

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



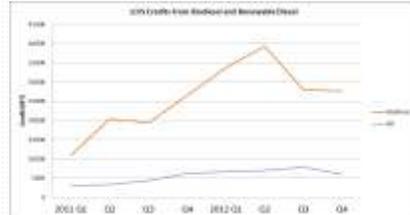
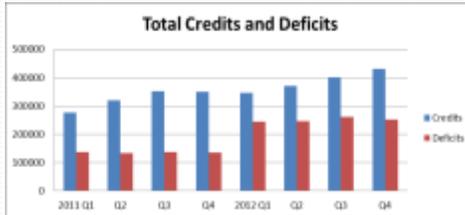
Objectives

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

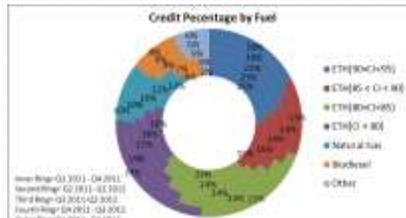
Increasing ADF demand in California

- 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



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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

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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

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California Energy Commission Staff Presentation (Tim Olson)



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Literature Review Update



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CARB Emission Studies

- Three on-road engines:
2000 Caterpillar, 2006 Cummins ISM, 2007 DDC MBE4000
- Two off-road engines:
2009 John Deere; 1998 Kubota
- ΔNO_x for (CARB B20 – CARB diesel)
greater than ΔNO_x for (Fed B20 – Fed diesel)
- Consistent with other studies on high cetane diesel
- Further study needed on B5 and below

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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

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Criteria for Studies Reviewed

Study fuels targeted for review:

- High Cetane Base Fuel: Cetane Number \geq 48, Aromatics \leq 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

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Literature Review Summary

Results: Literature generally consistent with CARB biodiesel test program

Results of Literature Review (% increase in NO _x emissions)	High-Cetane Base fuel (≥48)	CARB Studies	Low-Cetane Base fuel (<48)
<i>B20 all feedstock</i>	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)

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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

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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

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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

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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

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



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Current CARB Policies on Biodiesel as an ADF



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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



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CDFA-Division of Measurement Standards Presentation (Allan Morrison)



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Session II-

Discussion of White Paper ADF Regulatory Concepts

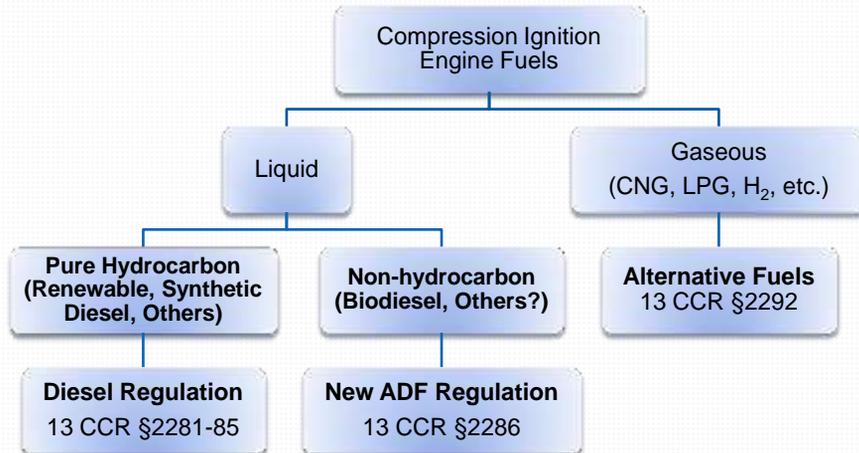


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Proposed Regulatory Structure for Alternative Diesel Fuels



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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

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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

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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.

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ADF Compliance Options

CARB NO_x Equivalent:

Option 1
Address ADF
blendstock

Option 2
Address
CARB diesel
portion

Option 3
Certified ADF
Formulations

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Option 1 Address ADF Blendstock

- Through emissions testing, demonstrate that the ADF, when blended to a specified level with CARB diesel, achieves CARB NO_x 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

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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



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Rulemaking Addresses Specific Blends

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

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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

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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 NO_x 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

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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

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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

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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

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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

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Biodiesel Certification Compliance Option

- Modeled after 13 CCR 2282(g)
- Test for statistical equivalence of candidate fuel and CARB reference diesel for NO_x, 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

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Additional Considerations

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

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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?

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Diesel Regulation Amendments

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



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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

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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

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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)

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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 (°F), ASTM D86-12
 - Nitrogen content (ppmw), ASTM D4629-08

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On-going CARB Activities

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

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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



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