

Advanced Biofuels USA, a nonprofit educational organization, advocates for the adoption of advanced biofuels as an energy security, economic development, military flexibility and climate change solution.



## How to De-Fossilize Your Fleet

### Suggestions for Fleet Managers Working on Sustainability Programs

by Joanne Ivancic\*

**Cities, companies, universities, organizations pledge** to be 100% renewable<sup>1</sup> (or 50%<sup>2</sup>) by a certain date. But how often does that pledge include renewable transportation energy? Occasionally. But it could be better.

At conferences, sustainability events, by phone and email, I've discussed with fleet managers practical ways they can contribute to near-term achievement of sustainability and renewable energy (including transportation) goals for their company's/university's/municipality's/state's/organization's/family's. Here are some of the ideas we've developed with suggested practice statements *in italics*.

#### **Dance with the One Who Brung You<sup>3</sup>**

*You got to dance with who brung you, swing with who swung you,*

*Life ain't no forty-yard dash, be in it for the long run ...*

That is: Start with what you have and lower your life cycle carbon emissions as much as possible with what is available to you immediately.

There are three key strategies:

1. Reduce Vehicle Miles Traveled
2. Decrease Fossil-Based Fuel Use
3. Increase Engine Efficiency

This article will focus on the second strategy with some overlap with the third.

Internal combustion engine vehicles including spark ignition engines, compression ignition/diesel engines and engines that use compressed natural gas likely dominate your fleet. They provide opportunities under your control to maximize emissions reductions immediately.

<sup>1</sup> Sierra Club, 100% Commitments in Cities, Counties, & States <https://www.sierraclub.org/ready-for-100/commitments>

<sup>2</sup> Singularity Hub, How the US Will Get to a 50 Percent Renewable Electric Economy by 2030, <https://singularityhub.com/2019/07/07/how-the-us->

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[will-get-to-a-50-percent-renewable-electric-economy-by-2030/](https://www.sierraclub.org/ready-for-100/commitments)

<sup>3</sup> Songwriters: R. Benson; Dance With Who Brung You Lyrics © Bob-a-lew Songs

We've come up with these policy suggestions and examples of how to achieve them.

## 1. Spark Ignition Engines: *Fuel with the greatest proportion of renewable fuel available*

**-Flex Fuel Vehicles:** *Any flex fuel vehicles (FFVs) in your fleet or that staff use as they travel must be filled up with E85 if there's a station reasonably available; second choice is E15 or other blends if available.*

How do you know it's an FFV and can use high ethanol blends? You can look in the owners' manual or on the driver's side door. It might also have a decal or insignia near the vehicle name. If you can't find it that way, for model years 2018 and older, the Renewable Fuels Association has published a list. The Fuel Freedom Foundation has the Check Your Car tool. You can enter in your vehicle's make, model, year and engine size, and it'll tell you if it is an FFV. If you don't have FFVs now; try to buy them.

What's a reasonably available station? Federal regulations described in the Federal Fleet Management Handbook<sup>4</sup> (see appendix) provide an example of what might be reasonable.

*"... within a 15-minute drive or within 5 miles (one way) from the vehicle's garaged location. Waivers will be granted for vehicles that have a drive*

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<sup>4</sup> U.S. Department of Energy, Executive Order 13514 Federal Leadership in Environmental, Energy, and Economic Performance Comprehensive Federal Fleet Management Handbook, [https://www.energy.gov/sites/prod/files/2017/01/f34/eo13514\\_fleethandbook.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/eo13514_fleethandbook.pdf)

<sup>5</sup> U.S. Department of Energy, Executive Order 13514 Federal Leadership in Environmental, Energy, and

longer than 15 minutes even if a station is within the 5-mile barrier. Dual fueled vehicles that have access to alternative fuel along the vehicle's usual travel route are expected to use that fuel, even if that infrastructure is more than 5 miles away from the vehicle's garaged location.

There's an exception related to expense:

(if) alternative fuel is unreasonably expensive. Unreasonably expensive means that alternative fuel costs more per gallon than gasoline at the same station.<sup>5</sup>

Choose an app such as E85 Prices (<https://e85prices.com/>) to locate fueling stations that carry E85 (technically 51-83% ethanol; but generally thought of as 85% ethanol and 15% gasoline) and other ethanol blends in the US. Or use the U.S. Department of Energy's Alternative Fueling Station Locator which also includes locations in Canada.

**A word of caution.** If the FFV has been using gasoline regularly before using high ethanol blends regularly, include in your maintenance plan changing the fuel filter after about 200 miles.

If the vehicle has been using gasoline for many years, as was true for the 2002 Ford Focus we converted to use E85<sup>6</sup>, we found

Economic Performance Comprehensive Federal Fleet Management Handbook [https://www.energy.gov/sites/prod/files/2017/01/f34/eo13514\\_fleethandbook.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/eo13514_fleethandbook.pdf)

<sup>6</sup> Kozak, Bob, Advanced Biofuels USA, Walking the Walk in Advanced Biofuels USA's "E30 and Beyond Retrofitted" Focus <https://advancedbiofuelsusa.info/walking-the-walk->

another fuel filter change after 1000 miles is a good idea. The ethanol serves to clean out the fuel system and dislodges hydrocarbon build up which gets filtered out and can clog the fuel filter. After getting the fossil fuel grunge out of the system, regular use of E85 should keep the system clean.

**-Model year 2001 and newer Use E15 whenever available.**

If spark ignition vehicles in your fleet are 2001 model year or newer (18 years old or newer) and not Prius-type hybrids (which can't "stomach" the higher octane very well)<sup>7</sup>, they should use E15 when filling up. The U.S. Environmental Protection Agency has approved E15 use in 2001 MY and newer vehicles, although manufacturer warranties and owners' manuals might not mention E15 as it was not available for consumers when those vehicles were manufactured and sold. The Renewable Fuels Association provides an annual analysis of vehicle warranty statements<sup>8</sup> available here<sup>9</sup>. And a list<sup>10</sup> of approval status of E15 for non-FFV vehicles.

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[in-advanced-biofuels-usas-e30-and-beyond-retrofitted-focus/](http://www.advancedbiofuelsusa.info/wp-content/uploads/2012/08/New-Ethanol-Engine-Tech-Revised-Aug-2012-Formatted.pdf)

<sup>7</sup>Kozak, Robert, New Engine Technologies Could Produce Similar Mileage for All Ethanol Fuel Mixtures, Advanced Biofuels USA <https://advancedbiofuelsusa.info/wp-content/uploads/2012/08/New-Ethanol-Engine-Tech-Revised-Aug-2012-Formatted.pdf>

<sup>8</sup> [https://ethanolrfa.org/wp-content/uploads/2019/02/carmodels\\_e15.jpg](https://ethanolrfa.org/wp-content/uploads/2019/02/carmodels_e15.jpg)

<sup>9</sup> <https://ethanolrfa.org/consumers/e15-higher-octane-lower-price/>

<sup>10</sup> <https://ethanolrfa.org/wp-content/uploads/2018/10/Copy-of-2019MY-Table.pdf>

<sup>11</sup> Renewable Fuels Association, Ethanol Savings Calculator <https://ethanolrfa.org/consumers/>

<sup>12</sup> <https://e85prices.com>

<sup>13</sup> CRC study, Report No. E-129, titled ALTERNATIVE OXYGENATE EFFECTS ON EMISSIONS, [https://crcao.org/reports/recentstudies2019/E-129/CRC%20Project%20%20E-129%20Final%20Report\\_May%202019.pdf](https://crcao.org/reports/recentstudies2019/E-129/CRC%20Project%20%20E-129%20Final%20Report_May%202019.pdf)

## **-Benefit of Ethanol Fuel**

In addition to having lower carbon intensity than petroleum-based fuel, the added benefit of using higher ethanol blends is they may also save you money. E15 and E85 are usually less expensive than regular E10 gasoline. You do get about 22% less mileage with E85 compared to E10 regular. There are online calculators to help determine if the price difference makes up for the lost fuel efficiency.<sup>11</sup> E85Prices posts daily prices at [www.E85Prices.com](http://www.E85Prices.com)<sup>12</sup>.

Other benefits of ethanol: less reliance on foreign oil, cleaner air and more income in rural communities. Specifically, ethanol as an oxygenate lowers tailpipe emissions<sup>13</sup>, replaces benzene, a well-documented carcinogen<sup>14</sup>, reduces harmful volatile organic compound (VOC) emissions and reduces smog-forming potential.<sup>15</sup> It also lowers the wear and tear on engines and improves performance due to characteristics such as higher heat of vaporization and higher compression ratios.<sup>16</sup>

<sup>14</sup> *What's in Our Gasoline Is Killing Us: Mobile Source Air Toxics and The Threat to Public Health*, [http://www.safegasolinecampaign.org/wp-content/uploads/2019/06/MSAT-Fact-Book\\_042919.pdf](http://www.safegasolinecampaign.org/wp-content/uploads/2019/06/MSAT-Fact-Book_042919.pdf)

<sup>15</sup> EESI <https://www.eesi.org/articles/view/ethanol-and-air-quality-separating-fact-from-fiction>; The Consumer and Fuel Retailer Choice Act: Environmental, Health & Consumer Considerations, EESI; New Studies Show Ethanol Reduces Emissions And Improves Air Quality, Fix Our Fuel

<sup>16</sup> New Engine Technologies Could Produce Similar Mileage for All Ethanol Fuel Mixtures <https://advancedbiofuelsusa.info/wp-content/uploads/2012/08/New-Ethanol-Engine-Tech-Revised-Aug-2012-Formatted.pdf>

And Effects of Heat of Vaporization and Octane Sensitivity on Knock-Limited Spark Ignition Engine Performance Ratcliff, M.A., Burton, J., Sindler, P., Christensen, E. et al., "Effects of Heat of Vaporization and Octane Sensitivity on Knock-Limited Spark Ignition Engine Performance," SAE Technical

Increasing the volume of ethanol in the fuel supply to 30 percent (E30) has the greatest positive impact on tailpipe emissions of toxins out of any commercially available fuel. This included significant reductions in ultrafine particulates and carbon monoxide. Latest research finds that E30 did not contribute to smog formation (a mixture of nitrous oxides and carbon monoxide).<sup>17</sup>

Recent research from the U.S. Department of Agriculture has found that domestically-produced corn ethanol is, on average, 43 percent less GHG intensive than gasoline. Cellulosic ethanol, sourced from crop wastes and purpose-grown crops (rather than edible plant matter), must be 60 percent less GHG intensive than gasoline. According to modeling from the U.S. Department of Energy, cellulosic ethanol can reduce GHG emissions between 90 and 115 percent, relative to gasoline, depending on the feedstock.<sup>18</sup>

So, using high ethanol blends in spark ignition engines can significantly defossilize your fleet.

**2. Compression Ignition/Diesel Engines** *Any compression ignition/diesel vehicles in your fleet or that staff use as they travel must be filled up with renewable diesel or biodiesel blends if there's a station reasonably available. Diesel equipment must use the highest blend of biodiesel or*

*renewable/green diesel available that is compatible with the engine.*

Existing vehicles and equipment that have compression ignition or diesel engines can transition to renewable fuels as well.

Renewable diesel (also known as green diesel or HVO) can be used as a drop-in ultra low sulfur replacement for petroleum diesel with no modification, additives or warranty issues. It has fewer particulates in the exhaust and lower maintenance needs. Biodiesel can be used in some proportion, depending on the engine, fuel system and weather conditions. Other fuels such as rDME may also be an option.

Advanced Biofuels USA published a white paper<sup>19</sup> explaining the differences between renewable diesel/green diesel and biodiesel. We are working on an update with a more world-wide focus that also includes renewable DME and other fuels that can be used in compression ignition engines.

### **-Biodiesel**

Essentially, biodiesel is an alternative diesel fuel for use in diesel engines defined by ASTM to be “a fuel comprised of mono-alkyl esters of long-chain fatty acids derived from vegetable oils or animal fats.” Biodiesel is also referred to as FAME (fatty acid methyl ester) or RME (rape seed methyl ester) in Europe; and when the catalyst used is

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Paper 2018-01-0218, 2018, doi:10.4271/2018-01-0218.  
<https://www.nrel.gov/docs/fy18osti/70443.pdf>

<sup>17</sup> EESI <https://www.eesi.org/articles/view/ethanol-and-air-quality-separating-fact-from-fiction>

<sup>18</sup> EESI Fact Sheet - The Consumer and Fuel Retailer Choice Act -- Environmental, Health & Consumer Considerations

<https://www.eesi.org/papers/view/fact-sheet-the-consumer-and-fuel-retailer-choice-act>

<sup>19</sup> <https://advancedbiofuelsusa.info/whats-the-difference-between-biodiesel-and-renewable-green-diesel> Here's more information:  
<https://advancedbiofuelsusa.info/tag/renewable-diesel-green-diesel/>

ethanol, the version is known as FAEE (fatty acide ethyl ester)<sup>20</sup>. Generally, it is produced using a transesterification process, or “reacting vegetable oils or animal fats catalytically with a short-chained aliphatic alcohol (typically methanol or ethanol).”

Biodiesel possesses properties that are dissimilar to fossil diesel. Biodiesel users must be aware of these differences for they may affect the operation of their diesel/compression ignition engine.

For example, biodiesel is chemically different from fossil diesel because it contains oxygen atoms. This leads to different physical properties for biodiesel, some of which vary according to the biodiesel feedstock.<sup>21</sup> Biodiesel can be made from many things from used cooking oil or restaurant grease to algae, from seed crops to oil crops. Most of the biodiesel in the US is made from soybeans as the oil is extracted when making soy meal for animal feed. Similarly, in the Europe, most of the biodiesel is made from canola/rapeseed as the co-product to high protein animal feed.

In the US over the past 10 years, we can count on more consistent quality characteristics from industrially-produced biodiesel. Experience with biodiesel blends in cold weather has also lead to development of best practices that include

additives, cold flow improvers, stabilizers<sup>22</sup> and limiting high biodiesel blend use during winter.

According to the National Biodiesel Board (NBB), some engine companies specify that biodiesel used in their engines must meet ASTM D6751 standards. Others are still in the process of adopting this standard within their company or have their own set of guidelines for biodiesel use that were developed prior to the approval of ASTM D6751.<sup>23</sup> The NBB anticipates that the entire industry will incorporate the ASTM biodiesel standard into their owner’s manuals over time. [Here’s a list of current OEM support providers created by the NBB.](#)<sup>24</sup>

In the US, any diesel fuel can contain up to 5% biodiesel (B5) without notification to customers and without special labeling. The biodiesel is considered an additive or part of the fuel “recipe.” Users must be advised about blends over 5%.<sup>25</sup> ASTM7467 designates biodiesel blends of 6-20%.

Some engine manufacturers will allow concentrations up to B20 in their engines through Tier 3/Stage IIIA models, including all non-emissions-certified engines if the biodiesel (B100) meets ASTM D6751, EN 14214 or equivalent specification.

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<sup>20</sup> Ron Cascone and Steven Slome, FAME Is Fleeting: FAEE as a More Sustainable Option for Biodiesel in the US: Filling the Tank on the Road to the Future, Nexant/Biofuels Digest  
<https://advancedbiofuelsusa.info/fame-is-fleeting-faee-as-a-more-sustainable-option-for-biodiesel-in-the-us-filling-the-tank-on-the-road-to-the-future/>

<sup>21</sup> Rapiere, Robert, R-Squared Energy, Renewable Diesel Primer,

<http://www.rrapier.com/2009/01/renewable-diese/>

<sup>22</sup> <https://advancedbiofuelsusa.info/?s=stabilizer>

<sup>23</sup> <https://www.biodiesel.org/using-biodiesel/oem-information>

<sup>24</sup> <https://www.biodiesel.org/docs/default-source/ffs-basics/oem-support-summary.pdf?sfvrsn=28>

<sup>25</sup> U.S. Department of Energy, Biodiesel Codes, Standards and Safety,  
[https://afdc.energy.gov/fuels/biodiesel\\_codes.html](https://afdc.energy.gov/fuels/biodiesel_codes.html)

The advanced emission controls of newer model engines designed to meet new Environmental Protection Agency Tier 4 standards may not accommodate high levels of biodiesel.

One company, Optimus Technologies based in Pittsburgh, Pennsylvania, has designed a B100 fuel management system that includes two tanks, a smaller tank with #2 diesel, and a larger tank with B100. The technology sends the #2 diesel fuel to the engine at startup, then directs the heat from the engine to warm the B100 tank to a specified operating temperature, then switches to B100 for the majority of running time, even in cold temperatures. Once the engine is shut off, the system will run the engine for roughly 30 seconds purging the B100 from the engine's fuel lines — replacing it with petroleum diesel in preparation for the next cold engine start.<sup>26</sup>

Manufacturers continue to test, study, and research the effect of biodiesel in their engines and equipment. As a result, a manufacturer's stance on biodiesel is continuously changing as they release new vehicles and gain more field experience. For this reason, it is critical to check with your engine manufacturer before using biodiesel, at any blend level over 5%.

### **-Renewable, Green Diesel or HVO Hydrotreated Vegetable Oil**

Renewable Diesel, often called green diesel, second generation diesel, or hydrotreated

vegetable oil (HVO) refers to fossil diesel-like fuels derived from biological or renewable sources that are chemically not esters and thus distinct from biodiesel.

In the US, the term “renewable diesel” has been defined differently by the Department of Energy (DOE), the Internal Revenue Service (IRS) and the Environmental Protection Agency (EPA).<sup>27</sup> In addition, the terms renewable diesel and green diesel have been further distinguished based on the processing method to create the fuel with fossil diesel-like chemical composition. For the purpose of this discussion, the term “renewable diesel” will refer to diesel fuels derived from biomass or other renewable feedstock that meet the standards of ASTM D975 and are not mono-alkyl esters.

Renewable diesel is chemically similar to fossil-based diesel. Like biodiesel, renewable diesel has near-zero aromatic content and very low sulfur content. It typically has a very high cetane number and a cloud point more like conventional fossil diesel fuels. Renewable diesel can be made from the same feedstocks as biodiesel.

Renewable diesel blends follow the same nomenclature as biodiesel. Renewable diesel in its pure form is designated R100 while a blend comprised of 20% renewable diesel and 80% fossil diesel is called R20. Renewable diesel can be mixed with fossil diesel in any proportion but users may need to add an additive to address lubricity issue associated with compounds with no oxygen.

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<sup>26</sup> Optimus Technologies, “The Vector System.”

<https://www.optimustec.com/vectorsystem>

<sup>27</sup> Lane, Jim. “Bioenergy PROFITS Principles: How the Government Defines Renewable Diesel and Biodiesel for Tax Credits and Engine Acceptance.” *Biofuels Digest* 8 Jan. 2010. Web-page.

<http://www.biofuelsdigest.com/blog2/2010/01/08/bioener>

[gy-profits-principles-how-the-government-defines-renewable-diesel-and-biodiesel-for-tax-credits-and-engine-acceptance/](http://www.biofuelsdigest.com/blog2/2010/01/08/bioener)

## **-Biodiesel and Renewable Diesel Sources**

You will probably find it difficult to find biodiesel or renewable diesel in many parts of the US. If you want to buy direct from the producer, there's a list of member biodiesel and renewable diesel plants that are members of the National Biodiesel Board [here](#).<sup>28</sup>

For biodiesel retail locations, here's the [list](#).<sup>29</sup>

You might contact these retailers or the National Biodiesel Board about what it would take to get fuel retailers close to you to carry biodiesel blends or renewable diesel or for information about installing your own pumps.

Some schools have partnered with their science programs and sustainability offices to acquire biodiesel from class production projects.<sup>30</sup>

**3. Compressed Natural Gas (CNG) Engines** *Any compressed natural gas (CNG) vehicles in your fleet or that staff use as they travel and rent must be filled up with renewable natural gas (RNG) if there's a station reasonably available. On-site CNG equipment must use RNG.*

Fossil natural gas has been promoted as a bridge to renewables and over the past decade many fleets have transitioned to CNG vehicles such as CNG buses and trucks. If these are already in your fleet, you can decrease their carbon footprints substantially by using biomethane or renewable natural gas (RNG) in place of all or part of the fossil CNG.

When RNG comes from dairy waste, Dairy Cares reports that according to the California Air Resources Control Board, dairy biomethane is by far the least carbon-intensive transportation fuel currently available in California with a negative carbon intensity score of -255, making it nearly ten times more effective at reducing carbon than even electric vehicles.<sup>31</sup>

Biomethane or renewable natural gas usually comes from captured landfill methane or biogas from anaerobic digesters. The feedstock for the anaerobic digesters could be food waste, agricultural feedstock, animal manure and waste (for example, swine in North Carolina, dairy in California), connected to wastewater treatment facilities, etc. Often biogas from anaerobic digesters is used to generate power on-site. If it is distributed by existing natural gas pipelines or used for transportation fuel, additional clean-up is required.<sup>32</sup>

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<sup>28</sup> <https://nbb.org/about-us/member-plants>

<sup>29</sup> <https://www.biodiesel.org/using-biodiesel/finding-biodiesel/retail-locations/biodiesel-retailer-listings>

<sup>30</sup> For example, Villanova:

<https://advancedbiofuelsusa.info/villanova-center-for-the-advancedment-of-sustainability-in-engineering-invites-advanced-biofuels-usa/> and others: Lane, Jim, March Madness: These Colleges are Mad for Biodiesel, Biofuels Digest <https://advancedbiofuelsusa.info/march-madness-these-colleges-are-mad-for-biodiesel/>; Sims, Bryan, Fueling Education Loud and Clear, Biodiesel Magazine [http://www.biodieselmagazine.com/articles/8358/fueling-](http://www.biodieselmagazine.com/articles/8358/fueling-education-loud-and-clear)

[education-loud-and-clear](#); High School Students from Arizona Charter Academy are Taking Part in Innovative Biodiesel Project,

<http://www.prweb.com/releases/2015/02/prweb12497317.htm>

AIDB's biodiesel program provides unparalleled work experience for its students

<sup>31</sup> <https://www.dairycares.com/dairy-digesters>

<sup>32</sup> Eggleston, Michael, What Happened to Anaerobic Digestion in Rhode Island? Advanced Biofuels USA, <https://advancedbiofuelsusa.info/what-happened-to-anaerobic-digestion-in-rhode-island/>

To locate local sources of biomethane or renewable natural gas, you might want to talk to the people at the [Coalition for Renewable Natural Gas](#)<sup>33</sup> or the [American Biogas Council](#)<sup>34</sup> to see if there's someone who would deliver RNG to your fueling location. A map of RNG production facilities is [here](#)<sup>35</sup>.

## Travel Practices

Although the use of transportation for travel may be beyond the control of a fleet manager, the organization might want to incorporate attention to the fuel used when traveling. In addition to the suggestions provided above, you might want to give priority to airlines that use renewable fuel and let them know that is a factor in making travel arrangements. Some airlines are providing options for customers, instead of buying offsets, they can pay into a fund that supports research, development and deployment of renewable aviation fuels. For example the Nordic countries' [Fly Green Fund](#)<sup>36</sup> and [KLM's Corporate BioFuel Programme](#),<sup>37</sup> use [Lufthansa's calculator](#),<sup>38</sup>.

If planes are part of the fleet for freight or business, SkyNRG's [Board Now](#) program provides an opportunity to reduce business air travel emissions and at the same time contribute to the development of a new production facility for sustainable aviation fuel. Board Now enables companies to contribute directly to the development of the sustainable aviation fuel (SAF) industry.

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<sup>33</sup> <http://www.rngcoalition.com/>

<sup>34</sup> <https://www.americanbiogascouncil.org/>

<sup>35</sup> <http://www.rngcoalition.com/rng-production-facilities>

<sup>36</sup> <http://skynrg.com/nordic/fly-green-fund/>

<sup>37</sup>

<http://skynrg.com/klmcorporatebiofuelprogramme/#track-record>

Organizations that join Board Now, commit themselves for a period of 5 years to the purchase of SAF. With this commitment, they reduce their own business air travel CO<sub>2</sub> emissions, contribute to the development of a new production facility and have their investments used to cover the price difference between sustainable aviation fuel and conventional jet fuel.<sup>39</sup>

## Future Fuels

In addition to bio-based fuels, researchers are working on making fuel from flue gas, recycling plastics to chemicals that can be fuels or building blocks of other products like plastics, fibers, etc. And other fuels like renewable DME that can be used in compression ignition engines are under development.

## Policy Considerations

A number of states or municipalities have policies that promote the sale and use of biofuels. Some states follow or are planning to follow some of California's policies, incorporating a version of that state's model low carbon fuel standard.

Without strong policy, other than transitioning to increased use of lower cost higher ethanol blends, transitioning to renewable fuels may incur additional costs. Unless the prices of fossil natural gas and petroleum/oil go up or a price is put on carbon or a policy like California's low carbon

<sup>38</sup> Lufthansa Group, Lufthansa Innovation Hub launches the "Compensaid" sustainability platform and focuses on CO<sub>2</sub> neutral aviation fuels, <https://newsroom.lufthansagroup.com/english/newsroom/all/lufthansa-innovation-hub-launches-the-compensaid-sustainability-platform-and-focuses-on-co2-neutral/s/475236ad-062e-452d-bbce-ff0d234d1be7>

<sup>39</sup> Board Now <https://boardnow.org/>



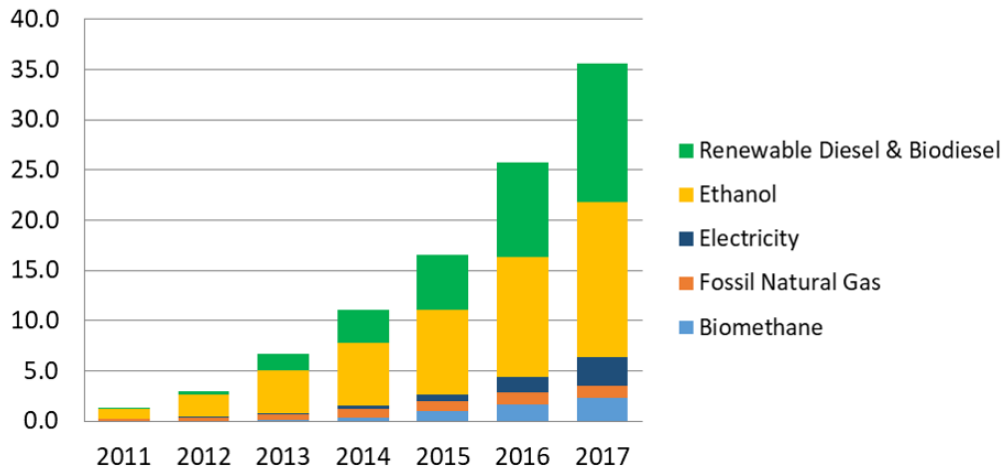
fuel standard is implemented, fossil fuels will have a price advantage.

This graph made by Diesel Technology Forum using data from the California Air Resources Board regarding the progress of the state's Low Carbon Fuel Standard

illustrates the benefit of transitioning to renewable transportation fuels such as ethanol, biodiesel, renewable diesel and renewable natural gas (biomethane) to achieve the greatest near-term progress to climate change mitigation goals.

### Cumulative CO2 Reductions (million tons)

SOURCE: California Energy Commission, Low Carbon Fuel Standard Dashboard



Graph: Diesel Technology Forum

The Advanced Biofuels USA website has gathered articles that describe others experiences [defossilizing fleets](https://advancedbiofuelsusa.info/tag/fleets/). (<https://advancedbiofuelsusa.info/tag/fleets/>) We encourage you to learn from others, to avoid “reinventing the wheel.”<sup>40</sup>

## Appendix

<https://afdc.energy.gov/fuels/laws/ETH?state=US>



### Vehicle Acquisition and Fuel Use Requirements for Federal Fleets

Under the Energy Policy Act (EPA) of 1992, 75% of new light-duty vehicles acquired by covered federal fleets must be alternative fuel vehicles (AFVs). As amended in January 2008, Section 301 of EPA 1992 defines AFVs to include hybrid electric vehicles, fuel cell vehicles, and advanced lean burn vehicles. Fleets that use fuel blends containing at least 20% biodiesel (B20) may earn credits toward their annual requirements. Federal fleets are also required to use alternative fuels in dual-fuel vehicles unless the U.S. Department of Energy (DOE) determines an agency's vehicle requests qualify

<sup>40</sup> <https://advancedbiofuelsusa.info/tag/fleets/>

for waivers; grounds for a waiver include lack of alternative fuel availability and cost restrictions (per EPO Act 2007, section 701).

Additional requirements for federal fleets were included in the [Energy Independence and Security Act of 2007](#), including fleet management plan requirements (Section 142), low greenhouse gas (GHG) emitting vehicle acquisition requirements (Section 141), and renewable fuel infrastructure installation requirements (Section 246). For more information, see the [Federal Fleet Management](#) website.

Executive Order 13834, issued in May 2018, requires the Secretary of Energy (Secretary), in coordination with the Secretary of Defense, the Administrator of General Services, and the heads of other agencies as appropriate, to review the existing federal vehicle fleet requirements. In April 2019, the Secretary provided a [report\(PDF\)](#) to the Chairman of the Council on Environmental Quality and the Director of the Office of Management and Budget detailing opportunities to optimize federal fleet performance, reduce associated costs, and streamline reporting and compliance requirements. Specifically, the report recommends that federal agencies identify and implement strategies to:

- Right-size the fleet
- Reduce vehicle miles traveled
- Implement more fuel efficient vehicles
- Align the implementation of AFVs and associated fueling infrastructure

To track progress toward meeting AFV acquisition and fuel use requirements, federal fleets must report on their percent alternative fuel increase compared to the fiscal year 2005 baseline, alternative fuel use as a percentage of total fuel consumption, AFV acquisitions as a percentage of vehicle acquisitions, and fleet-wide miles per gasoline gallon equivalent of petroleum fuels.

(Reference 42 [U.S. Code](#) 13212 and [Executive Order 13834\(PDF\)](#))

***Point of Contact***

Federal Energy Management Program

U.S. Department of Energy

[https://federalfleets.energy.gov/fleet\\_management\\_contacts](https://federalfleets.energy.gov/fleet_management_contacts)

## **Vehicle Acquisition and Fuel Use Requirements for Private and Local Government Fleets**

Under the Energy Policy Act (EPO Act) of 1992, the U.S. Department of Energy (DOE) was directed to determine whether private and local government fleets should be mandated to acquire alternative fuel vehicles (AFVs). In January 2004, DOE published a final rule announcing its decision not to implement an AFV acquisition mandate for private and local government fleets. In response to a March 2006 ruling by a U.S. District Court, DOE issued a subsequent final rulemaking on the new Replacement Fuel Goal in March 2007, which extended the EPO Act 1992 goal to 2030. The goal is to achieve a domestic production capacity for replacement fuels sufficient to replace 30% of the U.S. motor fuel consumption. In March 2008, DOE issued its determination not to implement a fleet compliance mandate for private and local government

fleets, concluding that such a mandate is not necessary to achieve the Replacement Fuel Goal. For more information on the Private and Local Government Fleet Rule compliance, visit the [EPAct Private and Local Government Fleet Determination](#) website. (Reference 42 [U.S. Code](#) 13257)

## **Vehicle Acquisition and Fuel Use Requirements for State and Alternative Fuel Provider Fleets**

Under the Energy Policy Act (EPAct) of 1992, as amended, certain state government and alternative fuel provider fleets are required to acquire alternative fuel vehicles (AFVs) as a portion of their annual light-duty vehicle acquisitions. Compliance is required by fleets that operate, lease, or control 50 or more light-duty vehicles within the United States. Of those 50 vehicles, at least 20 must be used primarily within a single Metropolitan Statistical Area/Consolidated Metropolitan Statistical Area, and those same 20 vehicles must also be capable of being centrally fueled for the fleet to be subject to the regulatory requirements.

Under [Standard Compliance](#), the AFVs that covered fleets acquire help them achieve compliance, with each AFV acquired earning the fleet one AFV-acquisition credit. Covered fleets may earn additional credits for AFVs earned in excess of their requirements, and these credits may be banked for future use toward compliance or traded with other fleets. Additionally, fleets that use fuel blends containing at least 20% biodiesel (B20) in medium- and heavy-duty vehicles may earn credits toward their annual AFV-acquisition requirements. A fleet may also earn credits that may be used toward compliance or banked once the fleet achieves compliance for investments in alternative fuel infrastructure, mobile non-road equipment, and emerging technologies associated with certain electric drive vehicle technologies.

Fleets may also opt into [Alternative Compliance](#), which allows fleets the option to choose a petroleum reduction path in lieu of acquiring AFVs under Standard Compliance. Interested fleets must obtain from DOE a waiver from Standard Compliance by submitting a plan that demonstrates a path by which they will achieve a certain level of petroleum reduction specific to their fleet composition.

For more information, visit the [EPAct State and Alternative Fuel Provider Fleets](#) website.

(Reference 42 [U.S. Code](#) 13251 and 13263a, and 10 [CFR](#) 490)

### ***Point of Contact***

EPAct Transportation Regulatory Activities  
U.S. Department of Energy  
[regulatory.info@nrel.gov](mailto:regulatory.info@nrel.gov)  
<https://epact.energy.gov/contact-us>

## **Vehicle Incremental Cost Allocation**

The U.S. General Services Administration (GSA) must allocate the incremental cost of purchasing alternative fuel vehicles (AFVs) across the entire fleet of vehicles distributed by GSA. This mandate also applies to other federal agencies that procure vehicles for federal fleets. For more information, see the GSA's [AFV](#) website. (Reference 42 [U.S. Code](#) 13212 (c))

**Point of Contact**

U.S. General Services Administration

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<http://www.gsa.gov>

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*Advanced Biofuels USA, a nonprofit educational organization advocates for the adoption of renewable fuels as an energy security, military flexibility, economic development and climate change mitigation/pollution control solution. Our key tool is our web site, [www.AdvancedBiofuelsUSA.org](http://www.AdvancedBiofuelsUSA.org), including a 30,000-item online library, a bioeconomy resource for everyone from opinion-leaders, decision-makers and legislators to industry professionals, investors, feedstock growers and researchers; as well as journalists, teachers and students. In addition, we prepare technology and policy assessments, brief government staff, participate in conferences, lecture, and provide general assistance to those interested in renewable fuels. Technology neutral and feedstock and product agnostic, Advanced Biofuels USA's work is respected around the world. We take seriously the importance of shaping public discussion, focusing on high-impact solutions.*

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