



# Introducing a New Fuel: A Regulatory Perspective

Sustainable Transportation Summit

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# Overview

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  - New fuel for existing vehicles and engines
  - New fuel for new vehicles and engines
- Regulation Driven
- Past Regulatory Experience
- Conclusions



# EPA Fuels Regulatory Authority

- Congress has given EPA regulatory authority for motor vehicle and nonroad fuels
  - Contained in Title 2 (Mobile Sources) of the CAA, Section 211
    - Major revisions in 1990
    - Several subsequent amendments
  - Specific requirements and general authority
  - Fuels and fuel additives only – not lubricants
  - No other Federal agencies have authority (FAA has authority over aircraft fuels tied to an EPA finding of need)
- EPA's authority is primarily limited to vehicle and engine emissions in order to protect public health and welfare and emissions control devices
  - NOT vehicle and engine performance issues
  - Market has relied on ASTM, NCWM, API standards to protect gasoline quality for performance objectives



# Market Driven Fuel Introduction



# Market Driven Fuel Introduction

- The CAA and our regulations allow the market to introduce new fuels and fuel additives for new and existing vehicles
- Some checks in place to make sure vehicle emission controls and air quality is protected
  - Registration and Health effects testing (CAA 211(a)&(b))
  - Substantially similar (CAA 211(f))
- Many new additives and formulations are registered every year
- New fuels more rare but do happen
- Usually, but not always as blends with gasoline and diesel fuel.  
E.g.,:
  - CNG
  - E10, E15, Biobutanol
  - Biodiesel, Renewable diesel



# New Fuel for Existing Vehicles

## Fuel and Fuel Additive (F/FA) Registration

- CAA 211(a): Any motor vehicle or nonroad F/FA EPA designates **must be registered per 211(b) or it cannot be introduced into commerce**
  - **To date only motor vehicle gasoline and diesel fuel have been designated**
  - **So does not yet apply to other fuels**
  - Per EPA's F/FA regs: "The gasoline family includes fuels composed of more than 50% gasoline by volume"
- CAA 211(b): Any designated F/FA must be registered with EPA
  - To do so requires an **assessment of potential emissions and health or environmental concerns from their use in vehicles/engines**
    - Waiver provisions for small businesses
  - >500 registration applications every year for new/revised fuel or fuel additive formulations
    - Almost all rely on historical data
    - Infrequently requires health and environmental effects testing (e.g., E15, Butanol)



# New Fuel for New AND Existing Vehicles

## Subsim

- CAA 211(f): All F/FA introduced into commerce for use in motor vehicles **must be substantially similar (subsim) to the fuel used to certify the motor vehicle/engine**
- CAA 211(f)(4): Admin may waive the subsim requirement if it won't cause vehicles/engines to fail their stds in-use
  - Does not mean no increase emissions
  - E.g., The recent E15 waiver
- Interpretive rule in place defining subsim **for gasoline only** (must be composed solely of Carbon, Hydrogen, Oxygen, Nitrogen, Sulfur)
  - No subsim rule for diesel fuel or any other fuels have been done
  - **For fuels other than gasoline we rely on 211(f) language above**



# New Vehicles Requiring the Use of a New Fuel

## Vehicle Certification

- 202(a) and 206: General authority for EPA to set emission standards for vehicles and require certification and testing by regulation
  - Have used for most new vehicle and engine standards over the years (those not prescribed by Congress)
  - 40 CFR 1065.701(c): Vehicle manufacturers can petition the Administrator to certify new vehicles on an alternative test fuel
- 202(e): New power sources or propulsion systems
  - “In the event a new power source or propulsion system is submitted for certification...the Administrator may postpone certification until he has prescribed standards for any air pollutants emitted...”

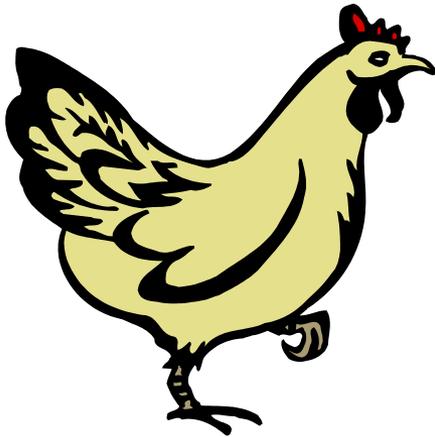


# Market Introduction of a New Vehicle Requiring a New Fuel

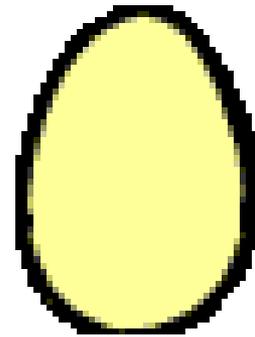
- Vehicle manufacturer
  - Develops the new vehicle
  - Identifies the characteristics of the fuel
  - Works with potential fuel suppliers to ensure availability of the fuel
  - Requests certification from EPA
    - Would likely have to meet standards applicable to those for gasoline/diesel vehicles and not raise any new unique pollutant concerns to avoid triggering 202(e)
    - Would likely have to provide reasonable assurance that the vehicles will operate in-use on the new fuel or meet the same emission performance on existing fuel(s)
      - If it can run on other fuels on which the emission performance is worse, that would raise in-use emission and compliance concerns
  - Certifies the vehicle on the new fuel(s) with EPA
- Fuel suppliers
  - Provide to the market a fuel that is substantially similar (211(f)) to the fuel used for certification and label/market it appropriately



The statute and regulations don't solve the chicken and the egg problem, but they allow the market to sort it out



New Market Fuel



New Alternative  
Fueled Vehicles



# Regulation Driven

Aka “Why Doesn’t EPA Just...”



# Regulation Driven

- Considerable interest is being expressed in raising US gasoline octane levels
  - The U.S. lags much of the world
  - We've had an influx of high octane ethanol
- Raising octane levels may allow higher compression engines, improving fuel efficiency and reducing GHG emissions
  - Enabling LDGHG standards that go beyond the 2025 standards
- Now that EPA can regulate CO<sub>2</sub>, can't EPA just require higher octane?



# Statutory Authority: General Fuel Stds

- CAA 211(c): **EPA may limit or prohibit F/FAs:**
  - (1)(A) “**if** in the judgment of the Administrator, any **fuel** or fuel additive **or any emission product** of such fuel or fuel additive **causes or contributes to air pollution** or water pollution... that may reasonably be anticipated to endanger the public health or welfare,” or
  - (1)(B) “**if emission products** of such fuel or fuel additive **will impair** to a significant degree **the performance of any emission control device** or system which is in general use, or has been developed to a point where in a reasonable time it would be in general use were such regulations to be promulgated”
- (A) is focused primarily on direct emission impacts from the fuel itself
- (B) is focused primarily on indirect emission impacts from fuel impacts on vehicle/engine emission control technology



# CAA 211(c)(1)(A) – Cause or Contribute

- **First requires an EPA finding that emissions from a F/FA causes or contributes to air pollution that endangers public health and welfare**
  - To date we have not done so for GHG under 211(c) - fuels
  - Only for motor vehicles under 202(a)
- We would likely have to show how raising gasoline octane will reduce GHG emissions from the existing fleet
- 211(c)(2)(A) requires that prior to setting a F/FA standard, **must first consider other technologically or economically feasible means** of achieving the vehicle and engine emission standards
  - If something other than octane could achieve the reductions and get them as economically then we must pursue those first
- To get the rule through the administrative process we would have to show how the benefits of raising gasoline octane would justify the cost



# CAA 211(c)(1)(B) – Impair

- Control of octane would appear to be aimed at facilitating vehicle emission control technology (e.g., higher compression ratios) which is addressed under 211(c)(1)(B)
- To utilize 211(c)(1)(B) authority for octane, EPA would be required to show a tie to emission products associated with fuels with higher or lower octane
  - “if **emission products** of such fuel or fuel additive will **impair** to a significant degree the performance of any emission control device or system”
- In the past when we have used 211(c)(1)(B) authority the connection has been clear
  - The emission products of burning lead and sulfur in the fuel were clearly impairing catalyst emission performance
  - For octane, the emission products of burning high octane fuel might have to be tied to engine compression ratios



# CAA 211(c)(1)(B) – Impair (cont.)

- In addition, when regulating under 211(c)(2)(B), prior to setting a standard
  - EPA **must first consider** “available scientific and economic data,” including a **“cost benefit analysis”** comparing the **emission control systems that do and don’t require the fuel change**
- EPA would need to justify why technologies enabled by higher fuel octane are more beneficial than other technology options
  - E.g., light-weighting, hybridization, etc.
  - Including consideration of options such as phasing in a high octane standard with a new vehicle fleet



# CAA 211(c)(1)(A) or (B)

- EPA finalized MY2017-2025 LDGHG standards
  - Based on projected use of:
    - Advanced gasoline engines and transmissions
    - Vehicle mass reduction
    - Improved aerodynamics, lower rolling resistance tires
    - Diesel engines
    - More efficient accessories, improvements in air conditioning systems
    - Electric technologies such as start-stop systems, mild and strong hybrids, plug-in hybrids, and all electric vehicles in limited numbers
  - Actual technology used will vary; left up to the market
- To use 211(c)(1)(B) to raise gasoline octane we have to be looking at LDGHG standards beyond 2025 levels



# CAA 211(c)(2)(C) New Fuel Not Worse

- Can only exercise 211(c)(1) authority to prohibit a F/FA upon publishing a finding:
  - That the control of the fuel or fuel additive in question **will not cause the use of another fuel or fuel additive which will endanger public health and welfare** the same or worse
- In the case of a high octane fuel standard it could require:
  - Test data on vehicles that are designed for the higher octane fuel
  - Test data on the in-use fleet with and without the new fuel
  - Evaluation of vehicle emission performance for all pollutants, not just GHG



# Past Regulatory Experience



# Summary

	Gasoline						Diesel		
	Unleaded	RVP	RFG	T2 Sulfur	Benzene	T3 Sulfur	Hwy 500 Sulfur	Hwy ULSD	NRLM ULSD
Year Finalized	1973	1989	1994	2000	2007	2014	1990	2001	2004
Federal Register Pages	3	89	162	124	142	472	31	191	315
With New Vehicle Stds	Y	Y	N	Y	N	Y	Y	Y	Y
Forward Compatibility	N	Y	Y	Y/N	Y	Y	Y/N	N	N
Backward Compatibility	Y	Y	Y	Y	Y	Y	Y	Y	Y
Capital Cost (\$B)	?	?	?	4.3	0.6	2.0	>1.0	5.1	2.3
Per Gallon Cost (historic \$, not additive)	3¢/6%	0.5¢/0.5%	5¢/4%	2¢/1%	0.3/0.01%	<1¢/0.3%	2¢/2%	4¢/2%	5¢/2%
Additional Grade(s) Added*	P, T, ~R	P, T	P, T	N	N	N	P, T	P, T	~N
Availability Mandate	Y	N	Y -Local	N	N	N	N	N	N
Leadtime after Final Rule (yrs)	1.5	0.2	<1	4	4	3	<3	6	3
Years FRM to Fully Implemented	17	3	6	10	8	6	<3	9	11
Consumer Backlash	Y	N	Spotty	N	N	TBD	N	N	N

\* P=Pipeline, T=Terminal, R=Retail, N=None



# Some Lessons Learned

- Fuel market changes can be very difficult
  - Everyone thinks its simple for everyone else
  - Regulations have become much longer to address the issues that arise
- Since the conditions of every fuel transition are different, the necessary solutions are too
- When vehicle changes require a new fuel it is more challenging
  - Particularly when there is a compatibility issue – EPA has never implemented a regulation where the fuel was not backwards compatible
- Phase-ins, Phase-downs, Step-downs, delays for market segments are always required
  - Full market transitions may take >10 years
- The ability to produce the fuel may not be the biggest challenge – the tail can wag the dog
  - You can't overlook the distribution system and retail infrastructure implications
- If the incentives are there for all market segments, the market can act quickly
- If fuel prices go up and are not transparent to the consumer, be prepared for some consumer backlash
- It's possible to have smooth transitions if the program is designed appropriately and/or all affected stakeholders are bought in and proactive in communicating with consumers
- It takes a village
  - Its hard to predict all the vehicle, engine, supply, distribution infrastructure, consumer, issues ahead of time



# Conclusions

- The CAA and our regulations allow the market to introduce new fuels and fuel additives for new and existing vehicles
  - Provides some checks to make sure vehicle emission controls and air quality is protected
  - But does not solve the chicken and egg problem
- The CAA also provides EPA with broad and general authority to regulate fuels and fuel additives
  - But its not an open license
  - To exercise this authority EPA must meet a number of CAA requirements
- Regardless, introduction of a new fuel, either by the market or by regulation will:
  - Need to be acceptable to consumers
  - Likely be phased in over an extended period of time
  - Require the collaboration of the auto industry, fuel providers, and others



Thank You