



Vehicle Certification Test Fuel and Ethanol Flex Fuel Quality

Paul Machiele, U.S. EPA

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Overview

- Tier 3 Proposal for Cert Fuels
- Opportunity to use natural gasoline to reduce costs for high level ethanol blends
- Tier 3 discussion on provisions for higher level ethanol blends



Gasoline Vehicle Certification Test Fuel

- Tier 3 rule proposed to consolidate all gasoline exhaust and evap emissions test fuels into “single” test fuel
 - Should limit number of test fuels auto makers need to manage
 - RVP adjusted for cold and high-altitude testing
- Proposed to replace historic test fuel specification (Indolene is typically used) with an updated specification based on in-use gasoline
- Proposed forward-looking E15 test fuel
 - Evaluating comments re finalizing an E10 test fuel
 - Market trigger for moving from E10 to E15?
- Proposed 9psi RVP for E15 certification test fuel
 - Need to consider 10 psi RVP if we were to finalize E10; ~50% of in-use gasoline is 10 psi
- Proposed 87 AKI Octane to reflect typical in-use fuel



High-Octane Vehicle Certification Test Fuel

- Proposed to allow use of high octane (91+ AKI) test fuel for “Premium gasoline required vehicles”
 - Vehicles designed specifically for operation on high-octane fuel
 - Manufacturer requires the use of premium as part of warranty as indicated in owner’s manual
- Also proposed to allow use of high octane E30 as test fuel for dedicated E30 vehicles or FFVs optimized to run on E30 or higher ethanol
 - Could petition EPA to approve higher-octane, higher-ethanol content test fuel
 - Would be required to demonstrate that:
 - Fuel would be used by the operator
 - Would be readily available nationwide
 - Vehicles would not operate appropriately on other available fuels
 - Fuel would result in equivalent emissions performance



FFV Vehicle Certification Test Fuel

- No historical regulations defining FFV certification test fuel
 - In practice has been blended from gasoline test fuel and ethanol
- Proposing FFV cert test fuel regulations for the first time
 - Mirror long-standing historical practice
- Start with new gasoline test fuel and add 80-83 vol% EtOH
 - Allow butane trimming to meet 6.0 to 6.5 RVP spec
 - If we were to allow natural gasoline, pentanes, and butane to be used as blendstocks for E51-83, we would consider 9psi spec for FFV certification fuel



In-use E51-83

- E51-83 is not considered gasoline, & therefore has not yet been subject to Part 80 gasoline standards or Part 79 F&FA registration and health effects testing
- No specific regulations for in-use E51-83 quality
- Gasoline, & BOBs are currently used to manufacture E51-83
 - In-use E51-83 must be sub-sim to the fuel the FFVs were certified on - mixtures of finished gasoline and ethanol
 - Only RFG, RBOB can be used in RFG areas
- But while helping to provide assurance of E51-83 quality, the current situation is creating barriers to E51-83 expansion
 - Often unable to make E51-83 blends in the high-ethanol content range with the current hydrocarbon blendstocks because the volatility can be too low for good vehicle startability/performance



Natural Gasoline: Potentially A Nice Fit as an E51-83 Blendstock

| | Ethanol | Natural Gasoline | Butane |
|---|---------|------------------|--------|
| Octane (R+M)/2 | 116 | 73 | 90 |
| RVP (psi) | 2.4 | 12 | 52 |
| BTU adjusted price relative to CBOB (July data) | 133% | 80% | 57% |

- Domestic natural gasoline supply expected to increase substantially with growth in natural gas and tight-oil production
 - U.S. NGL production projected to increase ~45% from 2012 to 2017 (3,250 Mb/d by 2017)
 - No clear home for increased volumes.
- Butane/pentane would be useful RVP trimmers



Natural Gasoline Blending Might Help Make E51-83 more Economical

| Blend | NGL % | CBOB % | Butane % | RVP | Octane | \$ / gal | BTU cost vs E10 |
|-------|-------|--------|----------|-----|--------|----------|-----------------|
| E10 | - | 90% | - | 10 | 87 | 2.86 | 100% |
| E51 | - | 49% | - | 8.9 | 100.1 | 2.79 | 111.4% |
| E51 | 2% | 47% | - | 9 | 99.9 | 2.77 | 111% |
| E70 | - | 30% | - | 7.3 | 106 | 2.75 | 118% |
| E70 | 29% | 1% | - | 9 | 103 | 2.54 | 111% |
| E83 | - | 17% | - | 5.6 | 110 | 2.73 | 123% |
| E83 | 14.3% | - | 2.7% | 9 | 109 | 2.59 | 112% |

<1% savings

7% savings

11% savings

- Use of butane as RVP trim might be handled similar to gasoline. July cost data used.
- RVP of >E10 blends limited to 9 RVP. ASTM current maximum RVP for E51-83 is 8.5 RVP.



Continued from previous slide

| Blend | NGL % | RBOB % | Butane % | RVP | Octane | \$ / gal | BTU cost vs E10 | |
|-------|-------|--------|----------|------|--------|----------|-----------------|------------|
| E10 | - | 90% | - | 7.2 | 87 | 3.04 | 100% | |
| E30 | - | 70% | - | 7.1 | 93 | 2.97 | 104% | 2% savings |
| E30 | 9% | 61% | - | 7.8 | 92 | 2.88 | 102% | |
| E51 | - | 49% | - | 6.6 | 100 | 2.89 | 108% | 3% savings |
| E51 | 12.5% | 36.5 | - | 7.8 | 99 | 2.77 | 105% | |
| E70 | - | 30% | - | 5.6 | 106 | 2.81 | 113% | 5% savings |
| E70 | 19% | 11% | - | 7.8 | 104 | 2.64 | 108% | |
| E83 | - | 17% | - | 4.5* | 110 | 2.76 | 117% | 5% savings |
| E83 | 15.7 | - | 1.3 | 7.8 | 109 | 2.59 | 112% | |

- Use of butane as RVP trim might be handled similar to gasoline.

- RVP of >E10 blends limited to 7.8 RVP. July price data used.

* Would not meet ASTM minimum RVP



E51-83 Discussion in the Tier 3 Rule

- Requested comment on new regulatory provisions to ensure E51-83 quality while allowing use of natural gasoline, and butane/pentane as blendstocks
- Apply S, Bz, RVP standards as for gasoline
 - Evaluating whether a lower benzene standard might be feasible
 - Considering minimum as well as maximum RVP specification
- Requested comment on removing requirement that gasoline portion contain a deposit control additive
 - Would defer setting deposit control requirement for E51-83 until sufficient data is available



Two Options to Ensure E51-83 Quality

- Option 1: E51-83 producer would assume all responsibilities of a refiner
 - Batch sampling, testing, reporting, etc.
 - Provides the most flexibility re blendstocks used
 - However, the per-batch testing and other requirements would be impractical for most E51-83 blenders
- Option 2: A “refiner” who is an “E51-83 blender” would comply with compositional requirements by blending only compliant blendstocks and retaining PTDs
 - Hope to allow use of an RVP model to demonstrate compliance with RVP specs in place of RVP testing
 - Potential blendstocks
 - Certified gasoline & BOBs (RFG/RBOB in RFG areas)
 - Denatured ethanol that meets requirements proposed in T3 rule
 - Natural gasoline certified by producer for use in E51-83
 - Butane that meets existing requirements for downstream blending into gasoline
 - Pentane that meets requirements similar to those for butane



Standards for Natural Gasoline for Use by E51-83 Blenders

- Producer of natural gasoline blendstock would register with EPA similar to gasoline refiner and certify that product meets specifications on a batch-by-batch basis
 - Initiate PTD that lists RVP to facilitate downstream use of RVP model
- Evaluating comments on appropriate sulfur and benzene cap standards that balance environmental and feasibility concerns
 - Baseline consideration is that E51-83 made with natural gasoline should at least have equivalent quality to gasoline
 - Standards discussed in Tier 3 rule (10 ppm sulfur cap. 0.2 vol % benzene) were based on premise that more stringent quality specifications than gasoline might be possible while still providing access to sufficient blending pool of natural gasoline



Addressing Outstanding Issues re Use of Natural Gasoline

- Evaluating:
 - Natural gasoline production, markets, distribution, prices to further assess potential for natural gasoline to be used in substantial volumes in E51-83
 - In-use natural gasoline quality to help set appropriate compositional requirements
 - Impacts of natural gasoline on FFV emissions
 - Development of RVP blending model to allow terminal blending without need for RVP testing
- Evaluating comments to either finalize E51-83 quality requirements in context of Tier 3 or defer to a later action and delay the flexibility



In-use E16-50

- Under the F&FA registration program, the gasoline family includes fuels with at least 50% clear gasoline
- Thus, while EPA currently has no specific regulations for in-use E16-50 quality, E16-50 is subject to gasoline standards
- ~ 300 blender pumps and the number is growing
 - Currently, such blenders are refiners under our regulations
 - Blends sold from blender pumps may not be complying with our standards for F&FA registration, RVP, detergents, other?
- Sought comment in the Tier 3 proposal to treat in-use E16-E50 similar to approach for E51-E85



Conclusion

- Currently evaluating comments received on Tier 3
- Certification fuel: Choice of E10 vs E15 is the main issue
- In-use fuel:
 - If we are able to finalize in-use fuel provisions for E16-E83, we may be able to:
 - Reduce the cost of E85 and enable growth in ethanol use next year
 - While simultaneously ensuring fuels used in FFVs allow emissions and vehicle performance to be maintained