through the Equipment Management Technical Services Program (EMTSP) of the American Association of State Highway and Transportation Officials (AASHTO) could be a good way to disseminate information about AFVs to fleet managers.
- Clean Cities coalitions use a SharePoint site where they can ask each other questions and share requests for proposals related to AFVs. This is something DOT fleet managers interested in using AFVs may also want to pursue through partnerships with FHWA, AASHTO, Clean Cities or others.

## Summary of Workshop Evaluations

An online survey was distributed to workshop attendees on April 20, 2016. The survey was intended to assess the effectiveness of the workshop, help build the workshop toolkit, as well as inform the development of future workshops. A total of 15 attendees responded, and their answers are summarized below.

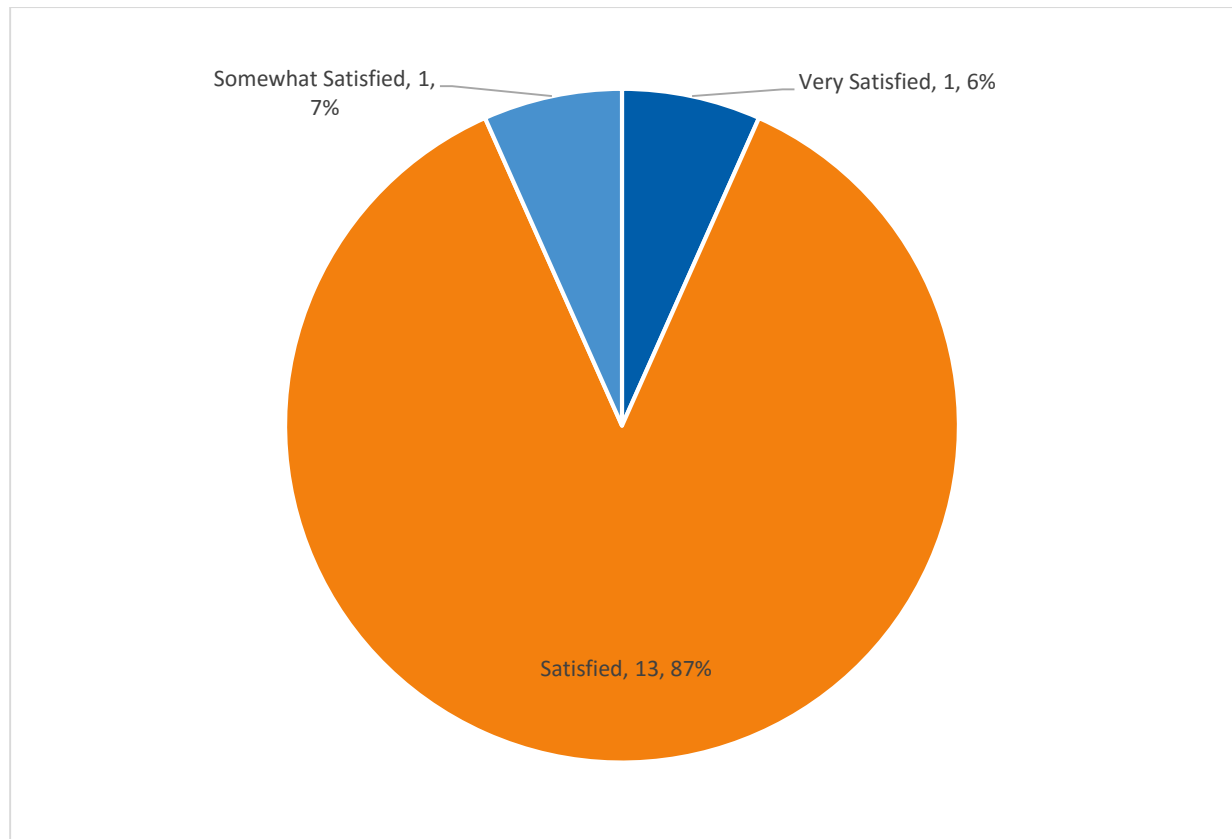
**Figure 1. What best describes your role in AFV deployment?**



Out of those that responded to the survey, most were state DOT representatives, while the rest were divided among several different categories such as Clean Cities coalition members and other government officials. One of the respondents who selected “Other” indicated they were from an alternative fuel system manufacturer while the other was from an organization that supplied propane and provided propane conversions and infrastructure.



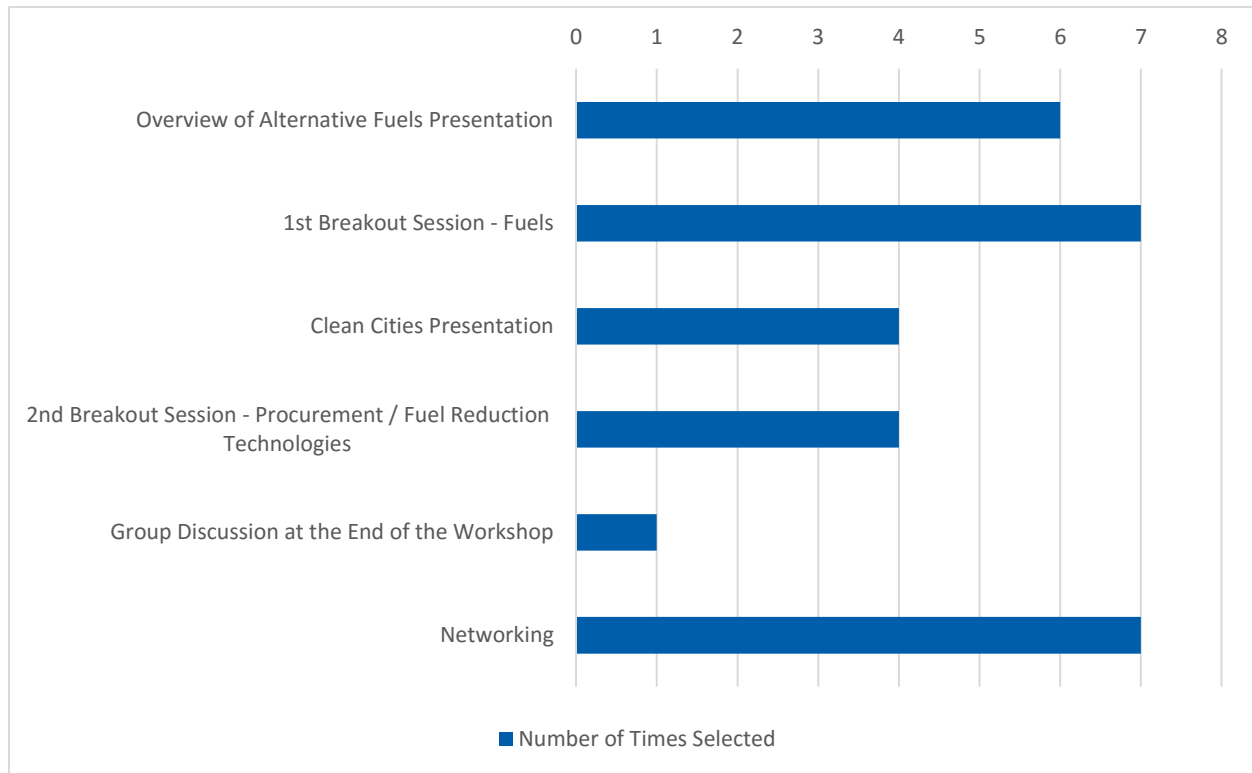
**Figure 2. How satisfied were you with the overall content and organization of the workshop?**



The vast majority of respondents (93%) were either satisfied or very satisfied with the overall content and organization of the workshop. No respondents indicated that they were “Not Satisfied,” which would have required further explanation.



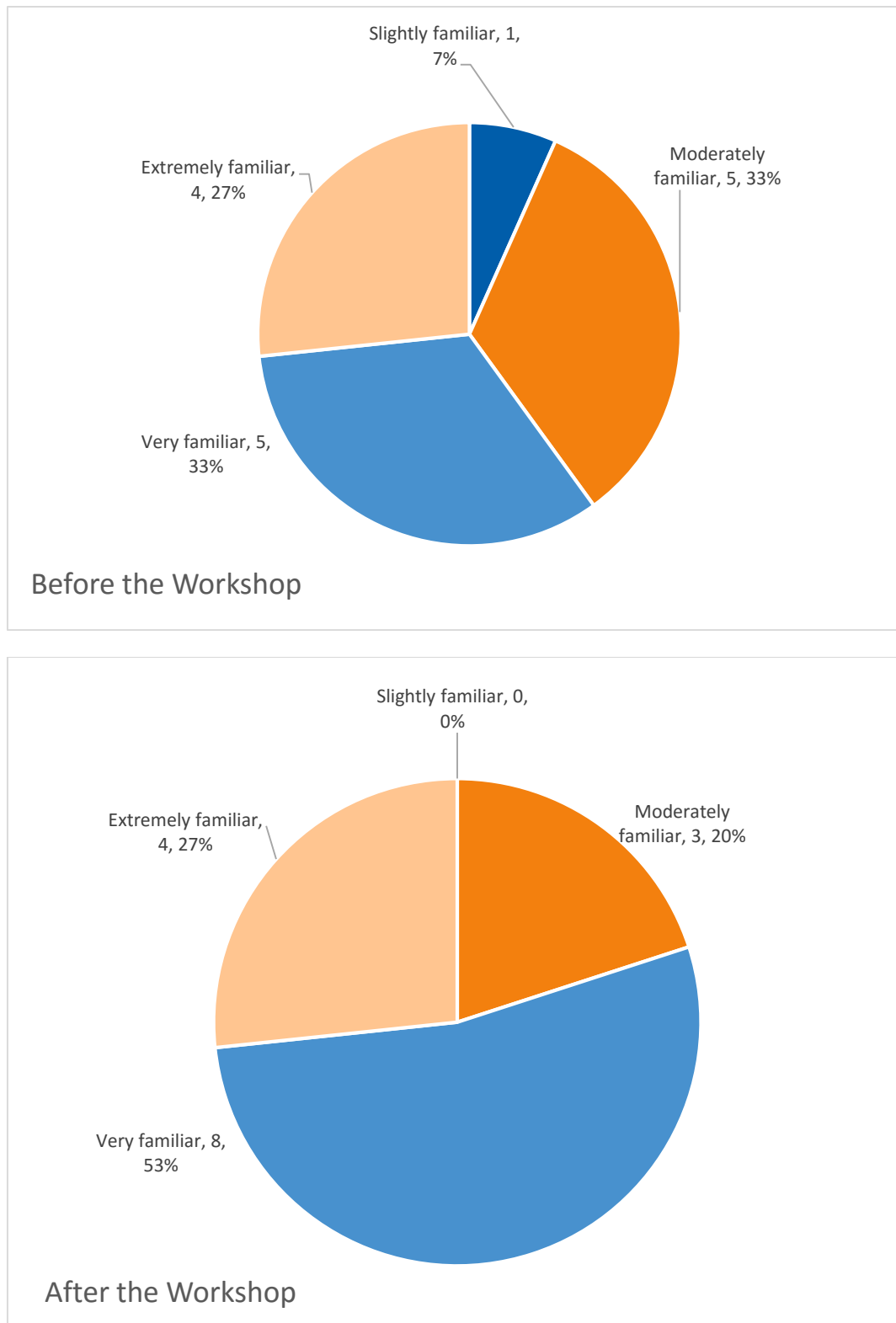
Figure 3. What were the most valuable aspects of the workshop for you?



Survey respondents found that the first breakout session focused on fuels and networking were equally the most valuable portions of the workshop, with the presentation providing an overview of alternative fuels being a close second choice. Respondents were allowed to select more than one answer to this question.

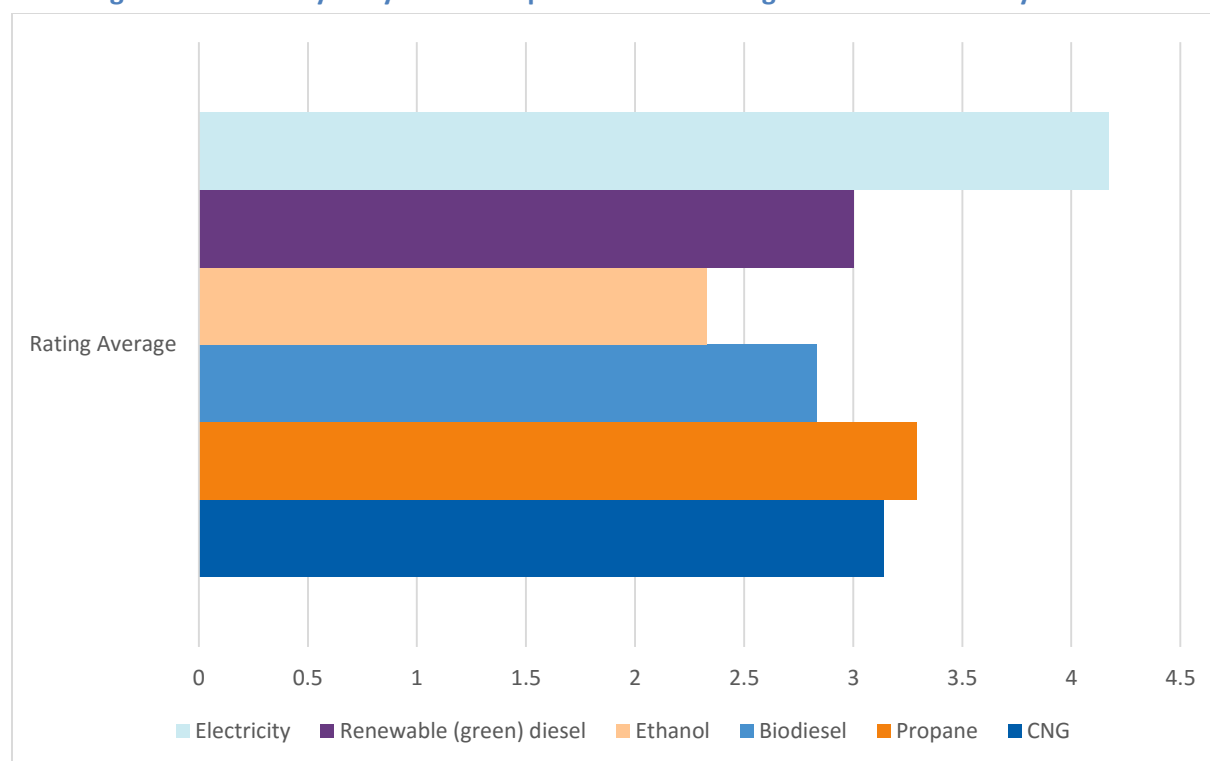


**Figure 4. Familiarity with the different fuel options, barriers to adoption, and resources/opportunities to overcome barriers related to alternative fuels in fleets.**



This question was intended to gauge if the meeting objective was met. Before the workshop, a roughly equal proportion of survey respondents were moderately, very, and/or extremely familiar with the challenges and opportunities facing AFV adoption in fleets. Following the workshop, a higher proportion of respondents indicated they were very familiar with these issues and no one indicated they were only slightly familiar. No one selected that they were “Not at all familiar” with the issues listed in the question, either before or after the workshop.

**Figure 5. How likely are you to incorporate the following alternative fuels in your fleet?**



This question was targeted at fleet managers to determine which of the alternative fuels discussed at the workshop they would be most likely to integrate into their fleets. Respondents were provided with the fuels listed above and asked to rank them on a five-point likeliness scale, ranging from highly unlikely to highly likely. Electricity emerged as the most likely “fuel” to be adopted, followed by propane, CNG, and renewable diesel. Respondents were allowed to select more than one answer to this question.

The last two questions in the survey were open-ended. One of these questions solicited additional ideas for the resource library portion of the workshop toolkit. Respondents replied with the following suggestions:

1. A list of the DOT fleet managers by state, the number and types of alternative fuels they have deployed in their fleets, and their methods of refueling and maintenance.
2. A list of workshop attendees with contact information.



3. A vendor listing with the geographic area by fuel type.

The final question allowed respondents to provide additional open-ended feedback on the workshop or future workshops. Respondents replied with the following comments:

1. It would have been good to have a contact list of workshop attendees with emails or phone numbers.
2. A DOT only session without vendors would have enhanced networking and discussion sessions.

## Appendix I: Workshop Agenda

8:30 am	<b>Arrival and Registration</b>
9:00 am	<b>Welcome and Introductions</b> <i>Marc Williams, Deputy Executive Director, Texas Department of Transportation</i> <i>Michael T. Leary, Director of Planning and Program Development, FHWA Texas Division</i> <i>Diane Turchetta, Transportation Specialist, FHWA</i> <i>Dalton Pratt, Statewide Fleet Division Director, Texas Department of Transportation</i>  Roundtable introductions of all participants
9:30 am	<b>Overview of Alternative Fuels</b> <i>Mike Scarpino, Transportation Project Engineer, US DOT Volpe Center</i>  <i>A review of alternative fuels available for DOT fleet applications, including benefits, costs, use cases and vehicles available for compressed natural gas (CNG), propane, biodiesel, ethanol (including E85), and electricity.</i>
10:10 am	<b>Breakout – Fuels Part 1</b>  <b>Objective: Identify specific barriers to state DOTs transitioning to given alternative fuel and ways of overcoming each barrier.</b>  <i>Participants will select one of three breakout sessions, which will be repeated after the break so each person can go to two out of the three topics.</i> <ul style="list-style-type: none"> <li>• <b>CNG / Propane</b> – Texas DOT and Oklahoma DOT will present on their experience with CNG followed by a group discussion. Propane will be discussed as applicable.</li> <li>• <b>Renewable fuels</b> – VTrans and Oregon DOT will present on their experience with biodiesel, followed by a group discussion. Ethanol and renewable (green) diesel will be discussed as applicable.</li> <li>• <b>Electric power</b> – Washington State DOT and Caltrans will present on their experience with electric powered vehicles, followed by a group discussion.</li> </ul>
10:50 am	<b>Morning Break</b>



11:05 am	<p><b>Breakout – Fuels Part 2</b></p> <p><b>Objective:</b> Identify specific barriers to state DOTs transitioning to given alternative fuel and ways of overcoming each barrier.</p> <p><i>Participants will select one of three breakout sessions, which will be repeated after the break so each person can go to two out of the three topics.</i></p> <ul style="list-style-type: none"><li>• <b>CNG / Propane</b> – Texas DOT and Oklahoma DOT will present on their experience with CNG followed by a group discussion. Propane will be discussed as applicable.</li><li>• <b>Renewable fuels</b> – VTrans and Oregon DOT will present on their experience with biodiesel, followed by a group discussion. Ethanol and renewable (green) diesel will be discussed as applicable.</li><li>• <b>Electric power</b> – Washington State DOT and Caltrans will present on their experience with electric powered vehicles, followed by a group discussion.</li></ul>
11:45 am	<p><b>Breakout Groups Report</b></p> <p><i>Moderated discussion on key issues identified in morning discussions.</i></p>
12:05 pm	<p><b>Lunch</b></p> <p><i>TxDOT cafeteria</i></p>
1:00 pm	<p><b>TxDOT CNG Pickup Truck Demonstration</b></p> <p><i>Dalton Pratt, Texas Department of Transportation</i></p>
1:20 pm	<p><b>Partnering with Clean Cities/Clean Cities Tools &amp; Resources/National Fleet Programs</b></p> <p><i>Linda Bluestein, Clean Cities Co-Director, US DOE</i></p> <p><i>An overview of Clean Cities, including how state DOTs can partner with them for projects and resources, the program’s available tools and resources, and the experience the program has had working with the private sector fleets under the National Clean Fleets Partnership.</i></p>
2:00 pm	<p><b>Breakout – Procurement / Fuel Reduction Technologies Part 1</b></p> <p><b>Objective:</b> Identify promising examples, tools, or resources for given breakout topic.</p> <p><i>Participants will select one of two breakout sessions, which will be repeated so each person can go to both topics.</i></p> <ul style="list-style-type: none"><li>• <b>Procurement / Financing</b> – Provide information on various AFV vehicle, fuels, and fueling infrastructure procurement and financing options available to DOTs.</li><li>• <b>Fuel and Emission Reduction Technology and Policies</b> – Case studies of vehicle systems and training programs for DOT fleets that provide cost effective reductions in fuel consumption and emissions.</li></ul>

2:40 pm	<p><b>Breakout – Procurement / Fuel Reduction Technologies Part 2</b></p> <p><b>Objective:</b> Identify promising examples, tools, or resources for given breakout topic.</p> <p><i>Participants will select one of two breakout sessions, which will be repeated so each person can go to both topics.</i></p> <ul style="list-style-type: none"> <li>• <b>Procurement / Financing</b> – Provide information on various AFV vehicle, fuels, and fueling infrastructure procurement and financing options available to DOTs.</li> <li>• <b>Fuel and Emission Reduction Technology and Policies</b> – Case studies of vehicle systems and training programs for DOT fleets that provide cost effective reductions in fuel consumption and emissions.</li> </ul>
3:10 pm	<p><b>Breakout Groups Report</b></p> <p><i>Moderated discussion on key issues identified in discussions</i></p>
3:45 pm	<p><b>Afternoon Break</b></p>
4:00 pm	<p><b>Identify, Develop, and Refine Promising DOT AFV Fleet Transformations</b></p> <p><b>Participants will discuss the most promising solutions raised throughout the day and provide direction on toolkit materials which will be helpful to DOT fleet personnel considering AFVs.</b></p> <p><i>Discussion Questions</i></p> <ul style="list-style-type: none"> <li>• What are the best use cases for AFVs in DOT fleets?</li> <li>• What are the key information/resource gaps?</li> <li>• What priority actions could accelerate fleet use of AFVs?</li> </ul>
4:30 pm	<p><b>Adjourn</b></p>



## Appendix II: Workshop Participant List

\*Not in Attendance

First Name	Last Name	Affiliation	Title
Harris	Baker*	Pinnacle Propane	VP of Business Development
Heather	Ball	Texas Natural Gas Foundation	Executive Director
Ray	Belk	Texas Department of Transportation	Business Operations Project Manager
Linda	Bluestein	U.S. Department of Energy/EERE	Clean Cities Co-Director
Gina	Campoli	Vermont Agency of Transportation	Environmental Policy Manager
Lee	Christensen	Texas Department of Transportation	Alternative Fuels Program Manager
Lori	Clark	North Texas Council of Governments	Principal Transportation Planner
Anton	Cox	Capital Area Council of Governments	Air Quality Program Specialist
Maddie	Crick*	Texas Natural Gas Foundation	Intern
Tony	Dale	Propane Education and Research Council	Consultant
Ryan	Erickson*	Trillium CNG	Senior Manager, Business Development
Bruce	Erickson	Oregon Department of Transportation	Fleet Services Manager
Kirk	Fauver	FHWA Texas Division	Statewide Planning Engineer
Sam	Fox	McCraw Oil Company, Inc.	Director of Propane Sales
Damian	Herd	Nissan North America, Inc.	Electric Vehicle Business Development Manager
Lon	Holloway	Northwest Propane	Sales Manager
David	Irwin	Texas Department of Transportation	Special Projects Coordinator
Jason	Isaac	Texas House of Representatives	State Representative
Nic	Jones	Alamo Area Council of Governments	Clean Cities Coordinator
Oana	Leahu-Aluas	Cadmus	Research Analyst
Michael	Leary*	FHWA Texas Division	Director of Planning and Program Development
John	Mackinaw	CleanFUEL USA	Regional Sales



Jackie	Mason	Propane Council of Texas	Education & Marketing Director
Jeremy	Matsuo	California Department of Transportation	Senior Equipment Engineer, Division of Equipment
Stuart	Mayper*	CNG 4 America	Business Development
Michelle	McCutcheon-Schour	Vermont Energy Investment Corporation	Account Manager
Geoff	Morrison	Cadmus	Associate
Elizabeth	Munger	Lone Star Clean Fuels Alliance	Projects Consultant
Clay	Norrell	Oklahoma Department of Transportation	Fleet Manager
Paul	Osborn	Westport Dallas, Inc.	National Sales Manager
Dalton	Pratt	Texas Department of Transportation	Statewide Fleet Division Director
John	Reece	Momentum Fuel Technologies	Sales Representative
David	Roberts	Vermont Energy Investment Corporation	Senior Consultant
Jason	Robinson*	McCraw Oil Company, Inc.	Director of Operations
Rocky	Rogers	Dallas Area Rapid Transit	AVP, Maintenance Technical Services
Frank	Sanzo	Department of Administrative Services, State of Connecticut	Director, Fleet Operations
Mike	Scarpino	U.S. Department of Transportation, Volpe Center	Transportation Project Engineer
Paul	Shaffer	Westport Dallas, Inc.	VP / Managing Director
Wayne	Snead	Lone Star Clean Fuels Alliance	CNG Specialist
Jamie	Stovall*	VNG CNG	Market Manager, Texas
Corey	Theurer	Texas Department of Transportation	Policy and Relations
Diane	Turchetta	U.S. Department of Transportation, FHWA	Transportation Specialist
Art	Valladares*	Railroad Commission of Texas	Regional Coordinator
Darah	Waldrip	Texas Department of Transportation	Information Specialist, Fleet Operations Division
Nicklaus	Watson	Texas Procurement & Support Services (TPASS Division), Texas Comptroller of Public Accounts	Fleet Program Specialist



Bob	White	Texas Department of Transportation	Fleet Services Section Manager
Shelley	Whitworth*	Houston-Galveston Area Council	Air Quality Program Manager
Georgina	Willner	Washington State Department of Transportation	Fleet Sustainability Coordinator
Susan	Wirtanen*	Texas Natural Gas Foundation	Intern
Marc	Williams*	Texas Department of Transportation	Deputy Executive Director