EPA’s Regulatory Authority to Address Octane

MSTRS Meeting
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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

• Until Octane became an emissions issue with CO2, it remained outside EPA’s purview
CAA Fuel Authorities

- 211(a)&(b) – Fuel and Fuel Additive Registration
- 211(c) – Broad and General Authority
  - 211(f) – Fuel must be substantially similar to the fuel used in vehicle certification
  - 211(h) – Gasoline volatility (RVP)
  - 211(k) – Reformulated gasoline (RFG) and Antidumping for conventional gasoline
  - 211(l) – Gasoline Detergents
  - 211(o) – Renewable Fuel Standard (RFS)
  - 211(q) – 1st RFS Anti-backsliding study requirement
  - 211(v) – 2nd RFS Anti-backsliding study requirement
  - 211(i) – 500 ppm std for highway diesel (now moot)
  - 211(j) – Lead substitute gasoline additives
  - 211(m) – Wintertime oxy fuels (essentially over)
  - 211(n) – Lead prohibition for highway use
  - 211(r) – clarifying that fuel manufacturer includes importers
  - 211(s) – Conversion assistance for cellulosic fuels 2006-8
  - 211(t) – Allowance for ethanol commingling
  - 211(u) – Standards for biodiesel
Fuel Standards
(Effective Dates)

- **1974**: Unleaded Gasoline
- **1979**: E10 Ethanol Subsim Waiver
- **1980**: Gasoline Sub-Sim
- **1989**: Phase 1 Gasoline Summer RVP Limits
- **1991**: Phase 2 Gasoline Summer RVP Limits (7.8, 9.0, 1-psi E10 waiver)
- **1992**: Winter Oxyfuels Program (39 cities)
- **1993**: Highway diesel fuel sulfur control (500 ppm)
- **1995**: Phase 1 RFG and Anti-dumping
- **1995**: Gasoline Detergent Additives
- **1996**: Fuel and Fuel Additives Registration
- **1996**: Prohibition on lead
- **2000**: Phase 2 RFG
- **2002**: Mobile Source Air Toxics (MSAT1)
- **2004**: Tier 2 Gasoline Sulfur Control (30 ppm avg, 80 cap)

Red = General Authority
Black = Other
Fuel Standards (cont.)

- EPAct 2005 – RFS1 Default Rule
- Removal of RFG Oxy Mandate
- **Ultra-low Sulfur Highway Diesel Fuel (15 ppm)**
- **Boutique Fuels List**
- **Nonroad, Locomotive and Marine Diesel Fuel (500 ppm)**
- RFS1 Finalized/Implemented; EISA passed requiring RFS2
- **Ultra-low Sulfur Nonroad Diesel Fuel (15 ppm)**
- **Renewable Fuels Standard 2 Finalized/ Implemented**
- **MSAT2 - Gasoline benzene**
- **E15 Subsim Waiver/Misfueling Mitigation Rule**
- **Ultra-low Sulfur Locomotive and Marine Diesel Fuel (15 ppm)**
- **Low Sulfur Bunker Fuel in ECA (10,000 ppm)**
- **Low Sulfur Bunker Fuel Sulfur (1000 ppm)**

**Annual RFS Rules**
- **Tier 3 - Gasoline Sulfur**
What About Octane?

• 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 CO2, can’t EPA just require higher octane?

• Of the various authorities our broad and general section 211(c) authority is the likely means to allow us to get at 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 emission benefits from the existing fleet

- (B) is focused primarily on emission impacts on vehicle 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
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 recently 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
CAA 211(c)(4) – State Limitations

• States (other than CA) cannot set standards for F/FA for the purposes of emission control if EPA has controlled it or found it shouldn’t be controlled
  – To date EPA has taken no action wrt octane

• Due to Boutique fuel concerns 211(c)(4)(C)(v) was added - limiting new State fuel programs to expansions of existing Boutique fuels

• However, 211(c)(4) does not restrict states from setting fuel standards for reasons other than air quality
  – States can and do have ethanol, biodiesel requirements
Tier 3 as a Case Study

• The time frame to complete all the steps could be ~10 years as in the recent Tier 3 rule
  – Initial scoping began in 2004; initial data gathering in 2005
  – Rule not finalized until 2014
  – Rule not fully phased in until 2020

• The hurdle for octane may be significantly higher
  – Tier 3 was <1¢/gal and <$100/vehicle

• A longer phase-in for octane may be required
  – Tier 3 provided significant benefits to the existing fleet which is not currently evident with octane
  – To limit costs, ease implementation, and meet benefit/cost requirements Tier 3 was phased in from 2014-2020
Conclusions

• CAA 211(c) provides EPA with broad and general authority to regulate fuels and fuel additives

• This authority could be used to either “control” or “prohibit” the octane level of gasoline

• To exercise this authority for octane EPA would have to meet a number of CAA requirements

• Even if the rule were initiated now it would likely be a number of years before it could be implemented
  — Likely phased in over an extended period of time
Thank You