ALTERNATIVE FUELS IN CAFE RULEMAKING
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NHTSA has a long history of regulating fuel economy for light-duty vehicles and, more recently, medium- and heavy-duty vehicles

- Corporate Average Fuel Economy (CAFE) under the Energy Policy and Conservation Act (EPCA) – 1975

- Energy Independence and Security Act (EISA), required developing a new fuel efficiency program for medium-duty, heavy-duty (MDHD) and work trucks – 2007

- For both programs, NHTSA incentivizes alternative fuel vehicle implementation into the U.S. Fleet
The USDOT currently recognizes the following as Alternative Fuels:

- Denatured Ethanol
- Electricity
- Natural Gas
- Liquefied Petroleum Gas
- Hydrogen
- Fuels derived from biological materials (e.g. biodiesel)
- Methanol
- Other Alcohol
- Coal Derived Liquid Fuels

Notes:
- Defined by Title 49, U.S.C. 32901
- To be considered an Alternative Fuel – alcohols need to be blended at levels of at least 85 percent of the total mixture when blended with gasoline or other fuels.
- The agency considers “neat” biodiesel (B100) to be an alternative fuel
Incentives apply to “dedicated” and “dual-fuel” alternative fuel vehicles as defined by the Alternative Motor Fuels Act (AMFA) of 1988

- Generally, alternative fuel vehicles are incentivized by a 0.15 divisor
  - Liquid Fuels – E85, Biodiesel, LPG:
    - One gallon is counted as 0.15 gallon of fuel
  - Gaseous fuels – Natural Gas/Hydrogen:
    - Converted to a gallon gasoline equivalent (gge) through petroleum equivalent factors (PEF) and then the 0.15 incentive is applied
  - Electricity:
    - Converted to a gallon gasoline equivalent through the Department of Energy (DOE) Petroleum Equivalency Factor (PEF) formula. The PEF formula includes the 0.15 incentive.

- “Dedicated” or “dual-fuel” vehicle fuel economy is calculated differently, as follows
Example alternative fuel incentive calculations

• **Dedicated** alternative fuel vehicle:
  - Measured fuel economy on alternative fuel $\rightarrow$ 25 mpg
  - Divide by Incentive amount $\rightarrow$ 0.15
  - CAFE compliance amount per vehicle produced $\rightarrow$ 166.7 mpg

• **Dual-fuel** alternative fuel vehicle through Model Year 2019:
  - Assume half of the vehicle operation is with alternative fuel, and half is with gasoline:
    \[ FE_{\text{dual}} = \frac{1}{0.5 \cdot \frac{1}{166.7 \text{ mpg}} + 0.5 \cdot \frac{1}{25 \text{ mpg}}} = 43 \text{ mpg} \]
  - Maximum increase in fuel economy for each fleet is capped at 1.2 mpg through MY 2014, phasing down to 0.2 mpg in 2019, except electricity has no cap.
Manufacturers have continually utilized alternative fuel credits – primarily through the sale of Flexible Fuel Vehicles (FFVs) capable of operating on E85 blends. Recent trend indicates an increase in utilization.
Dual-fuel alternative fuel vehicle calculation post-AMFA: Model Year 2020 and beyond

- E85: Weighting of alternative fuel use and gasoline use is based on demonstrated/projected use in the field

- Natural Gas and Electricity
  - Shift to use of the SAE “utility factor” methodology (based on the alternative fuel range and typical daily travel mileage)
  - Utility factor determines how to proportion measured values when a vehicle is operating on gasoline or diesel fuel and operating on the alternative fuel
  - Continues the use of PEF and the 0.15 incentive for the proportion of operation on alternative fuel

- No cap on maximum increase in fuel economy for each fleet
Alternative Fuel Incentives – Heavy Duty

MY 2014 – 2018 HD (Phase 1) regulations incentives for alternative fuel vehicles

• Primary incentive is via measuring consumption based on vehicle CO2 emissions, instead of energy equivalency
  
  - For Natural Gas, yields an incentive of 20% to 30%

  - Electricity and Hydrogen, counted as no (zero) fuel consumption, because no tailpipe CO2 emissions

  - There is an additional 1.5x vehicle multiplier for Hybrid (HEV), Plug-In Hybrid (PHEV) and dedicated Electric Vehicles (EVs)
NHTSA analysis shows manufacturers could comply with MY 2012-2016 CAFE regulations and MY 2014-2018 HD fuel consumption regulations without producing alternative fuel vehicles.

- Overall there are a wide range of non-alt fuel technologies available for automakers to meet the upcoming standards
  - Advanced gasoline engines and transmissions, vehicle mass reduction, improved aerodynamics, lower rolling resistance tires, diesel engines, more efficient accessories, improvements in air conditioning systems

- For light-duty vehicles, the agency projects fleet production of about 1-3% for MY2025 as EVs/PHEVs*

*based on current projected, augural 2021-2025 CAFE standards