



Initiative for Resiliency in
Energy through Vehicles



INTEGRATING ALTERNATIVE FUEL VEHICLES INTO EMERGENCY PLANS:
A TOOLKIT FOR TENNESSEE

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<https://www.infinitiofcoolsprings.com/blogs/739/7-places-tn-road-trip/>

Background and Purpose of the iREV Policy and Planning Toolkit

Vehicles that run on alternative fuels – such as biodiesel, electricity, natural gas, and propane – can help build system resiliency by diversifying an emergency response fleet. If a storm or other emergency disrupts a state’s primary fuel supply, emergency managers should have a plan to activate fleets that run on alternative fuels to perform essential services. Integrating alternative fuel vehicles into emergency operation plans and related plans will allow a jurisdiction to rely on a diversified pool of fuel resources in the event of a petroleum shortage.

The National Association of State Energy Officials has launched a nation-wide program – the [Initiative for Resiliency in Energy through Vehicles \(iREV\)](#) – to help integrate alternative fuel vehicles into emergency operation plans. iREV has developed a series of reports that outline the benefits of alternative fuel vehicles, highlight ways that these fuels have helped states and communities during emergencies, and recommend actions that states can take to integrate alternative fuel vehicles into future emergency plans. Four “case studies” provide basic information on [biodiesel](#), [electric](#), [natural gas](#), and [propane](#) vehicles for emergency planners and provide key context for why alternative fuels should be considered during the emergency planning process, and used during emergencies. A subsequent “[Baseline Assessment](#)” reviews the current status of alternative fuel vehicles in emergency plans, and recommends ways that states may include alternative fuel vehicles in future plans.

An Alternative Fuel Vehicle and Infrastructure Tracking Tool was also developed to help emergency planning entities understand the various alternative fuel vehicle and infrastructure assets and options at their disposal, and optimize planning and investment based on their specific fuel supply, geography, and risk-profile. This “[iREV-Tracking Tool](#)” combines data from the Alternative Fuels Data Center, on-the-ground fleet and infrastructure information relayed through Clean Cities Coalitions, and disaster readiness tools being used at the national level to support critical infrastructure and homeland security.

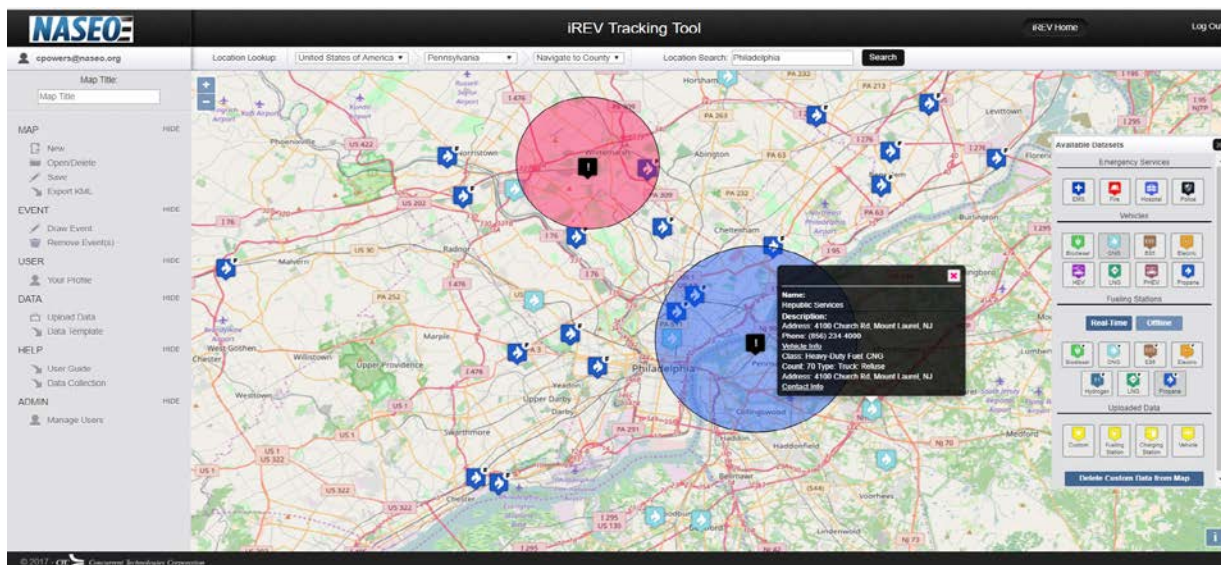


Figure 1: iREV Tracking Tool sample

NASEO is working with several jurisdictions across the United States to develop Policy and Planning Toolkits that integrate lessons from the above research and provide guidance on ways that communities can incorporate alternative fuel vehicles into their emergency operation plans. The State of Tennessee was selected as a “pilot” community, and NASEO has been working with the Tennessee Emergency Management Agency (TEMA) and the Tennessee Department of Environmental Conservation’s Office of Energy Programs (OEP) to review state emergency operations and energy plans, assess petroleum vulnerabilities and threats to the state, collect data on alternative fuel vehicle and infrastructure locations, and develop recommendations for ways that Tennessee can integrate alternative fuel vehicles into future emergency and energy plans and support the deployment of alternative fuels generally. This Toolkit summarizes NASEO’s findings and provides guidance for Tennessee.

The Jurisdiction

The State of Tennessee is situated in the southeastern portion of the United States and stretches almost 500 miles from North Carolina westward to the Mississippi River. Wide bends in the Tennessee River divide the State into three regions or Grand Divisions: the largely mountainous East; the Middle comprised of a central basin rimmed by highlands; and the West with its low, rolling plains. The Tennessee River and the Cumberland River, which flows in an arc from Kentucky across north-central Tennessee, have histories of destructive floods. In the 20th century, the federal Tennessee Valley Authority (TVA), now the largest public power organization in the nation, built a series of dams to control the rivers which brought hydroelectricity to the region. Today, virtually all of Tennessee and parts of six other states are served by the TVA.

The population of Tennessee is approximately 6.65 million (as of July 2016). The state is comprised of 95 counties and 347 incorporated municipalities. The State’s westernmost city, Memphis (Shelby County), is one of the world’s busiest hubs for barge, air, truck, and rail cargo traffic. Other large metropolitan areas include: Nashville (Davidson County), Knoxville (Knox County), Chattanooga (Hamilton County), Clarksville (Montgomery County), Jackson (Madison County), Murfreesboro (Rutherford County), and the Tri-Cities of Kingsport-Bristol-Johnson City. Tennessee’s climate is relatively mild, but it is greatly influenced by the state’s topography. Much of the State experiences hot summers and mild winters, except in the mountains, which are cooler at higher elevations.

Energy consumption among Tennessee’s end-use sectors is fairly balanced, with transportation the largest consuming sector (28.3 percent), followed by the industrial sector (26.4 percent), the residential sector (24.6 percent), and the commercial sector (20.7 percent).¹ Manufacturing leads the state’s economy and includes the manufacturing of motor vehicles and automotive parts; food, beverages, and tobacco products; and chemical products.

Emergency Planning in Tennessee

TEMA, which is one of three major divisions of the Tennessee Department of Military, is responsible for managing the state’s response to emergencies and disasters that affect the citizens of Tennessee and its

¹ U.S. Energy Information Administration. *State Profile and Energy Estimates: Tennessee*. Accessed December 18, 2017. <https://www.eia.gov/state/?sid=TN#tabs-2>

local governments. In the event of an emergency, TEMA provides the Governor with essential information regarding casualties, damage, and recommended protective courses of action. TEMA coordinates state and federal disaster response mechanisms, while providing a direct link between state and local governments, and a conduit for outside assistance from the Emergency Management Assistance Compact (EMAC) between the states and territories and the federal government.

The agency has responsibility to ensure the State and its local governments are prepared to deal with the disasters and emergencies that threaten people and their property. The most prevalent threats in Tennessee are severe storms, floods, forest fires, hazardous materials incidents, and earthquakes. According to the National Oceanic and Atmospheric Administration, the most common natural hazard in Tennessee is thunderstorm and lightning, which occur once every three days on the average during the months of March to October. The second-most common natural hazard is flood, which occurs once every 10.2 days on the average. Tornadoes caused the greatest overall property loss during 1996 to 2014; the second-highest cause of property loss was flooding.

The Tennessee Emergency Management Plan (TEMP), coordinated by TEMA, establishes the framework for a comprehensive emergency management program designed to: address the potential effects of hazards that might impact the State; prepare for implementation of measures to preserve life and minimize damage; respond effectively to the needs of the citizens and local jurisdictions; and provide a recovery system to return the State and its communities to normal status as soon as possible. The TEMP is designed to address all-hazards with a focus on thirteen of prime concern: drought; earthquake; extreme temperature; wildfire; flood; geologic; severe weather; tornado; communicable disease; dam/levee failure; hazardous material release; terrorism; and infrastructure incident. The TEMP is structured using the Federal Response Plan format of specific Emergency Support Functions (ESFs) that categorize disaster services.

The TEMP is comprised of a *Basic Plan*, which is an overview of how the state conducts emergency management operations. *Appendices* provide more detail about various subject-matter areas addressed in the *Basic Plan*. *Attachments*, which provide historical context and information on specific hazards, are separable from the TEMP but attached for ease of use. *Annexes* are stand-alone plans directly linked to the TEMP, but issued separately. These include the 16 all-hazard ESF Annexes that define roles and responsibilities of state and other agencies in each functional area; ESF-12 is the Energy Annex.

The Planning Section of TEMA's Bureau of Preparedness leads the update process for the TEMP and ESF Annexes. The *Basic Plan* is revised at least every five years and requires the Governor's signature. The most recent process, initiated in 2015, is ongoing. The ESF Annexes are updated on a rotating basis, usually one per quarter, to ensure that they are re-visited at least once within the 5-year cycle. All of the primary and support agencies listed for the ESF as well as federal agencies, NGOs and private sector entities are engaged in the planning process.

Each of Tennessee's 95 counties is required to have emergency operations plans modeled after the TEMP. TEMA reviews and archives these plans, and provides significant hands-on support from staff at TEMA's three Regional Field Offices. Several cities also maintain their own emergency plans.

TEMA conducts monthly seminars to discuss various planning topics with state, federal and private sector partners. TEMA also conducts an annual three-day in-service training, including at least one table-top exercise. All counties that receive funding from TEMA (about 70 of the 95 counties) are required to participate in at least three exercises per year. TEMA trains about 12,000 people a year, mostly first responders and emergency managers, in hazardous material response and a variety of other emergency management topics. As noted below, there may be an opportunity for TEMA to include alternative fuels in future trainings with local governments.

Energy Emergency Planning in Tennessee

Tennessee's Energy Assurance Plan (EAP) was developed to facilitate energy emergency preparedness and planning to create a rapid response capability for recovery from disasters, including a Governor's "Declaration of Disaster Emergency" triggered by the disruption or shortage of energy supplies. The EAP outlines when government involvement is warranted, the State's responsibilities during an energy emergency, and the coordination of federal and state resources, when required.

TDEC's OEP is charged with energy system monitoring, emergency response, and informing senior government leaders on Tennessee energy supply issues. OEP led the effort to update the EAP and the ESF-12 Energy Annex to the TEMP, which outlines state agency responsibilities for responding to various types and levels of energy emergencies. The TEMP assigns to OEP the coordination responsibility for non-utility energy emergency preparations and plans.

The EAP is updated approximately every three years with state energy asset information typically updated every year. It is the guiding document for normal operations, elevated operations during the assessment of potential situations, and emergency operations during full emergency response efforts. In addition, the EAP:

- Outlines the concept of operations, organizational plan, and responsibilities for managing and coordinating the occurrence or immediate threat of energy disruptions.
- Lists state actions that will ease the impacts of short-term energy disruptions.
- Provides data and information that will assist with long-term strategies and options for dealing with sustained disruptions or outages.
- Identifies and defines critical infrastructure protection.
- Describes coordination of state organizational relationships and responsibilities.
- Identifies information that the State needs to know regarding specific energy sources as well as pertinent government and industry contacts.
- Identifies steps that state officials can take to work with industry to minimize and resolve the impacts of an energy supply disruption.

Part 2 of the EAP provides Energy Asset Details for each type of energy source. It provides information which is referenced during potential or actual events and is intended to support the EAP for operational and policy decision making by the State during normal and emergency situations. This information is updated annually.

The EAP identifies roles and responsibilities, authorities, actions for state agencies, and stakeholder involvement for energy disruptions or emergencies related to liquid fuels (petroleum, propane, and others) and natural gas. As detailed in the EAP, OEP is responsible for developing preparedness programs aimed at reducing the effects of petroleum shortages within Tennessee and for administering the State Fuel Set-Aside Program as required or requested by the Governor. This requires OEP to, among other things:

- Monitor emerging threats to energy systems, the infrastructure, and supply chains.
- Update and maintain a network of public and private sector energy company contacts.
- Collect and monitor supply, consumption, and production of petroleum fuels.
- Contact petroleum supplier and distributor representatives for indications of what the situation may mean to the industry and to Tennessee.
- Coordinate with the petroleum distributors concerning potential supply availability for Tennessee.

The EAP recommends several mitigation strategies that can be employed during any petroleum supply disruption. These options are further detailed in the Tennessee Petroleum Contingency Plan (see below) and include: managing supply to ensure public need; issuance of waivers; resupply of gas stations along evacuation routes; and a variety of measures to reduce demand.

Petroleum Vulnerabilities

A number of vulnerabilities specific to Tennessee that may impact energy supply, including the variety of energy sources, seasonal changes, and natural disasters. Of significant concern is the New Madrid fault which primarily runs along Tennessee's western border. A significant earthquake along the fault line would have catastrophic impact on the energy systems, supply networks and infrastructure within Tennessee and surrounding regions. Such an event would likely require a mass evacuation which would stress the fuel supply; a diversified source of fuels and vehicles capable of using those fuels could potentially mitigate the impact.

The primary petroleum assets are petroleum refining, interstate and intrastate transmission pipelines, over-the-road delivery systems, and storage. While noticeable disruptions are rare due to robust markets, large finished product reserves do not exist; therefore, system outages can have large and immediate system wide effects.

Energy supplies come from many sources and greatly depend on the transportation infrastructure, which consists of rail, pipeline, water, and road traffic. Each of these modes of transportation is vulnerable during disasters. The supply system for natural gas and petroleum products includes underground pipelines with compressor stations, or barges, which are vulnerable to multiple types of hazards.

Tennessee has one petroleum refinery, a Valero facility located in Memphis, which can process about 180,000 barrels of crude oil per calendar day. The refinery receives its light, low-sulfur crude oil supply from the Capline pipeline that crosses through western Tennessee on its route between the Gulf Coast

and Midwest refineries. Tennessee's refinery has access to the Mississippi River and can also receive feedstocks and ship petroleum products by barge. The refinery produces motor gasoline, diesel fuel, jet fuel, and petrochemicals.

There are 29 major petroleum product pipelines and branches serving the State. These are owned and managed by 18 different companies. Over 70 percent of petroleum products (gasoline and distillate) are transported into the State by the Colonial Pipeline. Colonial supplies terminals in the Nashville, Knoxville, and Chattanooga markets. Knoxville and Chattanooga also receive supply from Kinder Morgan's Plantation Pipeline. West Tennessee is supplied primarily by the Valero Refinery in Memphis. Besides pipelines, product may be trucked to terminals in the four main major metropolitan areas – Nashville, Memphis, Knoxville, and Chattanooga. Terminals in Nashville and Memphis can accept barge deliveries; however, no ocean-going sea vessels can reach these ports. Ten or more local distributors serve the major markets in Tennessee and deliver product to gas and diesel retail outlets and private fueling facilities.

While rare, incidents can occur that disrupt the supply of petroleum products for local use. These can occur upstream of supply – including where the products are sourced, and downstream of supply – by way of local storage and delivery networks. Historically, major disruptions have occurred due to Gulf Coast hurricanes either shutting down Gulf oil rigs or damaging pipeline infrastructure; both incidents can prevent delivery of refined product to Middle and East Tennessee.

For example, in 2008, Middle and East Tennessee experienced major gasoline outages and price spikes when refineries on the Gulf Coast were shut down due to Hurricanes Gustav and Ike. In September 2016, Colonial Pipeline shut down its gasoline pipeline in Alabama due to a major fuel leak. The company constructed a bypass and ultimately restored service 12 days later. In the interim, gas supplies tightened and the Greater Nashville area experienced a “run on the pumps,” with sales increasing 50 percent above normal. OEP monitored the situation and worked to resolve any first responder shortages. The Federal Motor Carrier Safety Administration's hours of service limits were waived until the end of the month when inventories returned to normal.

Petroleum Contingency Plan

Since Tennessee has very limited petroleum refining capacity and limited petroleum reserves, it needs to plan for potential shortages, and anticipate the impact of supply disruptions. As part of its responsibilities under ESF-12 and as discussed in the EAP, OEP maintains a Petroleum Contingency Plan which documents its responsibilities in managing disruptions to the supply of petroleum fuels.

The Petroleum Contingency Plan follows the four levels of fuel supply conditions to prepare for, respond to, and recover from petroleum shortages as outlined in the [NASEO State Energy Assurance Guidelines](#). These levels have been modified from NASEO's guidance to correlate with TEMA's activation levels. Checklists were developed for each of the following conditions:

- *Level 4* – Normal Conditions where there is no discernible shortage or where there may be shortages elsewhere. Checklist items call for monitoring and issuance of alerts.

- *Level 3* – Mild Fuel Shortage where there is a 5-10 percent reduction in petroleum supply for a week or more, or in the event of isolated shortages. Checklist items call for assessment of disruption and resiliency, issuance of notifications and situation reports, implementing public information campaigns, and limited activation of OEP’s Emergency Operations Center (EOC).
- *Level 2* – Intermediate Fuel Shortage where there is a 10-15 percent reduction in petroleum products for three weeks or more, or moderate to severe isolated shortages. Checklist items call for full activation of EOC and assessment of need to implement voluntary and/or mandatory measures to reduce consumption.
- *Level 1* – Severe Fuel Shortage where there is a greater than 15 percent reduction in availability of petroleum products. Checklist items call for possible declaration of an energy emergency, which would trigger mandatory conservation and fuel allocation measures and possible call for federal assistance.

OEP maintains a planning process relative to various types of energy emergency measures, such as demand/restraint, supply management, or supply-side type measures. The plan includes voluntary and mandatory mitigation strategies in response to a petroleum supply disruption including a range of options to promote conservation through public education and public information. If voluntary conservation measures are not sufficient, then mandatory measures are recommended.

The Plan proposes a Priority User emergency fuel allocation program that can be quickly implemented to supply emergency service providers (law enforcement, fire and emergency medical services) with fuel as well as a continuation of the Petroleum Set Aside process for longer term shortages in order to supply fuel for essential service providers (public works, utilities, public transit, sanitation services, communications and others).

In order to improve Tennessee’s emergency preparedness and response capabilities for critical users during a petroleum shortage, the Plan recommends that the State: maintain fuel supply for public safety agencies; develop contractual provisions and language in fuel purchasing contracts for fuel supplies in an emergency; and increase fuel storage capacity by expanding existing storage locations or incorporating larger storage in new facilities that may be constructed in the future. The State currently has an emergency fuel supply contract in place; during a fuel emergency, the contract may be used to order fuel for specific counties or municipalities in need of fuel for their emergency responders and/or critical services. In addition to considering fuel needed to operate vehicles, especially those which provide essential public services, the Plan notes that consideration should also be given to fuel for back-up emergency generators which would be used in the event of a power outage. The generators would need to be refueled from onsite storage or through additional deliveries of fuel for the duration of the outage.

Voluntary conservation measures noted in the Plan that could be triggered if needed include: encouraging emergency ridesharing programs, telecommuting, flexible work hours, carless days, and bicycling; and expanding transit services by offering fare reductions. If voluntary

measures are not sufficient, OEP can recommend mandatory measures such as: elimination of non-essential driving; strict enforcement of speed limits; intensified flexible work hour and rideshare programs; one-day per week closing of retail stores; and minimum and maximum purchases of motor fuel (with exemptions for emergency vehicles). OEP periodically analyzes and reviews other measures that could be instituted if needed.

One of the options that the Plan includes as a way to mitigate petroleum fuel shortages is to “maximize the use of alternative fuels through increased use of vehicles with flexible or alternative fueling capabilities, including use of LNG, hybrid electric and electric vehicles.” While this is a good start, it does not fully recognize all of the alternative fuel types available or the role that the diverse set of fuels and vehicles could play in dealing with response and recovery from emergencies when the supply of petroleum is disrupted. Specific recommendations that can more fully address the opportunities are discussed below.

Availability of Alternative Fuels

A diversified fuel supply with vehicles capable of running on alternative fuels such as compressed natural gas (CNG), liquid natural gas (LNG), liquefied petroleum gas (LPG, also known as propane), biofuels (biodiesel and ethanol) and electricity could mitigate Tennessee’s vulnerability to fuel shortages. These fuels are energy assets that could be called upon in the event of a petroleum shortage. As such, it is important to understand where those assets are located and how to contact the people responsible for their operation.

The iREV Tracking Tool (Tool) was developed to provide emergency managers and others with an easy-to-use location reference that can be incorporated into the jurisdiction’s emergency planning regime. The Tool is an online resource that shows the location of alternative fuel dispensing facilities, using data from the Alternative Fueling Station Locator maintained on behalf of the U.S. Department of Energy by the Alternative Fuels Data Center (www.afdc.energy.gov). For Tennessee, this includes the location of 560 public and 96 private alternative fuel stations throughout the State, with many clustered near population centers. Dispensing facilities for CNG, LNG, propane, E-85 ethanol, B20 biodiesel and electricity are identified. This data has been imported into the iREV Tracking Tool as part of this Pilot project, and a sample of data collected is included in Appendix C.

Compressed Natural Gas

Tennessee imports most of the natural gas consumed within the State via a network of pipelines. Local distribution companies typically transport natural gas from interstate pipeline delivery points to end users through distribution pipes. For vehicular use, natural gas is extracted from a local pipeline and compressed at a CNG dispensing station. There are 13 public access CNG stations in Tennessee as identified by the AFDC. All of these stations are fast-fill and dispense CNG at either 3000 or 3600 PSI. There are also nine private CNG stations that do not provide routine access to the public, but are used by one or more fleets co-located with the station.

Gas utilities have made a notable investment in CNG stations: 10 companies operate 13 stations (8 public access and 5 private). Of these, two utilities – Sevier County Utility District and Piedmont Natural

Gas – operate both a public and private station. All of the utilities that operate stations also use some CNG vehicles as part of their fleet operations.

CNG stations are spread throughout the State, with some concentration around Nashville and Memphis. Emergency response fleets located where CNG infrastructure is also located are good candidates for use of CNG since the fuel source is already available. Emergency fleets that adopt CNG vehicles would be able to use the publicly available sites or possibly make arrangements to access the private sites. CNG stations can operate in the event of a petroleum disruption, as long as there is a source of electricity available to power the station (either connected to the electric grid or using a back-up generator). CNG vehicles are available in a broad variety of light and heavy-duty vehicle platforms with bi-fuel and dedicated options.

Liquid Natural Gas

LNG must be stored cryogenically for delivery to fueling locations. LNG is liquefied in nearby states and trucked to fleets in Knoxville, Nashville, and Memphis. There is one public LNG station in the State at the Flying J #722 located in Knoxville, however that station is scheduled to close in the near future. Given the constraints, LNG is probably not a good fuel choice for emergency vehicles.

Propane

Propane is also delivered via pipeline to a distribution center, and then trucked to storage locations and to fleets by companies such as Amerigas, Blossman, FerrellGas, and Suburban Propane. There are six public propane stations in Tennessee, with four of those operated by U-Haul. Fleets that use propane for vehicles generally install on-site fueling for their own use.

Propane is a good candidate for emergency response vehicles since the fuel is readily available and the cost of dedicated fueling reasonable. Propane can also be delivered via mobile refueling trucks so that vehicles do not always need to return to a central fueling facility. Propane vehicles are available in many light and heavy-duty platforms suitable for emergency response applications including both bi-fuel and dedicated fuel options. Similar to CNG fueling, propane dispensers can operate when petroleum is not available.

Ethanol

Ethanol is produced in other states and trucked into Tennessee and blended either at or near the production facility or at a terminal location. Fuel blended as E-85 (85 percent ethanol, 15 percent gasoline) is trucked by companies such as Tri-Star to the 70 public gas stations and convenience stores that have dedicated E-85 dispensers. Eleven companies and franchise operators represent the 70 locations which are spread throughout the State, with a concentration in Middle Tennessee near Nashville, and around Chattanooga. There are also 9 private E-85 stations which are located primarily at state and federal government fleet locations. These private sites could potentially also serve emergency response fleets under a shared agreement.

Flex-fuel vehicles that can run both on gasoline only or a blend of gasoline and ethanol up to E-85 are commonly available in light duty applications. In the event that petroleum resources are disrupted or

tightened, E-85 fueling would be a good option for emergency response fleets with vehicles capable of using that fuel.

Biodiesel

Most of the biodiesel used in Tennessee is produced in other states. The fuel is commonly delivered by rail as B100 to a storage site where it is blended with diesel, mostly as B5. A very small percent is blended to B20 or B10 and hauled directly to fleet users or to public fueling stations. There are 14 public B20 stations located at gas stations and convenience stores, with most clustered near Nashville. There are 13 private B20 fueling sites, all located at state and federal facilities.

In addition to the importation of biodiesel, Agrileum produces biodiesel in the Memphis area and blends and distributes the fuel through a relationship with Valero. A new plant is being built to replace an original plant which burned down. The new plant is expected to be able to produce 4 million gallons of biodiesel per month which will be dispersed by rail or truck. A storage facility at the plant will have storage capacity of approximately 100,000 gallons of B100 or B99. Gold Coast Refining in Chattanooga does not routinely store biodiesel given the current market conditions, however the plant has the ability to significantly increase storage dedicated to fuels in an emergency, since the total tank storage capacity, including feedstocks and other raw materials, is over 2 million gallons. They can also accommodate 18 rail cars, which offer another 400-500 thousand gallons.

Most diesel powered vehicles can run on a blend of biodiesel and regular diesel without modification. B20 is the most common blend for fleets interested in fuel diversity. While engine manufacturers recommend blends at B20 or lower for routine use, the blend level could be increased for short term use in the event that petroleum supply is disrupted or tightened. Diesel vehicles that provide emergency response capabilities should consider arranging access to biodiesel fueling in order to assure their ability to remain in service.

Electric

Electric charging stations are located throughout Tennessee with most clustered in or near Nashville, Memphis, Chattanooga, and Knoxville. Over 1,000 public and private charging outlets at 450 electric stations serve the growing number of electric vehicles in the state. Electric Vehicle Service Equipment (EVSE) or charging sites are located at car dealerships, hotels, restaurants, workplaces, institutions, and transit hubs across the State with a concentration near the larger population centers. Fleets with heavy-duty electric vehicles (such as Nashville MTA) have high capacity electric charging service equipment at their vehicle fueling facilities.

Electric vehicles may be a good choice for certain emergency response applications and should be considered for fuel diversity purposes. In order to operate when the electric system is down, EVSE must be paired with back-up emergency generators. Plug in hybrid electric vehicles (PHEV) provide additional flexibility since they can be operated in electric only mode, which would be advantageous if petroleum is disrupted, or with a combination of electric and gas, to increase the range of the vehicle.

Availability of Alternative Fuel Vehicles (AFVs)

This section describes the current use of alternative fuels by fleets in Tennessee. This Policy and Planning Toolkit includes information representing 37 fleets² with nearly 10,800 vehicles capable of operating on an alternative fuel. Of these, 720 are capable of being operated on natural gas, propane, or electricity, including heavy-duty hybrid electric. The remaining vehicles have reported usage of B20 biodiesel or E-85 ethanol. Vehicles which are E-85 flex fuel vehicles and diesel vehicles capable of running on alternative fuels may or may not be using the fuel routinely. Below is a chart illustrating the breakdown by fuel type:

<u>Fuel Type</u>	<u>Light Duty</u>	<u>Heavy Duty</u>	<u>Total</u>
CNG	132	121	252
LNG		85	85
LPG	70	52	122
Electric	201	20	221
Hybrid-electric		40	40
Sub-Total	403	317	720
B20		7011	7011
E85	3063		3063
Total	3,466	7,328	10,794

These AFVs are operated by several different user types as described below. Specific information on the location and composition of the fleets has been uploaded to the iREV Tracking Tool.

Utilities

Several natural gas utilities have their own natural gas vehicle fleet and several operate natural gas fueling facilities that are used for their own fleet and for vehicles within their communities. For example, Sevier County Utility District (SCUD) has been a long time community partner for expansion of CNG use in Sevier County. The utility installed a public CNG station on their property in 2014 which is used by Dollywood for its 6 CNG trolleys, and by the City of Sevierville and the Sevier County School System for their CNG vehicles. SCUD also refuels the City of Gatlinburg CNG trolley via a mobile CNG storage trailer. The Knoxville Utilities Board (KUB), which installed a public access CNG station in 2017, has been operating CNG vehicles for several years and continues to expand their fleet. KUB also operates 25 hybrid and plug-in hybrid light-duty and medium-duty vehicles.

² This number represents only those fleets that agreed to have their vehicle data included in this Report.

<u>Utility</u>	<u>AFVs</u>	<u>Vehicle Types</u>
Greater Dickson Gas Authority	13	2 light duty and 5 heavy duty CNG trucks; 4 LPG ¾ ton and 3 LPG F-550 bobtail trucks
Amerigas Lebanon	1	E-85 flex fuel
Athens Utility Board	11	10 light duty and 1 heavy duty CNG truck
Jackson Energy Authority	15	14 light duty CNG trucks and 1 heavy duty LPG truck
Citizens Gas Utility District	7	1 light duty and 6 heavy duty CNG trucks
Knoxville Utilities Board	133	45 light duty CNG trucks, 52 E-85 vehicles, 26 light duty and 10 heavy duty EVs
Middle Tennessee Natural Gas	15	15 light duty CNG trucks, vans and cars
Sevier County utility District	50	7 light duty and 12 heavy duty CNG vehicles, 31 heavy duty B20 trucks
Gibson County Utility	17	10 light duty and 7 heavy duty CNG trucks
Hawkins County Gas	3	Light duty CNG trucks
Nashville Electric Service	141	135 E-85 flex-fuel vehicles; 4 light duty and 1 heavy duty EV; 1 HEV
Powell Clinch Utility District	3	2 light duty CNG and 1 light duty LPG trucks
Elk River Public Utility District	7	5 light duty and 2 heavy duty CNG trucks
Total	416	

Municipalities

Seven municipalities have added AFVs to their fleets. For example, the City of Kingsport started their alternative fuel program in 2009 and now operates the largest propane fleet in the State. Their fleet includes almost 100 mostly bi-fuel propane vehicles ranging from police cars to work trucks to zero-turn mowers. The City owns its own propane fueling site making it easy to refuel the vehicles as needed. The City also operates electric and hybrid electric vehicles including the first police wrapped (black and white) Nissan Leaf in the country.

<u>Municipality</u>	<u>AFVs</u>	<u>Vehicle Types</u>
Gatlinburg	1	Heavy duty CNG trolley
City of Knoxville	962	1 light duty CNG truck; 615 E-85 flex-fuel vehicles; 346 B20 trucks
City of Sevierville	283	1 light duty CNG vehicle; 81 E-85 flex-fuel vehicles; 76 B20 vehicles including fire trucks; 125 light duty EVs
City of Jackson	5	1 light duty and 1 heavy duty CNG truck; 3 light duty LPG trucks
City of Lebanon	17	15 light duty and 2 heavy duty CNG vehicles
Anderson County	1	Light duty LPG vehicle
City of Kingsport	77	54 light duty and 20 heavy duty LPG vehicles; 3 light duty EVs
Total	1,346	

Private Entities

Private fleets comprise the largest AFV user group in Tennessee. This includes UPS and Waste Management which have made national commitments to incorporate alternative fuels into their fleet. UPS operates the state’s only LNG over-the-road fleet, and Waste Management added CNG refuse trucks at two locations. Dollywood operates a fleet of CNG trolleys to transport the thousands of people who visit the venue each year.

<u>Private Fleet</u>	<u>AFVs</u>	<u>Vehicle Types</u>
Waste Management	77	77 CNG refuse trucks at two locations
Dollywood	6	6 CNG trolleys
Averitt Express	4,861	Heavy duty trucks use B20
Eastman Chemical	159	153 heavy duty B20 vehicles; 6 light duty EVs
UPS	85	85 over-the-road LNG trucks
Black Bear Solar	1	Light duty EV
Sullens Transport	40	Large trucks that run on B20 or higher blend
Total	5,229	

Transportation Providers

Four transportation providers incorporated alternative fuels into their operations. For example, the Nashville MTA operates 9 all-electric city buses on a downtown circuit to provide free transit around the downtown area. The buses are charged along the route via an innovative fast charging system. The MTA also operates diesel hybrid-electric buses in its fleet.

<u>Transportation Providers</u>	<u>AFVs</u>	<u>Vehicle Types</u>
Nashville MTA	48	9 electric buses and 39 HEV buses
NET Trans	6	LPG shuttle buses
Groome Transportation	5	LPG vans
Franklin Transit	2	B20 vans
Total	61	

Schools and Colleges

The University of Tennessee and two school districts have added AFVs to their fleets. Fleets of this type are excellent candidates for alternative fuels.

<u>Schools and Colleges</u>	<u>AFVs</u>	<u>Vehicle Types</u>
Morgan County Schools	4	1 CNG and 3 LPG school buses
Sevier County Schools	1	CNG school bus
Clarksville-Montgomery School System	16	LPG school buses
University of Tennessee	399	376 E-85 flex fuel vehicles; 23 light duty EVs
Total	420	

State and Federal Agencies

Government agencies should lead by example in adoption of alternative fuels. In Tennessee, the State Department of Transportation has reported use of biofuels in many of their vehicles. Alternative fuels are also used at the federal Oak Ridge National Laboratory and National Park located within the State's borders.

<u>State and Federal Agencies</u>	<u>AFVs</u>	<u>Vehicle Types</u>
TDOT	2,490	1,080 E-85 flex fuel vehicles; 1,410 B20 vehicles
Great Smokey Mtn NP	65	5 light duty LPG vehicles; 6 EVs; 22 E-85 and 32 B20 vehicles
Oak Ridge National Lab	768	7 light duty EVs; 70 E-85 flex fuel and 691 B20 vehicles
Total	3,323	

Recommendations

A diversified fuel supply with vehicles capable of running on alternative fuels such as compressed natural gas (CNG), propane, biofuels (biodiesel and ethanol) and electricity could mitigate the vulnerability to fuel shortages. Following are several recommended strategies that could help the State and its localities better prepare for emergencies where the availability of petroleum is disrupted or tightened.

Collaborate with Tennessee Clean Fuels

To help implement the recommended strategies in this section, OEP and TEMA should engage with staff of Tennessee Clean Fuels (TCF). TCF is part of the U.S. Department of Energy’s (DOE) Clean Cities Program which has a mission to reduce petroleum in the transportation sector through use of alternative fuels, vehicle efficiency technologies and demand management measures. TCF is comprised of two coalitions: Middle-West Tennessee Clean Fuels is currently managed by OEP; East Tennessee Clean Fuels is managed separately. The two organizations work collaboratively to educate fleets and others on the benefits of alternative fuels and vehicles.³ Suggested roles for TCF are identified below.

Maintain a List of Fuel Resources

Petroleum products and alternative fuels are vital energy assets on which citizens, businesses and organizations rely, including the government and non-government agencies that provide important public safety and emergency services. OEP maintains relationships with many contacts within the fuel industry including petroleum related associations, giving them the ability to gain information quickly when supply or distribution interruptions occur. The Department of Agriculture, which oversees regulation of petroleum fuels, notifies OEP of any major disruptions or storage issues. Having this information in a timely manner will allow OEP and TEMA to work with the companies to possibly shift resources among storage facilities or delivery routes if needed to deal with short term demand.

OEP should maintain similar contacts with the purveyors of alternative fuels. The iREV Tracking Tool should be maintained and used by emergency management staff and others as a source for information

³ Visit: www.tncleanfuels.org for more information.

on alternative fuel assets. TCF can assist by keeping the iREV Tool up to date and periodically uploading information reported to the Alternative Fuels Data Center and by adding custom features such as fuel storage locations. Information on the fuel resources should be incorporated into the EAP and/or Petroleum Contingency Plan.

Identify Emergency Uses of AFVs

It is important to identify the capabilities that the current alternative fuel vehicles could provide in the event of a shortage in petroleum. **TCF should work with staff of OEP and TEMA to reach out to the managers of those fleets that have the type and number of vehicles that might be able to provide an emergency function to gauge their interest. The goal would be to establish and maintain a list of “willing” fleets and a protocol to be followed if and when the vehicles or fueling assets could be called into service.** The results of this activity should be incorporated into the EAP and/or Petroleum Contingency Plan.

Examples of how the current alternative fuel vehicles might be used include:

- Utility trucks operating on CNG could be deployed to other utility districts to assist with power restoration and other emergency services.
- Municipal AFVs could assist with storm cleanup and other critical emergency functions requiring movement of equipment and materials.
- The CNG trolleys along with CNG and LPG school buses could be used to transport people out of harm’s way and move goods to central locations for distribution.
- LPG shuttle buses and vans could be used to move small groups of people to shelters, hospitals and other places of refuge.
- The all-electric transit buses could run for extended periods of time with no petroleum fuels available and carry significant numbers of people or supplies if needed.

The iREV Tracking Tool should be used as a reference for information and location of all AFV fleets. TCF, which already has responsibility to gather and report AFV information to DOE on an annual basis, could assist in keeping the iREV Tool current for fleet locations and composition.

Engage with Local Emergency Managers

In the event of an emergency, it is often the local emergency management structure that must respond to the needs of the public and assure that vital health and safety measures are in place. TEMA’s Regional Offices, which already work with the local emergency managers, could function as important links between the state agencies and the local governments to embed the concept of using alternative fuel supplies and fleet capabilities as an emergency strategy. This engagement should focus on cities and counties where there is a concentration of AFVs and alternative fueling facilities, and strive to increase the understanding of the role that these assets could play if the petroleum supply is limited.

TEMA Regional Office staff, possibly in collaboration with TCF, could train the local agencies to access and use the iREV Tool as a source of current information on alternative fuel assets in their area.

Information that OEP or TEMA has gathered on the willingness of fleets or fuel providers to be called

upon to provide vital services should be shared with the local emergency managers. **These local agencies should be encouraged to modify their plans and procedures to incorporate the information and protocols needed to issue a call to action for the fleets in their area that could provide an emergency-related function.**

Encourage New Uses of Alternative Fuels

Having additional alternative fuel vehicles operating within the State beyond those already identified would provide greater resiliency benefits in the event of an emergency. **Fleets that provide emergency support, public safety and critical transportation functions are good candidates for alternative fuels and should be targeted.** Examples include: local transit, para-transit and shuttle buses that are capable of moving people or supplies; ambulances, police cars, fire trucks and other vehicles that provide public health and safety functions; light and heavy duty trucks used for road and utility maintenance and repair which could also haul items such as food and medical equipment during an emergency; and refuse trucks used for debris removal. A diversity of fuel options for a portion of these types of fleets would mitigate the potential for shortages of petroleum diesel or gasoline which may occur due to a mass evacuation or other disruption in service. Appendix A provides a list of fleet contacts that represent some of the types of fleets noted here.

School buses are good candidates for alternative fuels since they provide a vital transportation function for students and could be deployed to move citizens in the event that petroleum diesel is unavailable or constrained. Propane is a good alternative fuel source for school buses. Thousands of school buses throughout the country now run on propane which provides both cost-saving and energy security benefits. Tennessee's 124 school districts operate over 9,000 buses (of all types). Of these, about 70 percent are operated by the districts with the remaining operated by school bus transportation providers. Currently only three districts have a small number of alternative fuel school buses (19 propane, 2 CNG). A list of districts in Tennessee and the number of buses in their fleet is shown in Appendix B.

State fleets are also good candidates for alternative fuels and should lead by example in adopting these technologies for resiliency and other purposes. Vehicles operated by state agencies could be called upon to provide emergency services in the area in which they are usually assigned or moved to other areas in the State if needed.

Efforts should be taken to educate public and private sector fleet managers on the resiliency and cost benefits of converting vehicles to run on alternative fuels or purchasing new alternative fuel vehicles to replace petroleum-fueled vehicles in their fleets. For example, certain medium and heavy duty vehicles may be good candidates for CNG, particularly those with access to existing or planned fueling facilities. As noted above, propane is a viable alternative for certain light-duty and medium vehicle applications. Biodiesel is another cost-effective option for diesel fleets. The most common blend is B20 (20 percent biodiesel, 80 percent petroleum diesel), but the percentage of biodiesel can be increased on a short-term basis in the event that petroleum diesel is in short supply. Electric vehicles are growing in popularity and may be a viable option for certain fleets which operate in a manner compatible with that technology.

TCF should continue to reach out to fleets to encourage use of alternative fuels and to provide information on available funding opportunities. In the coming months, OEP is expected to release the second round of its Tennessee Natural Gas and Propane Vehicle Program⁴ which assists public, non-profit and private Tennessee-based fleets with the investments in and purchase of natural gas or propane-powered vehicles. For successful applicants, the Program provides up to 70 percent of the incremental cost of dedicated-fuel vehicles with a cap of \$25,000 for each vehicle and a maximum award to a grantee of no more than \$250,000. Vehicles used for emergency response can be bi-fuel (non-emergency vehicles must be dedicated fuel only), providing more flexibility for those types of fleets in terms of fuel usage. Those vehicles must use the alternative fuel for no less than 75 percent of the vehicle's use for at least five years. Bi-fuel vehicles are eligible for up to 52.5 percent of the conversion or incremental purchase cost up with a cap of \$25,000 for each vehicle.

TCF could also work with TEMA's Regional Offices to offer training on alternative-fuels to local emergency managers, with a focus on the resiliency benefits that these vehicles provide. Such training would build upon and complement the initiative already underway to train first responders on how to deal with alternative fuel vehicles in their jurisdiction.

Emergency Back-Up Generators

Gas stations and other fueling facilities rely on electricity to operate fuel pumping and dispensing equipment. If the power goes out due to an emergency or problem in the electric delivery system, these facilities are unable to provide fuel to their customers. Backup power generators, which are available as either diesel operated or natural gas operated, are becoming a more commonly applied solution to this problem. Gas stations and alternative fueling facilities can invest in the units and on-site fuel storage to operate the units, or install the wiring necessary to connect to a back-up generator that could be delivered to the site through a pre-arranged agreement with a company that provides that service.

These emergency back-up generators are additional energy assets that should be identified in the state's emergency and energy planning documents. **TCF can assist OEP and TEMA to collect information on the stations that have emergency generators. A strategy to provide this information to the public should be implemented. The State could also consider ways to incentivize fueling facilities to install back-up generators, particularly near major highways and evacuation routes, in the event of electricity outages.**

Modifications to Tennessee's Energy Assurance Plan

As noted above, Tennessee's EAP and Petroleum Contingency Plan are the documents that address the roles and responsibilities and actions to be taken for energy disruptions or emergencies related to liquid fuels and natural gas. The EAP incorporates ESF-12, which is referenced in the TEMP. While these Plans recommend several mitigation strategies that can be employed during a petroleum supply disruption, neither document fully addresses the role that the diverse set of alternative fuels and vehicles could play in dealing with response and recovery. Following are suggestions for how these Plans could be

⁴ Visit www.tennessee.gov/environment/section/energy for more information.

modified to address the opportunity, based on the recommendations made in this Policy and Planning ToolKit.

Section 1 – Energy Assurance Plan

Section 1.13 of the EAP lists Standard Operating Procedures for various inter-agency groups that work singularly or jointly on energy emergency planning under four Phases: Readiness; Situational Awareness; Pre-Emergency; and Emergency. Recommended ways to modify the list of responsibilities of OEP for the Policy Group and Operations Group are listed below. Note that some of the items are repeated; it may be appropriate to include them in only one of the sections but for purposes of this report, they appear twice.

Section 1.13.1 – Policy Group

- Readiness Phase. Revise one bullet and add new bullets as follows:
 - Update and maintain a network of public and private sector energy company contacts. *This should include energy companies that store, distribute and dispense alternative fuels for transportation (compressed and liquid natural gas, liquid petroleum gas, ethanol, biodiesel, and electricity).*
 - *Update and maintain the iREV Tracking Tool which provides location of alternative fuel storage and dispensing stations and alternative fuel fleets.*
 - *Update and maintain a list of alternative fuel fleets that have indicated a willingness to be called upon to provide an emergency response function if needed.*
 - *Update and maintain a list of gasoline, diesel and alternative fuel stations that have emergency generators installed.*
- Pre-Emergency Phase. Add one bullet as follows:
 - *Notify alternative fuel fleets that have previously indicated a willingness to be called upon in an emergency that a shortage of petroleum may occur in their area. Confirm their continued ability to provide an emergency response function if needed.*
- Emergency Phase: Add one bullet as follow:
 - *Request the deployment of alternative fuel fleets willing to be called upon in an emergency if needed due to a petroleum disruption.*

Section 1.13.2 – Operations Coordination Group

- Readiness Phase. Add bullets as follows:
 - *Update and maintain the iREV Tracking Tool which provides location of alternative fuel storage and dispensing stations and alternative fuel fleets.*
 - *Update and maintain a list of alternative fuel fleets that have indicated a willingness to be called upon to provide an emergency response function if needed.*

- *Update and maintain a list of gasoline, diesel and alternative fuel stations that have emergency generators installed.*
- Pre-Emergency Phase. Add one bullet as follows:
 - *Notify alternative fuel fleets that have previously indicated a willingness to be called upon in an emergency that a shortage of petroleum may occur in their area. Confirm their continued ability to provide an emergency response function if needed.*
- Emergency Phase. Add one bullet as follow:
 - *Request the deployment of alternative fuel fleets willing to be called upon in an emergency if needed due to a petroleum disruption.*

Section 1.13 also includes a list of the types of information that the OEP’s EOC is required to consider when deciding to recommend implementation of various voluntary or mandatory measures to the Governor. It is recommended to add a new bullet to that list and modify another as follows:

- *Collect and monitor supply, consumption and production of alternative fuels.*
- *Coordinate with the oil and alternative fuel distributors concerning potential supply availability for Tennessee.*

Section 2 – Energy Asset Details

Section 2.7 is the Tennessee Transportation Energy Profile which describes the energy consumption of the transportation sector, with sub-sections that discuss Petroleum Pipelines (2.7.1) Petroleum Assets (2.7.2), and Monitoring Petroleum Supply, Demand, and Disruptions (2.7.3). It is recommended that a new sub-section be added that addresses the various alternative transportation fuels from the perspective of availability, distribution and current usage in the State. While the contribution of alternative fuels to the overall fuel usage is relatively small, these fuels are important from a fuel diversity, energy security and environmental perspective and should be considered an energy asset of some importance to the State.

Section 2.8 is a brief reference to the Petroleum Contingency Plan which is a separate document (discussed below). The section lists several mitigation strategies that could be employed during a petroleum supply disruption. The following bullets are recommended to be added:

- *Deploy alternative fuel vehicles to provide emergency response functions*
- *Reduce demand: Diversify fuel sources by encouraging use of alternative fuel vehicles*

Modifications to Tennessee’s Petroleum Contingency Plan

This Petroleum Contingency Plan documents OEP’s and other state agencies’ responsibilities in managing disruptions to the supply of petroleum fuels. The purpose of the Plan is to bring about the rapid recovery of the supply of petroleum fuels during disasters and shortages. The

Plan includes several options which could enhance the State’s energy emergency preparedness. Following are recommendations on how the Plan could be modified to account for the opportunity that alternative fuel vehicles could play in the event of a petroleum disruption.

Situation and Assumptions

The following modification to number 5 in the list of Options for Tennessee is recommended within the Situation and Assumptions section:

- Maximize the use of alternative fuels through increased use of vehicles with flexible or alternative fueling capabilities. This includes the use of *natural gas, LNG, liquid petroleum gas (propane), biofuels (biodiesel and ethanol)*, hybrid electric and electric vehicles.

A new item is recommended to be added to number 7 in the list of Assumptions:

- *Alternative-fuel vehicles operated by public and private fleets could be used to provide vital emergency and public health and safety functions during petroleum disruptions or shortages.*

Concept of Operations

A new paragraph is recommended to be added after the paragraph on Monitoring Supply and Demand in the Concept of Operations section.

- *Alternative Fuels. A tool to track the location of alternative fuel dispensing stations and alternative fuel fleets has been developed through the U.S. DOE - funded Initiative for Resiliency in Energy through Vehicles (iREV). The OEP will maintain and periodically update the iREV Tracking Tool to serve as a resource to be used by state and local emergency planners. OEP will also maintain contacts with alternative fuel providers to more broadly assess the availability and supply of those fuels in the State.*

Activation Levels

This section includes Checklists for actions related to the four levels of fuel supply conditions to prepare for, respond to, and recover from petroleum shortages outlined in the NASEO’s State Energy Assurance Guidelines. These levels have been modified from NASEO’s guidance to correlate with TEMA’s activation levels with Level One as the highest level of activation. It is recommended the following bullets be modified or added to the Checklists:

Normal conditions – Level 4: Monitor and Alert

- *Review and update alternative-fuel supplier Emergency Contact List*
- *Review and update the iREV Tracking Tool and maintain a list of alternative fuel fleets that have indicated a willingness to be called upon to provide an emergency response function if needed.*

Shortage – Level 3 Mild fuel Shortage

- *Notify the network of alternative fuel fleets of possible pending petroleum shortages. Confirm their continued ability to provide an emergency response function if needed.*

Shortage – Levels 2 and 1 Intermediate/Severe Fuel Shortage

- *Call upon one or more alternative fuel fleets with requests to provide emergency and public health and safety functions in areas experiencing fuel shortages that impede the ability of petroleum vehicles to provide those functions.*

Petroleum Conservation Implementation Measures

This section includes Public Information Measures, Voluntary Conservation Measures, and Mandatory Measures that the State could put in place if the petroleum shortage warrants such actions. It is recommended that the following item be added to the list of Voluntary Conservation Measures:

- *Encourage public and private fleets to purchase alternative-fuel vehicles particularly in areas where fueling facilities are located.*

The paragraph that discusses the Tennessee State Agency Fuel Allocation Program could be amended to read as follows:

- *In times of a motor fuel shortage, it will be imperative that state Government lead by example to reduce fuel usage. All state agencies should establish a plan for a phased reduction in the amount of fuel necessary to maintain essential agency functions as part of their Continuity of Operations or Continuity of Government plans. For longer range planning, state agencies should consider reducing their dependence on petroleum vehicles by converting a portion of their fleet to alternative-fuel vehicles.*

Address Emergency Planning in the State Energy Plan

Tennessee currently does not have a State Energy Plan⁵, however legislation in 2017 established an Energy Policy Council to, among other things, compile an annual report assessing the energy sector in the State and to develop a comprehensive state energy policy plan. This plan will address energy efficiency, renewable and alternative sources of energy, research and development into alternative energy technologies, and improvements to the State's energy infrastructure and energy economy.

Given the transportation sector's large contribution to the amount of petroleum used in the State, one would expect that opportunities to reduce transportation-related consumption and/or diversify fuels will be reviewed. As such, it is recommended that the emergency response capabilities of alternative fuels and vehicles be considered as an additional benefit that could result from the policies and programs that will be developed through this planning process. This provides an excellent opportunity and example of how to integrate energy and emergency planning in a way that provides the greatest benefits to the citizens of the State.

Conclusion

Tennessee has a multitude of alternative fuel assets that could potentially be called upon to address emergencies that result in disruption in the supply of petroleum. By modifying its plans and procedures and working with municipalities to recognize the role that alternative fuel vehicles could play, Tennessee will be better prepared to take advantage of this opportunity. Further expansion of usage of alternative fuels by public and private fleets in the State will help make the Tennessee more resilient.

⁵ Tennessee is unique in that the TVA, a corporation owned by the U.S. government, blankets the state's service territory, providing electricity to 99.7 percent of the electricity service territory in Tennessee. TVA is self-regulated with regard to fuel mix and production goals; thus, the State of Tennessee cannot establish such standards for TVA, a federal agency. OEP does provide a plan to the U.S. Department of Energy each year regarding activities under the DOE State Energy Program and has a distinct market title within its DOE State Energy Program Plan that focuses on OEP's activities to promote and educate citizens about alternative fuels, sustainable transportation, and the reduction of greenhouse gas emissions from mobile sources within the State.

Appendix A: Fleet Contacts

Below is a sampling of fleet contacts, representing vehicle types that could provide emergency functions. This list is not comprehensive; there are hundreds of fleets that fit this definition.

Organization	Contact	Title	Email
State Motor Vehicle Management	Bob Williams	Manager	bob.williams@tn.gov
Shelby County	Bill Cunningham	Fleet Manager	bill.cunningham@shelbycountyttn.gov
Memphis Office of Fleet Management	Eric Hunter	Administrator	eric.hunter@memphistn.gov
Memphis Area Transit Authority	Gary Rosenfeld	Interim Chief Executive Officer	
Metropolitan Government of Nashville and Davidson County Fleet Management	Stacey Wall		Stacey.Wall@nashville.gov
Nashville Metropolitan Transit Authority	Steve Bland	Chief Executive Officer	steve.bland@nashville.gov
City of Franklin Street Department	Joseph York	Director (maintains City fleet)	joey@franklntn.gov
City of Franklin Sanitation and Environmental Services	Jack Tucker	Director	sanitation@franklntn.gov
Franklin Transit Authority	Debbie Henry	Executive Director	dhenry@tmagroup.org
*City of Knoxville	Keith Shields	Fleet Services Director	kshields@knoxvilletn.gov
*Knoxville Area Transit	Dawn Distler	Director of Transit	ddistler@katbus.com
Knox County Public Works	Phillip May	Fleet Services Manager	Phillip.may@knoxcounty.org
City of Chattanooga Public Works	Justin Holland	Administrator	311@chattanooga.gov
*Chattanooga Area Regional Transportation Authority	Lisa Maragnano	Executive Director	maragnano_lisa@gocarta.org
*Waste Management	Robert Cheney		RCheney@wm.com
*FedEx	Marc Clark		maclark3@fedex.com
*UPS	Tim Rayburn		trayburn@ups.com
*Knoxville Utilities Board	Chris Wilson		chris.wilson@kub.org
*Chattanooga Gas	Paul Leath		pleath@southernco.com
*Piedmont Natural Gas	Chip Gifford		Chip.Gifford@piedmontng.com
*Memphis Light Gas Water	Jonathan Jones		jjones@mlgw.org
*Tennessee Valley Authority	Phil Essary		rpessary@tva.gov
*Ferrellgas	Rick Warren		RickWarren@ferrellgas.com
*Tranco Logistics	Byron Trantham		byron@trancologistics.com

**These fleets are currently or have used alternative fuels for some vehicles.*

Appendix B: Alternative Fuels in School Bus Fleets

	PUPIL TRANSPORTATION 2014-15									
	MILEAGE	SCHOOL BUSES					BUS OWNERSHIP			
							INSPECTED BY TN. DEPT of SAFETY		ADT 1 1/2 MI+	
	TOTAL DAILY	TYPE A	TYPE B	TYPE C	TYPE D	TOTAL	DISTRICT OWNED	PRIVATELY OWNED & UNDER CONTRACT	REGULAR	SPECIAL EDUC.
ANDERSON CO.	2,656	0	0	20	27	47	0	47	5,458	0
OAK RIDGE	1,633	1	1	0	28	30	27	3	776	0
BEDFORD CO.	2,190	2	0	9	59	70	70	0	4,848	82
BENTON CO.	1,738	1	0	21	10	32	5	27	2,060	32
BLED SOE CO.	1,460	1	0	3	26	30	30	0	1,497	122
BLOUNT CO.	3,554	22	0	31	70	123	5	118	8,310	124
ALCOA	1,053	1	0	0	6	7	0	7	536	11
MARYVILLE	1,431	5	0	0	18	23	5	18	1,985	46
BRADLEY CO.	1,888	15	0	11	66	92	24	68	6,975	87
CLEVELAND	868	1	35	0	0	36	0	36	2,650	80
CAMPBELL CO.	1,570	10	0	23	9	42	12	35	4,245	61
CANNON CO.	969	2	0	4	17	23	18	6	504	62
CARROLL CO.	1,294	0	0	39	40	79	79	0	3,011	16
CARTER CO.	1,263	19	0	62	0	81	81	0	3,910	74
ELIZABETHTON	210	0	0	15	0	15	15	0	477	9
CHEATHAM CO.	1,903	12	0	1	62	75	1	74	3,356	0

CHESTER CO.	1,842	1	0	9	24	34	34	0	1,861	18
CLAIBORNE CO.	2,982	0	0	49	0	49	45	4	3,583	30
CLAY CO.	441	2	0	9	12	23	23	0	705	5
COCKE CO.	1,843	0	0	4	68	72	72	0	2,758	58
COFFEE CO.	1,418	0	0	0	55	55	55	0	2,115	55
MANCHESTER	23	2	0	0	0	2	2	0	7	7
TULLAHOMA	0	0	0	0	0	0	1	0	6	6
CROCKETT CO.	496	0	0	4	22	26	0	26	1,394	15
CUMBERLAND CO.	4,177	15	0	0	65	80	79	1	3,053	57
DAVIDSON CO.	12,499	45	0	171	580	796	796	0	37,216	1,027
DECATUR CO.	1,609	0	0	0	30	30	30	0	1,457	0
DEKALB CO.	2,135	0	0	8	32	40	0	40	1,676	51
DICKSON CO.	2,308	1	0	0	101	102	102	0	4,610	114
DYER CO.	1,175	12	0	2	62	76	76	0	3,149	96
FAYETTE CO.	3,160	49	0	0	0	49	49	0	2,299	31
FENTRESS CO.	1,173	11	0	0	27	38	38	0	1,743	45
FRANKLIN CO.	1,948	1	0	15	31	47	43	39	1,990	77
HUMBOLDT	171	0	0	0	8	8	0	8	416	9
*MILAN	562	0	0	0	12	12	12	0	1,004	18
*TRENTON	326	0	0	0	7	7	7	0	761	1
*BRADFORD	394	0	0	7	1	8	8	0	32	2
*GIBSON CO. SPEC	852	5	0	1	29	35	35	0	1,233	30
GILES CO.	1,728	0	0	33	27	60	60	0	2,674	59
GRAINGER CO.	1,539	4	0	22	35	61	32	29	3,140	56
GREENE CO.	2,353	0	0	15	84	99	99	0	5,142	41
GREENEVILLE	243	1	0	2	14	17	17	0	1,015	23
GRUNDY CO.	1,262	3	0	28	1	32	32	0	1,276	29
HAMBLEN CO.	2,261	2	0	4	48	54	54	0	4,637	0
HAMILTON CO.	9,856	74	0	3	228	305	0	305	19,241	723

HANCOCK CO.	666	16	1	12	2	31	31	0	859	15
HARDEMAN CO.	1,507	7	0	4	73	84	84	0	2,293	38
HARDIN CO.	1,345	0	0	16	26	42	4	38	1,539	31
HAWKINS CO.	2,453	18	0	93	0	111	0	111	6,144	65
HAYWOOD CO.	2,659	4	0	32	13	49	49	0	1,735	0
HENDERSON CO.	3,028	7	0	35	11	53	10	43	1,996	36
HENRY CO.	1,870	0	0	65	0	65	65	0	2,431	11
*PARIS	196	0	0	1	10	11	11	0	786	15
HICKMAN CO.	1,292	5	0	33	17	55	55	0	1,944	3
HOUSTON CO.	1,087	1	0	0	17	18	18	0	950	0
HUMPHREYS CO.	1,053	0	0	5	37	42	42	0	1,411	28
JACKSON CO.	803	5	0	22	5	32	27	5	1,041	14
JEFFERSON CO.	2,148	14	0	7	69	90	90	0	5,668	73
JOHNSON CO.	1,799	3	0	35	1	39	39	0	1,475	2
KNOX CO.	10,820	96	0	69	229	394	1	396	38,065	1,100
LAKE CO.	307	0	0	10	0	10	10	0	393	13
LAUDERDALE CO.	1,237	0	4	3	43	50	50	0	2,663	55
LAWRENCE CO.	2,057	0	0	18	54	72	73	0	1,754	40
LEWIS CO.	402	1	0	0	26	27	27	0	685	9
LINCOLN CO.	2,294	5	0	15	33	53	53	0	2,012	15
FAYETTEVILLE	225	0	0	0	9	9	9	0	273	5
LOUDON CO.	1,348	8	0	17	22	47	0	47	1,711	26
LENOIR CITY	555	12	0	0	0	12	12	0	1,338	9
MCMINN CO.	2,299	0	0	57	10	67	67	0	2,831	0
ATHENS	168	1	0	10	1	12	4	8	565	8
ETOWAH	20	2	0	0	0	2	2	0	13	0
MCNAIRY CO.	2,820	0	0	10	42	52	74	0	2,961	39
MACON CO.	2,042	1	0	37	15	53	53	0	2,367	33
JACKSON-MADISON	5,068	0	0	39	111	150	150	0	6,732	273

CO.											
MARION CO.	1,290	1	0	17	7	25	1	24	3,122	18	
MARSHALL CO.	1,178	0	0	0	40	40	40	0	2,429	25	
MAURY CO.	4,419	27	0	0	85	112	112	0	4,512	154	
MEIGS CO.	647	1	0	7	22	30	30	0	1,609	117	
MONROE CO.	4,994	0	0	65	1	66	15	51	3,230	80	
SWEET WATER	92	0	0	2	0	2	0	2	7	7	
MONTGOMERY CO.	6,767	20	0	57	248	325	325	0	21,465	585	
MOORE CO.	431	1	0	14	0	15	44	0	537	3	
MORGAN CO.	9,431	4	0	4	33	41	41	0	2,202	0	
OBION CO.	1,044	0	0	34	19	53	53	0	2,094	35	
UNION CITY	148	0	0	8	2	10	10	0	592	0	
OVERTON CO.	893	1	0	22	17	40	40	0	1,510	7	
PERRY CO.	1,218	0	0	12	5	17	17	0	558	15	
PICKETT CO.	272	0	9	0	0	9	9	0	453	0	
POLK CO.	833	2	1	10	28	41	42	0	1,416	0	
PUTNAM CO.	1,468	1	0	20	44	65	65	0	3,162	206	
RHEA CO.	2,124	10	0	28	25	63	63	0	3,333	0	
ROANE CO.	2,590	0	0	8	68	76	76	0	3,547	23	
ROBERTSON CO.	3,185	24	0	2	78	104	104	0	5,679	79	
RUTHERFORD CO.	8,443	50	0	4	232	286	31	255	17,332	270	
MURFREESBORO	2,654	0	0	0	33	33	33	0	1,440	85	
SCOTT CO.	1,024	0	0	41	0	41	41	0	1,516	27	
*ONEIDA	38	6	0	0	0	6	6	0	292	4	
SEQUATCHIE CO.	818	0	0	0	16	16	16	0	1,172	15	
SEVIER CO.	3,523	25	0	59	95	179	178	1	10,326	221	
SHELBY CO.	20,560	18	25	351	102	496	0	496	20,733	1,492	
ARLINGTON	1,430	0	0	2	15	17	0	17	1,963	5	
BARTLETT	3,662	0	0	7	41	48	0	48	3,074	52	

COLLIERVILLE	3,136	0	0	8	36	44	0	44	2,728	37
GERMANTOWN	2,196	0	0	5	27	32	0	32	1,014	13
LAKELAND	832	0	0	2	8	10	0	10	331	5
MILLINGTON	1,244	0	0	6	20	26	0	26	837	17
SMITH CO.	1,138	1	0	11	29	41	41	0	2,158	54
STEWART CO.	2,616	1	0	0	43	44	44	0	1,512	28
SULLIVAN CO.	4,132	19	0	103	8	130	22	108	5,612	84
BRISTOL	422	10	3	21	1	35	13	22	1,251	49
KINGSPORT	1,232	1	0	0	43	44	44	0	1,971	100
SUMNER CO.	12,980	0	0	32	201	233	453	0	19,384	275
TIPTON CO.	3,633	12	0	44	156	212	212	0	8,419	132
TROUSDALE CO.	596	1	0	0	17	18	18	0	681	9
UNICOI CO.	681	0	5	22	5	32	32	0	1,708	18
UNION CO.	2,078	0	0	28	12	40	0	40	3,637	77
VAN BUREN CO.	598	0	0	0	12	12	12	0	532	0
WARREN CO.	1,684	0	0	0	61	61	55	6	1,020	16
WASHINGTON CO.	6,945	32	0	100	0	132	132	0	5,796	92
JOHNSON CITY	1,577	17	0	0	41	58	0	58	4,126	230
WAYNE CO.	1,865	7	0	34	2	43	45	0	1,364	0
WEAKLEY CO.	1,306	49	0	0	0	49	49	0	1,452	28
WHITE CO.	2,363	5	0	5	32	42	42	0	2,019	35
WILLIAMSON CO.	9,691	0	0	33	228	261	261	0	18,836	345
* FRANKLIN	1,610	3	0	0	30	33	33	0	1,935	52
WILSON CO.	7,264	4	0	50	129	183	183	0	7,980	115
* LEBANON	978	0	0	0	33	33	33	0	2,325	67
GRAND TOTAL	297,998	879	84	2,548	5,347	8,858	6,399	2,779	473,360	10,851

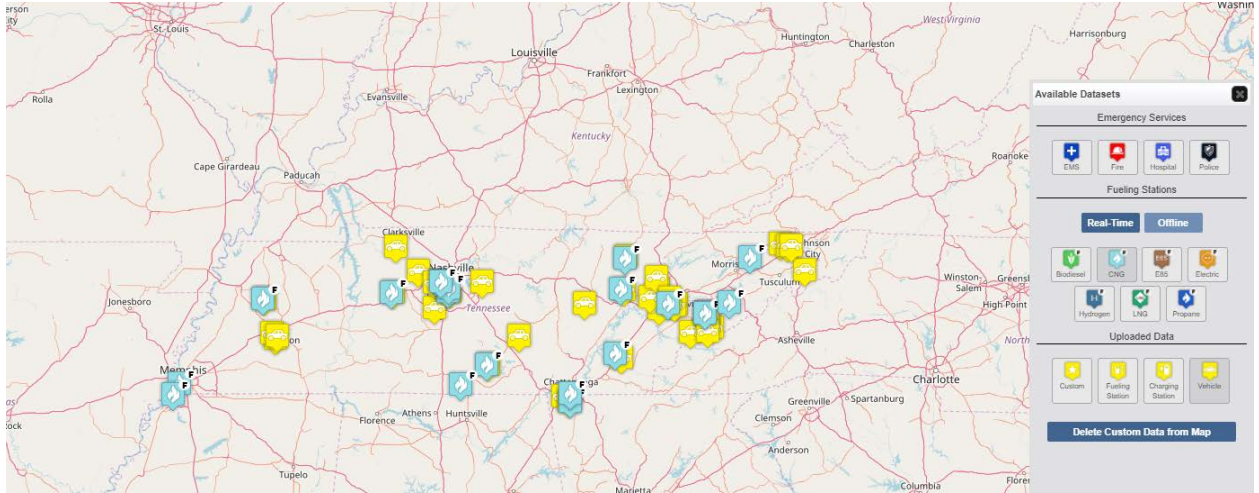
* SPECIAL SCHOOL DISTRICT

** ASD data is reported in Memphis and Davidson Co. data

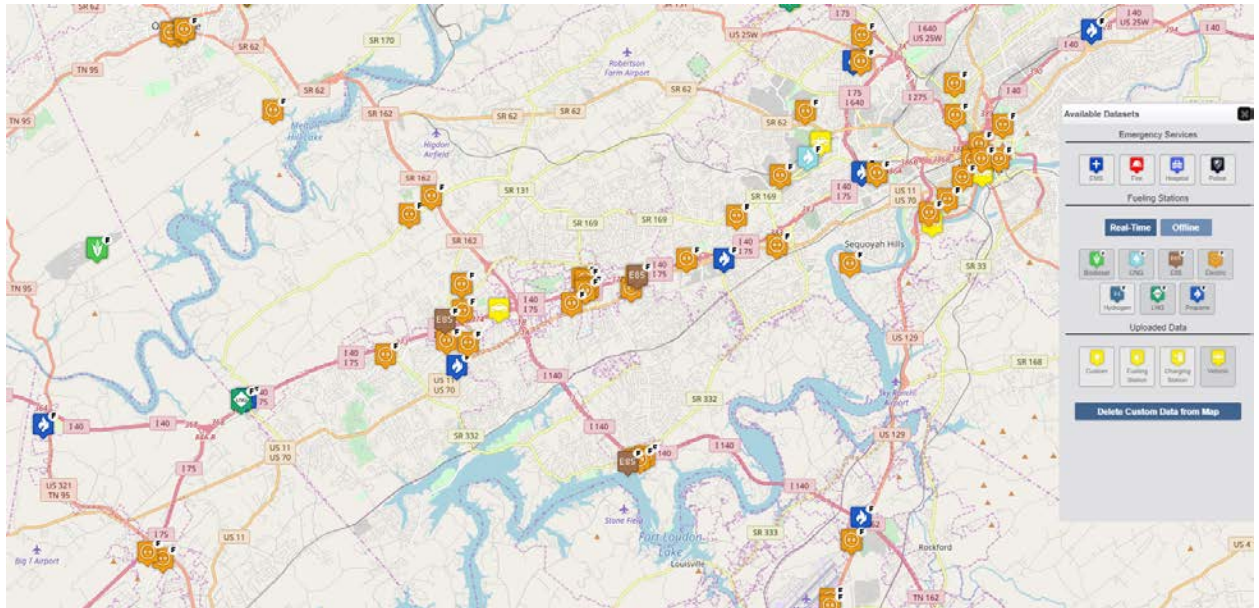
NOTE - 1) Total daily miles represent one way AM miles only.

Appendix C: iREV Tracking Tool Sample Output for Tennessee

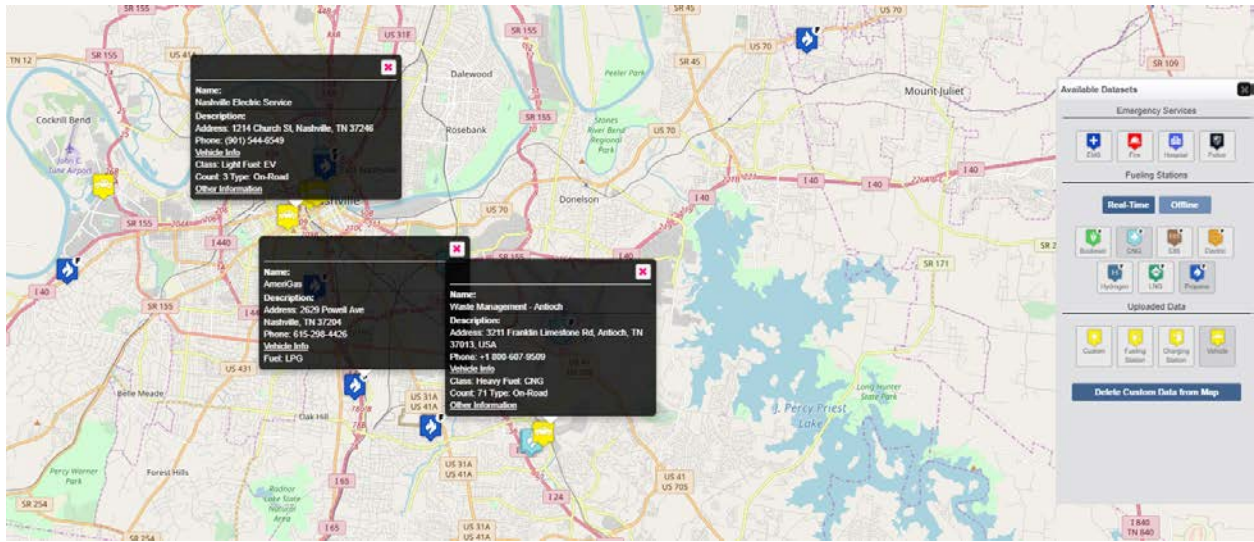
Locations of CNG Stations and Fleets in Tennessee



Locations of Alternative Fuel Fleets and Fueling Facilities in Knoxville



Location of Alternative Fuel Fleets in Nashville



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