Alternative Diesel Fuel Rulemaking

Public Workshop

April 23, 2013

California Air Resources Board
Stationary Source Division
Alternative Fuels Branch

Workshop Goals

- Present basis for rulemaking
- Share information from sister agencies
- Discuss ADF regulatory concepts - *White Paper*
- Discuss amendments to the CARB diesel fuel regulation
- Seek stakeholder input and ideas
- Share next steps

Today's Agenda

Session I:

- Basis for Rulemaking-*w/CEC Presentation*
- Update on Literature Review
- Status of Multimedia Assessment-*w/SWRCB Presentation*
- Current Policies on Biodiesel as an ADF-*w/CDFA-DMS Presentation*

Break

Session II:

- Discussion of White Paper ADF Regulatory Concepts
- Diesel Regulation Amendments
- Next Steps
- Stakeholder Comments and Suggestions
- Discussion

Session I:
Basis for Rulemaking

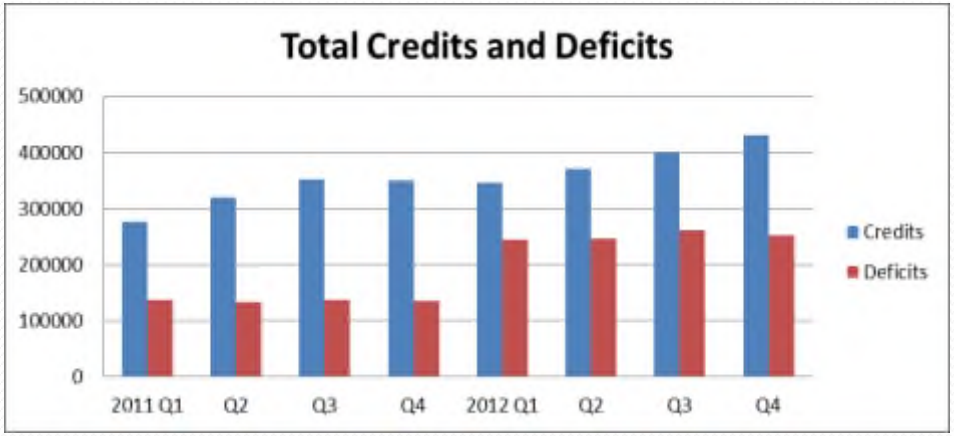
Objectives

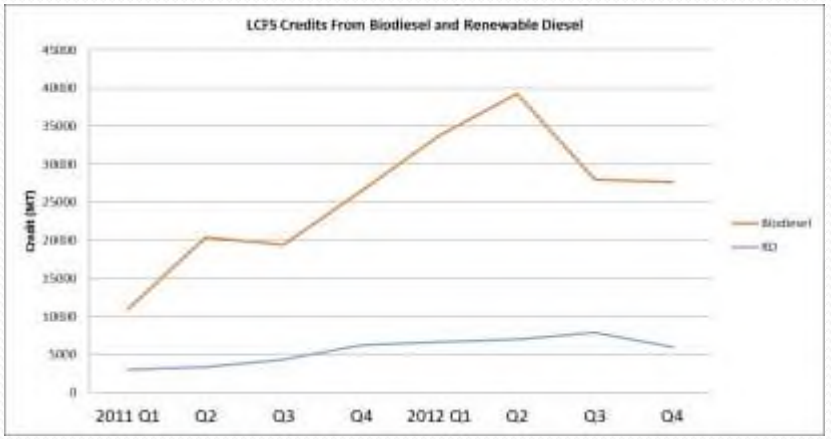
- Address existing and emerging alternative diesel fuels
- Preserve or improve overall air quality
- Support the Low Carbon Fuel Standard Implementation

Increasing ADF demand in California

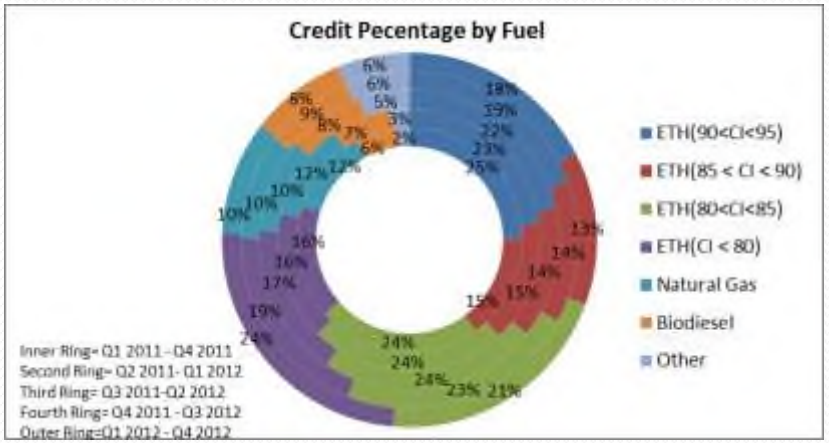
- RFS2: requires increasing volumes of biomass based diesel
- LCFS: requires overall decrease in CI of transportation fuels, which ADFs can provide
- Tax incentives: blenders credit
- Other governmental incentives, grants and loans: Dept. of Energy, CEC, others

LCFS is Working





- **LCFS working as designed**
- **Over 1.25 million credits through Q4 2012**
- **Biodiesel and renewable diesel total credits and percent of total credits increasing**



Need for Alternative Diesel Fuel Regulation

- CARB diesel specifications not designed for ADFs
- Increasing demand for low carbon/renewable ADFs
- Many diesel alternatives here or coming soon!
  - **Biodiesel, renewable diesel**
  - Amyris (Biotane), Global Energy Resources (Renewable fuel), REEP Development (Cellulosic diesel), Sierra Energy (biomass-to-liquid, BTL)
- Need for streamlined ADF regulation to remove market uncertainty, minimize costs

Need for Amendments to CARB Diesel Regulation

- Accommodate the new ADF regulation
- Add aromatic HC enforcement cap
- Update variance provisions
- Delete outdated legacy provisions
- Other clarifications and updates

California Energy Commission Staff Presentation (Tim Olson)

Literature Review Update

CARB Emission Studies

- Three on-road engines:

  2000 Caterpillar, 2006 Cummins ISM, 2007 DDC MBE4000

- Two off-road engines:

  2009 John Deere; 1998 Kubota

- ΔNOx for (CARB B20 – CARB diesel) greater than ΔNOx for (Fed B20 – Fed diesel)
- Consistent with other studies on high cetane diesel
- Further study needed on B5 and below

CARB Emission Studies – On Road Engines (NOx relative to CARB Diesel)

	Cummins ISM	Cummins ISM	MBE4000	MBE4000
	Soy 20	Animal 20	Soy 20	Animal 20
UDDS	4.1% P=0.002	-1.5% P=0.376	4.4% P=0.005	1.6% P=0.000
FTP	6.6% P=0.000	1.5% P=0.000	5.9% P=0.000	4.0% P=0.000
40 mph Cruise	3.9% P=0.000	--	--	--
50 mph Cruise	0.5% P=0.800	-2.3% P=0.151	6.9% P=0.000	5.9% P=0.000

Criteria for Studies Reviewed

Study fuels targeted for review:

- High Cetane Base Fuel: Cetane Number ≥ 48, Aromatics ≤ 21%
- Low Cetane Base Fuel: All other diesel fuels

Selection of studies reviewed:

- Heavy duty engines available in the U.S.
- Non-proprietary, non-confidential studies only
- Experimental design, no modeled results
- Test cycles designed to represent in-use application; transient and multiple mode test cycles

Literature Review Summary

Results: Literature generally consistent with CARB biodiesel test program

Results of Literature Review (% increase in NOx emissions)	High-Cetane Base fuel (≥48)	CARB Studies	Low-Cetane Base fuel (<48)
B20 all feedstock	***3.2%***	***3.0 %***	***1.5 %***
B20 soy	3.9%	4.1 %	1.8 %
B20 animal	1.8 %	1.6 %	0.0 %

Multimedia Evaluation Update

Multimedia Assessment Background

- Health and Safety Code, section 43830.8 requires multimedia evaluation of ARB regulations that establish new motor vehicle fuel specifications
- Multimedia Working Group (MMWG) - CARB, SWRCB, OEHHA, DTSC, other agencies as needed
- Review Tier I, Tier II, and Tier II reports-Basis for Cal/EPA Staff Report
- External scientific peer review
- Review and final determination by California Environmental Policy Council (CEPC)

Biodiesel Multimedia Findings

- Air Emissions
  - Toxic emissions reduced, incl. PM
  - General increase of NOx emissions
- Additives
  - Typical NOx mitigation additives tested
  - Impacts comparable to diesel if similar additives/amounts used
- Areas of Uncertainty *(see recommendations)*
  - Aquatic toxicity
  - Materials compatibility
  - Hazardous waste generation and management
- Multimedia evaluation being finalized

Preliminary Multimedia Workgroup Recommendations

- That the CEPC find use of biodiesel and renewable diesel does not pose significant adverse impact on public health or the environment.
- ***Condition findings on the following:***
  - Biodiesel not meeting specifications must undergo emissions equivalence comparison certification-Multimedia evaluation may be required
  - Same biodiesel additives used as conventional diesel
  - Hazardous substances must be handled in compliance with applicable CA laws and regulations
  - No new hazardous wastes generated

Status of Multimedia Assessments

- Renewable Diesel
  - Tier I and III completed – finding of no significant adverse impacts
  - Staff report being completed
- Biodiesel
  - Tier I and II completed
  - Tier III being finalized
  - Staff report being drafted

Multimedia Evaluation Schedule

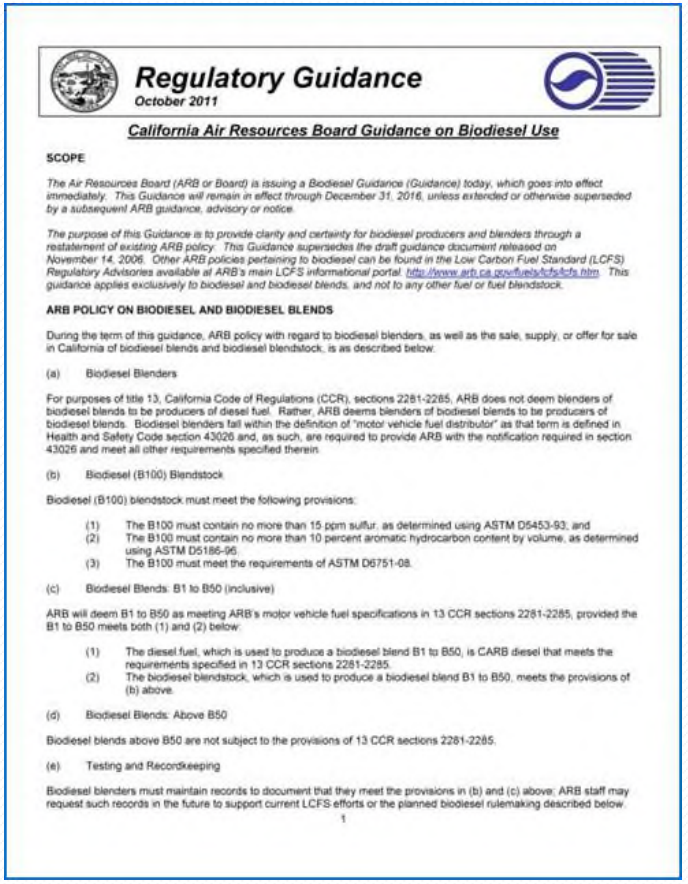
- Final Biodiesel Tier III Report – May 2013
- Peer Review Process – June 2013
  - Renewable Diesel and Biodiesel Reports
  - 30-Day Peer Review
  - Comment Period
- Environmental Policy Council Review – July 2013
- Final Determination – September 2013

Presentation by State Water Resources Control Board Staff (Laura Fisher)

Current CARB Policies on Biodiesel as an ADF

Current Policy on Biodiesel

- Released in October 2011
- Clarifies current policy
  - Biodiesel blends B1 to B50 allowed for legal sale
  - B50+ not subject to CARB regulations
- B100 blendstock subject to D6751, 15 ppm sulfur, 10 vol% aromatic HC
- B5 legal for sale as CARB diesel



Regulatory Guidance
October 2011

California Air Resources Board Guidance on Biodiesel Use

SCOPE

The Air Resources Board (ARB or Board) is issuing a Biodiesel Guidance (Guidance) today, which goes into effect immediately. This Guidance will remain in effect through December 31, 2016, unless extended or otherwise superseded by a subsequent ARB guidance, advisory or notice.

The purpose of this Guidance is to provide clarity and certainty for biodiesel producers and blenders through a restatement of existing ARB policy. This Guidance supersedes the draft guidance document released on November 14, 2006. Other ARB policies pertaining to biodiesel can be found in the Low Carbon Fuel Standard (LCFS) Regulatory Advisories available at ARB's main LCFS informational portal: http://www.arb.ca.gov/fuels/lcfs/lcfs.htm. This guidance applies exclusively to biodiesel and biodiesel blends, and not to any other fuel or fuel blendstock.

ARB POLICY ON BIODIESEL AND BIODIESEL BLENDS

During the term of this guidance, ARB policy with regard to biodiesel blenders, as well as the sale, supply, or offer for sale in California of biodiesel blends and biodiesel blendstock, is as described below:

(a) Biodiesel Blenders

For purposes of title 13, California Code of Regulations (CCR), sections 2281-2285, ARB does not deem blenders of biodiesel blends to be producers of diesel fuel. Rather, ARB deems blenders of biodiesel blends to be producers of biodiesel blends. Biodiesel blenders fall within the definition of "motor vehicle fuel distributor" as that term is defined in Health and Safety Code section 43026 and, as such, are required to provide ARB with the notification required in section 43026 and meet all other requirements specified therein.

(b) Biodiesel (B100) Blendstock

Biodiesel (B100) blendstock must meet the following provisions:

(1) The B100 must contain no more than 15 ppm sulfur, as determined using ASTM D5453-93; and
(2) The B100 must contain no more than 10 percent aromatic hydrocarbon content by volume, as determined using ASTM D5186-96.
(3) The B100 must meet the requirements of ASTM D6751-08.

(c) Biodiesel Blends: B1 to B50 (inclusive)

ARB will deem B1 to B50 as meeting ARB's motor vehicle fuel specifications in 13 CCR sections 2281-2285, provided the B1 to B50 meets both (1) and (2) below:

(1) The diesel fuel, which is used to produce a biodiesel blend B1 to B50, is CARB diesel that meets the requirements specified in 13 CCR sections 2281-2285.
(2) The biodiesel blendstock, which is used to produce a biodiesel blend B1 to B50, meets the provisions of (b) above.

(d) Biodiesel Blends: Above B50

Biodiesel blends above B50 are not subject to the provisions of 13 CCR sections 2281-2285.

(e) Testing and Recordkeeping

Biodiesel blenders must maintain records to document that they meet the provisions in (b) and (c) above; ARB staff may request such records in the future to support current LCFS efforts or the planned biodiesel rulemaking described below.

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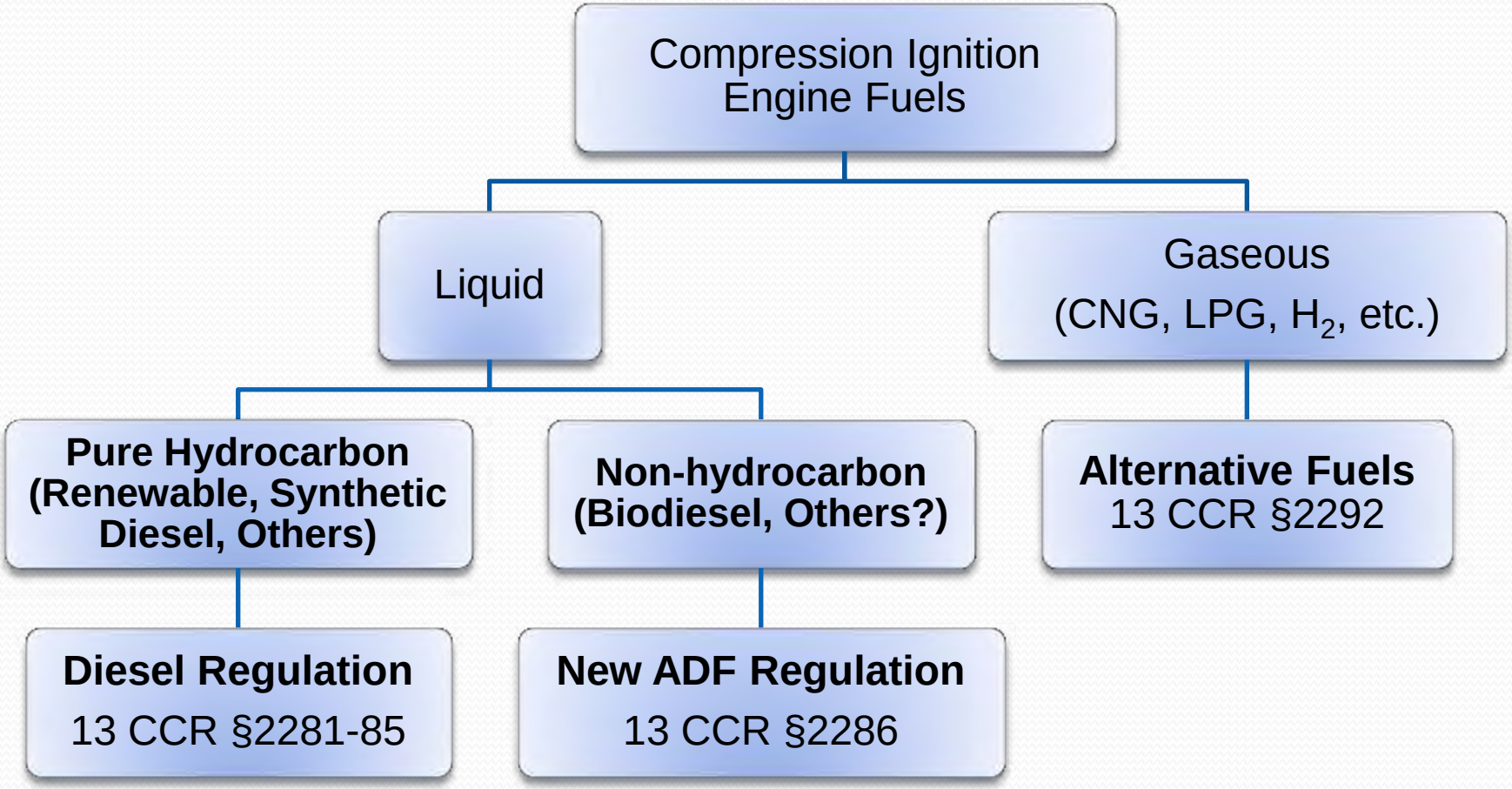
CDFA-Division of Measurement Standards Presentation (Allan Morrison)

Session II-

Discussion of White Paper ADF Regulatory Concepts

Proposed Regulatory Structure for Alternative Diesel Fuels



Proposed Modifications to the California Code of Regulations

- New alternative diesel fuels regulatory section:
  - Title 13 California Code of Regulations section 2286
  - Controls fuel quality for biodiesel, and other ADFs
- Amendments to diesel regulations:
  - Title 13 California Code of Regulations, sections 2281-2285
  - Accommodate ADF regulation
  - Other technical and administrative updates

Proposed Generic ADF Requirements

- Government recognition
- Public Health & Safety Info
- Environmental Assessment
- Fuel specifications
- OEM assurance of ADF use in certified engines
- Other State & Federal regulations
- Test methods
- Enforcement

NOx Emissions

ADF use vs. CARB Diesel use

- CARB NOx Equivalent: Refers to neat ADFs or ADF blends that show no NOx increase relative to CARB diesel.
- Non-CARB NOx Equivalent: Refers to neat ADFs or ADF blends that are anticipated to increase NOx emissions relative to CARB diesel fuel.

ADF Compliance Options

CARB NOx Equivalent:

- [redacted] Address ADF blendstock
- [redacted] Address CARB diesel portion
- [redacted] Certified ADF Formulations

Option 1
Address ADF Blendstock

- Through emissions testing, demonstrate that the ADF, when blended to a specified level with CARB diesel, achieves CARB NOx equivalence
- Appropriate ADF additives approved for use either via rulemaking, or through emissions demonstration
- Conservative feedstock used as baseline for ADF demonstration emissions testing
- CARB to issue Executive Order to allow use of ADF additives upon successful demonstration

Option 2
Address CARB Diesel Portion

- Through emissions testing, show that a subset of standard CARB diesel can achieve CARB NOx equivalence when blended with a specific ADF
- Develop specifications for CARB diesel that achieves NOx equivalence from ADF or ADF blends

Option 3
Certification of Specific ADF Formulations

- Use emissions testing to show that a specific ADF formulation achieves CARB NOx equivalence when blended with CARB diesel
- Set specifications for ADF emissions-related fuel properties and additive dosage
- CARB to issue Executive Order to certify specific formulations upon successful emissions testing
- Option also available for neat ADF

Staff Proposes to List Biodiesel as the First Alternative Diesel Fuel

Rulemaking Addresses Specific Blends

- B5 Fuels
- B20 Fuels
- B21-B98 Fuels
- B100 as a Neat Fuel
  - Blendstock Provisions for Fuel Quality
  - Requirements for CARB NOx equivalence if applicable

Proposed Requirements for Biodiesel as an ADF - B5 Blends

- B5 is 5 vol% biodiesel and 95 vol% CARB diesel
- B5 requires no mitigation, only recordkeeping
- B5 enforced as CARB diesel
- B5 most commonly marketed blend in CA followed by B20

Proposed Requirements for Biodiesel as an ADF - B20 Blends

- B20 is 20 vol% biodiesel and 80 vol% CARB diesel
- B20 has three options for CARB NOx equivalence:
  - ***Option 1:*** Blend neat biodiesel with an approved or certified additive & blend w/ CARB diesel
  - ***Option 2:*** Mix neat biodiesel with "B20-ready" CARB diesel
  - ***Option 3:*** Certify a unique B20 formulation

Proposed Requirements for Biodiesel as an ADF- B21-B98

- Non-CARB NOx equivalent blends not legal finished fuels
- Certification option available to demonstrate CARB NOx equivalence
- Requires variance from CDFA

Proposed Requirements for Biodiesel as an ADF – B100

- B100 is neat biodiesel (B99 also considered B100)
- Must meet ASTM D6751
- Requires minimum fuel quality specifications

Property	ASTM Test	Value
Cetane number	D613 or IQT	>47
API Gravity	D287	>27 degrees API
Sulfur	D5453	<15 ppm
FAME Content	EN14103	>96.5 percent

Proposed Requirements for Biodiesel as an ADF – B100

- B100 can be used for emissions neutral blends or for B5 blends
- Allowed as motor vehicle fuel if certified for CARB NOx equivalence
- Requires variance from CDFA
- Reporting requirements

Biodiesel Certification Compliance Option

Certify either biodiesel formulation or NOx mitigating additives

- Formulation results in specific biodiesel blendstock properties that must be met
- Certified additives may be used with any biodiesel blendstock regardless of feedstock

Biodiesel Certification Compliance Option

- Modeled after 13 CCR 2282(g)
- Test for statistical equivalence of candidate fuel and CARB reference diesel for NOx, PM, and SOF(?) emissions
- 2004-2006 Cummins ISM 360-380
- Test for selected toxics (PAH, Carbonyls, 1,3-butadiene)
- Heavy-duty FTP, minimum 20 hot starts per fuel

Additional Considerations

- Fleet-specific provisions (e.g., for fleets comprised of new vehicles, animal/waste feedstocks, etc.)
- Incentivize NOx-reducing fuels
- Limited use exemption
- Open to suggestions

Proposed Blending & Enforcement Provisions

- Who should provisions apply to, refiners, ADF producers, ADF importers, jobbers, marketers?
- Where should provisions apply?
- How should CARB address splash blending?

Diesel Regulation Amendments

(title 13, California Code of Regulations, sections 2281-2285)

Current Regulations

- § 2281. Sulfur content of diesel fuel
  - 15-ppmw standard enforced at refinery, import facility and throughout distribution system
- § 2282. Aromatic hydrocarbon content of diesel fuel
  - 10-vol% standard (20-vol% for small refiners), designated alternative aromatic hydrocarbon limit, certified diesel fuel formulation, or designated equivalent limits enforced at refinery or import facility
  - § 2282(g) certified diesel fuel formulations resulting in equivalent emissions reductions

Current Regulations

- § 2283. Exemptions for diesel fuel used in test programs
- § 2284. Lubricity of diesel fuel
  - Enforced by CDFA's Division of Measurement Standards with ASTM D975, Standard Specification for Diesel Fuel Oils
- § 2285. Exemption from diesel fuel requirements for military-specification fuels used in qualifying military vehicles
  - Exemptions from sections 2281, 2282, and 2284
  - e.g., JP-8 used in exempt vehicles and tactical military vehicles

Summary of Amendments

- Add provisions related to use of biodiesel blends
- Add prohibition on some downstream additives
  - Allow additives at production
- Add aromatic hydrocarbon caps for enforcement
- Update variance requirements
  - Delete outdated provisions
  - Add new section modeled after CaRFG
- Add, clarify and update other provisions
- Eliminate obsolete provisions

Use of Biodiesel Blends

- Add and clarify definitions
  - Add definition for biodiesel
  - Add and clarify other definitions to accommodate the use of biodiesel blends
- Add enforcement test method for biodiesel content
  - Propose ASTM D7371-07, or other more effective method

Use of Biodiesel Blends

- Add biodiesel cap
  - Would be enforced at all points of distribution system
- Mitigate NOx-emission increase from use of biodiesel blends
  - Diesel fuel that could be blended with biodiesel would be cleaner to offset increased NOx emissions caused by biodiesel (i.e., “B-20” ready)

Other Updates and Clarifications

- Clarify and update 2282(g) requirements
  - Clarify candidate fuel requirements
  - Clarify test requirements for additive-based candidate fuels
  - Update test engine to pre-2007
- Clarify standards with correct significant figures
- Clarify and add definitions related to enforcement protocols
- Test method updates
  - Distillation (ºF), ASTM D86-12
  - Nitrogen content (ppmw), ASTM D4629-08

On-going CARB Activities

- Continual research efforts on B5 and less
- Continual research efforts on possible additional compliance options (additive testing, etc.)

Next Steps

- Please provide written comments on regulatory concepts by May 14, 2013
- Release preliminary draft ADF regulation order in May
- Next rulemaking workshop in June/July
- Potential third workshop in August
- Board Hearing September 2013

Rulemaking Contacts

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- http://www.arb.ca.gov/fuels/diesel/altdiesel/biodiesel.htm