

2014 LCFS Advisory Panel

**California Air Resources Board
California Environmental Protection Agency
Coastal Hearing Room
Monday, May 19, 2014**

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2014 LCFS Advisory Panel

Welcome and Introductions

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Today's Schedule

- ✓ **Welcome**
 - Introductions**
 - Purpose of Advisory Panel**
- Review of Today's Schedule**
- Bagley-Keene Overview**
- Review of Panel Charter**
- LCFS Basics**
- Program Status, Progress Towards Targets**
- Fuel Availability and Compliance Schedule**

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Today's Schedule (cont.)

- Advances in Life Cycle Analysis**
- Economic Analysis**
- Environmental Analysis**
- Harmonization**
- Additional Topics (if necessary)**
- Public Comments**
- Closing Remarks**

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Bagley-Keene Public Meetings

- **The work of the Advisory Panel must be conducted in public**
- **Your work is to discuss, deliberate, and recommend regarding 13 topics**
- **Do that work in public if a quorum involved**

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Email distribution

- **If email likely to reach a quorum, avoid working on the 13 topics**
- **To distribute something that is likely to reach a quorum, ask ARB to distribute and post**

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Your Emails May be Public Records

- **Correspondence between Panel members about Panel business**
- **Correspondence from others commenting on the work of the Panel**

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Review of Panel Charter

- **Advisory Panel is a regulatory requirement**
- **Executive Officer to conduct two reviews**
- **Required to convene an Advisory Panel**
- **Reviews will address a broad range of topics**
- **May include recommended amendments**
- **Reviews to the Board by January 1, 2012, and January 1, 2015**

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Review of Panel Charter Scope of Review

- **Generally higher level**
- **Not duplicate effort of workgroups**
- **Between scheduled meetings, work performed by less than 20 Panel members may be submitted for posting**

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Review of Panel Charter Panel Composition

- **Government Agencies**
- **Fuels Industry**
- **Academia**
- **Environmental Groups**
- **Others**

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Review of Panel Charter Role of Chair and Co-Chair

- **Ensure discussion remains focused**
- **Clarify points of discussion as needed**
- **Disseminate meeting summaries**
- **Provide Panel report to the Board**

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Review of Panel Charter Role of Panel Members

- **Attend each meeting and prepare in advance**
- **Stay focused on the specific review areas**
- **Comment constructively, specifically, and in good faith**
- **Provide ARB staff with research and documentation as needed**
- **Conduct activities in compliance with the requirements of Bagley-Keene**

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Review of Panel Charter Code of Conduct

- **Place name card on end to be recognized to make a comment**
- **No substitutes for Panel members' absence from a scheduled meeting**
- **Treat Panel members and discussions with professional courtesy and disclosure etiquette**

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Public Comments

- **Identification cards are available**
- **Form queue next to podium**

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LCFS Key Objectives

- **Reduce greenhouse gas emissions
(~15 MMT in-state in 2020)**
- **Reduce carbon intensity of transportation
fuel pool by 10% by 2020**
- **Help achieve AB 32 objective of reducing
GHG emissions to 1990 levels by 2020**
- **Transform and diversify fuel pool**
- **Reduce petroleum dependency**

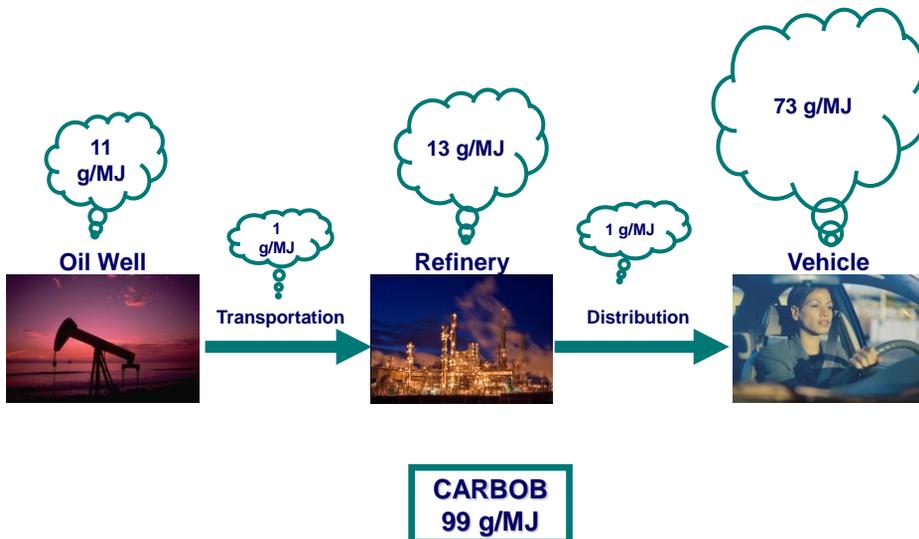
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Basic LCFS Requirements

- Sets annual carbon intensity standards for gasoline, diesel, and the fuels that replace them
- Carbon intensity (CI) is the measure of GHG emissions associated with producing and consuming a fuel (gCO₂e/MJ)
- LCFS is fuel-neutral and market-based
- CI based on complete life cycle analysis

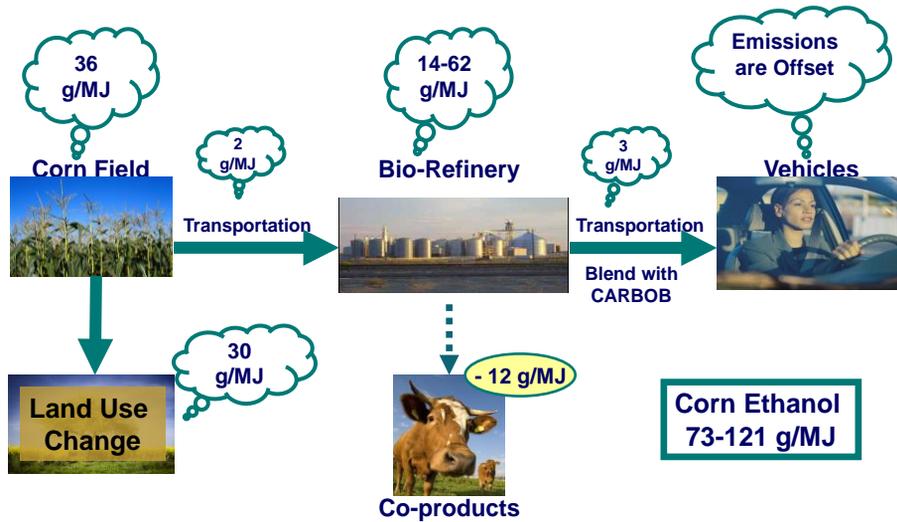
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Fuel Lifecycle – CARBOB



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Fuel Life Cycle – Corn Ethanol



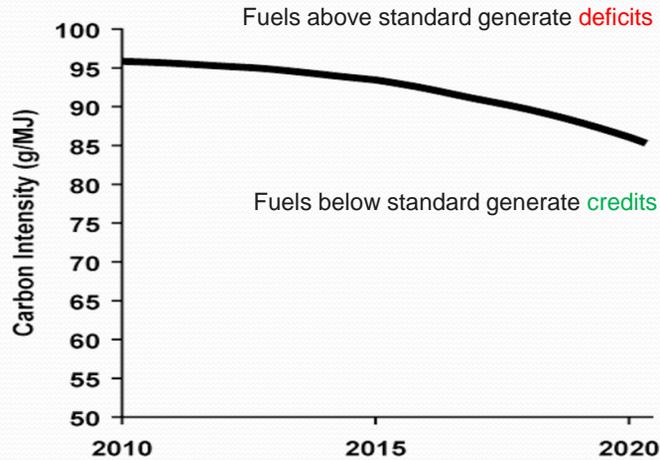
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Regulated Parties of the LCFS

- Providers in California of most petroleum and biofuels are “regulated parties” under the LCFS
- Providers of clean fuels that already meet 2020 target are exempt but can “opt in” to program and earn credits
 - Electricity
 - Hydrogen
 - Natural gas & biogas
- Generated credits can be bought and sold by regulated parties

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LCFS Accounting System Straightforward



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Carbon Intensities of Some Fuels

- Gasoline **99** gCO₂e/MJ
- Diesel **98** gCO₂e/MJ
- Corn Ethanol **73 – 121** gCO₂e/MJ
- Sugarcane Ethanol **58 – 73** gCO₂e/MJ
- Biodiesel **4 – 83** gCO₂e/MJ
- Methane **-15 – 83** gCO₂e/MJ
- Electricity **31 – 37** gCO₂e/MJ

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LCFS Update

- **Continuous activities**
 - Approving fuel pathways
 - Registering biofuel production facilities
 - Calculating crude oil carbon intensities
 - Making changes to LCFS Reporting Tool
- **Specific activities**
 - Conducting environmental and economic analyses
 - Updating indirect land use change values
- **Lawsuits**

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Lawsuits

- **Federal: 9th Circuit Court of Appeals**
 - Left LCFS in place
 - Ethanol and crude oil provisions not facially discriminatory
 - Remanded the case to the district court for additional determinations
- **State: 5th District Court of Appeal**
 - Left LCFS in place
 - Found issues with CEQA and APA
 - ARB will propose for adoption an alternative diesel fuel regulation and re-adoption of the LCFS in fall 2014

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2014 LCFS Proposed Amendments

Had planned to propose amendments to Board in October 2013 and again in 2014

- **Per Board's direction on many amendments**
- **For clarity and enhancement of the regulation**
- **To be responsive to stakeholder feedback**

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2014 LCFS Proposed Amendments (cont.)

- **Staff to propose revisions already identified and workshopped last year**
 - Cost containment mechanism
 - Revised indirect land use (iLUC) values
 - Electricity credits for mass transit and electric forklifts
 - Low-energy-use refineries provision
 - Innovative technologies for crude oil production
 - Additional fuel pathways (~140)
 - Miscellaneous revisions for clarity and enhancement
- **Staff sees this as an opportunity to strengthen LCFS, given three years of implementation**

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Additional Concepts Under Discussion

- **Refinery-specific crude oil incremental deficit accounting**
- **Fuel pathways and producer facility registration**
- **GHG emissions reductions at refineries as additional compliance pathway**
- **Scoping Plan Update: Continue to reduce CIs to help meet ongoing emission reduction targets**

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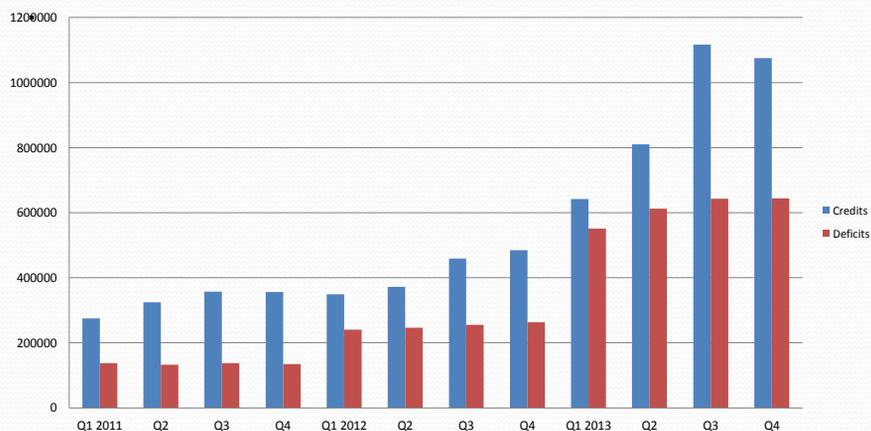
2014 LCFS Timeline

- **March 2014:** Initial public workshop to discuss LCFS framework for 2014 and Indirect Land Use Analysis
- **April 4th, 2014:** Workshop to discuss Fuel Pathways, Producer Facility Registration, and Cost Containment
- **April 18th, 2014:** Workshop to discuss Refinery and Crude Oil Provisions and Reporting and Enforcement Provisions
- Other workshops will follow, both topic-specific and general LCFS overview
- Board update in the summer
- Board hearing in the fall

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Progress Towards Targets

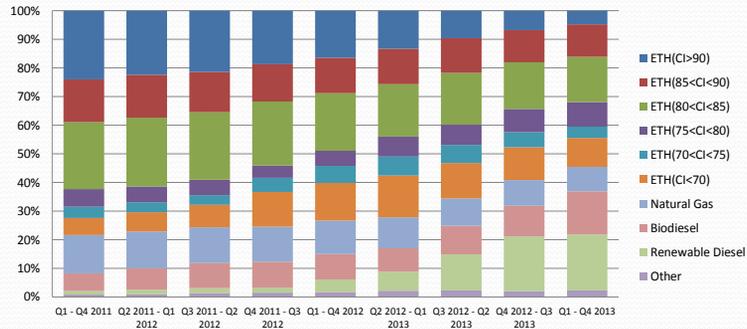
Fig. 1. Total Credits and Deficits
(All Fuels) Reported, Q1 2011 – Q4 2013



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Progress Towards Targets

Fig 3. Credit Percentage by Fuel
Q1 2011 - Q4 2013



- Larger portion of low CI ethanol
- Continued contribution of alternative fuel (e.g., natural gas)
- Non-ethanol fuels make up over 35 percent credits

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Fuel Availability

- **Present staff's general methodology**
- **Initiate discussion on each fuel**
 - **Growth potential/opportunities**
 - **Hurdles/barriers**
- **ARB staff role today is to participate in discussion**

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Fuel Availability - Methodology

Investigate:

- **Statewide, national, and global capacity of fuel**
- **Past and current production of fuel by feedstock**
- **Growth patterns for each feedstock and fuel**
 - **Nascent fuels**
 - **Current fuels with limited growth potential**

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Biodiesel

- **Soy – plentiful, revised ILUC?**
- **Canola – limited growth potential**
- **Waste grease/used cooking oil – limited**
- **Corn oil – high growth potential, challenges**
- **Tallow – limited growth potential**
- **Other**

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Renewable Diesel

- **Global capacity = 800 to 900 MGY**
- **Domestic capacity = 140+110 = 250 MGY**
- **High growth potential**
- **Feedstocks**
- **Infrastructure to/in California**
- **Labeling issue**

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CNG/LNG

- **Fossil – plentiful**
- **Renewable – high growth potential**
- **Price is right**
- **Challenges**
 - **Vehicle deployment – how many by when?**
 - **Biomethane access to pipelines**

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Ethanol

- **Corn/sorghum**
- **Sugarcane**
- **Cellulosic**
 - **Domestic**
 - **Brazilian**
- **Other**
 - **Molasses**
 - **Crop-based feedstocks**

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Electricity and Hydrogen

- **Used Advanced Clean Cars estimates**
- **Hydrogen – very little by 2020**
- **Electricity – may exceed ACC expectations**
 - **High gasoline prices**
 - **Customer preference**

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Renewable Gasoline

- **First plant due to produce in 2015**
- **Nameplate capacity is 10 MGY**
- **Plans to build additional plants**

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Fuel Availability - Discussion

- **Diesel standard**
 - Availability of low-CI alternatives bright
 - Infrastructure and vehicles may limit volumes
- **Gasoline standard**
 - Lower-CI ethanol becoming available
 - Alt-fuel LDVs are essential
 - More challenging than diesel standard

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Compliance Schedule

- **LCFS CI reduction standards frozen at 1.0% for 2014 and 2015**
- **Opportunity to deposit additional credits in the “bank”**
- **Post-2015 compliance curves based on fuel availability and banked credits**
- **Compliance curves will include some market push**

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Advances in Life Cycle Analysis

- **The main advance in life cycle analysis we are contemplating is to update CA-GREET**
- **Two primary advantages**
 - **Updated life cycle inventory data**
 - **Ability to build a greater variety of fuel pathways**
- **We are basing this update on Argonne National Lab's GREET 2013**

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Advances in Life Cycle Analysis

An advance in the LCFS (if not LCA) is the nascent fuel diversification underway

- **In the first few years, most pathways were for corn and sorghum ethanol.**
- **We're now seeing**
 - **Renewable diesel (13 pathways)**
 - **Biodiesel (9 pathways)**
 - **Biomethane (15 pathways; others in our 'pipeline')**
 - **Molasses (4 pathways)**
 - **Cellulosic ethanol (in the pipeline)**

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Advances in Life Cycle Analysis

- **We're also seeing starch ethanol producers switching to lower-CI process energy sources**
 - **Biomethane**
 - **Anaerobic digestion**
 - **Landfill gas**
 - **Wood waste (municipal solid and green waste)**
- **They are also beginning to convert some of the cellulose in the kernel to ethanol**

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LCFS Economic Analysis

Updated economic analysis comprised of two sections:

- ***Supply Analysis***
 - **Models market response to LCFS to forecast low-CI fuel supplies**
 - **Estimates cost to produce those fuels**
- ***Economic Impacts Analysis***
 - **Quantifies and analyzes the costs and/or cost-savings of the LCFS**
 - **Uses a macro-economic model**

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Supply Analysis

Model simulates California transportation fuel market's response to the incentive structure of the LCFS

- **Transportation energy demand**: How many MJ do we need each year to propel the California vehicle fleet?
- **Supply of low-CI fuels**: How much of any given low-CI fuel can be produced in a given year?
- **Cost of Production**: How much do these fuels cost to produce?
- **Cost of production and maximum feasible volume producible within a given year will form foundation of supply curves**

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Transportation Energy Demand

Data sources

- **California Energy Commission's Integrated Energy Policy Report**
- **California Bureau of Equalization's Historic Gasoline and Diesel Sales**
- **U.S. Energy Information Agency's Annual Energy Outlook**

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Supply of Low-CI Fuels

- Project supply of low-CI fuels available each year
- Build cost curves that reflect cost to produce and supply low-CI fuels to California
- Infer demand for low-CI fuels based on the LCFS compliance schedule

Use model to:

- Simulate market response to increased demand for low-CI fuels and resultant increases produced and supplied
- Methodology accounts for LCFS incentives that spur innovation and decrease the costs over time

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Cost of Production

- **The components of production costs:**
 - Capital costs
 - Feedstock costs
 - Enzymes and chemicals
 - O&M
 - Utilities
 - Co-production credit
 - Storage, transportation, and distribution
 - Taxes and incentives
 - Fuel dispensing and infrastructure
- **Experience curves in model simulate downward pressures on costs of production over time (learning by doing, economies of scale, etc.)**

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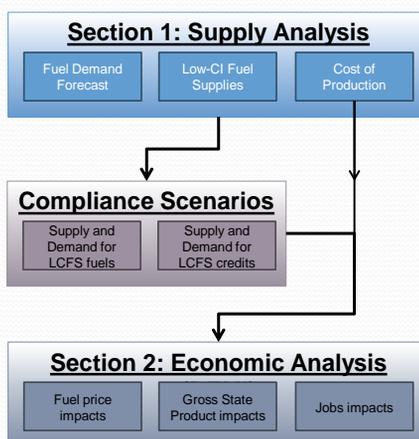
Economic Impacts Analysis

- **Cost estimates are dynamic and reflective of market pressures**
 - Costs are based on supply curves for low-CI fuels
 - Dynamic projections better reflect market responses to economic forces exerted by the LCFS
 - Dynamic projections simulate the most cost-effective options for regulated parties to achieve compliance
- **Extend the cost analysis to encompass macroeconomic impacts**
 - Economic impacts will be projected using REMI
 - Model runs estimate “ripple effects” of the LCFS costs and/or cost savings throughout the state economy
 - Model estimates the impact on key macroeconomic indicators (e.g., fuel prices, gross state product, jobs)

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Linking the Supply and Economic Impacts Analyses

- Annual market projections developed in *Supply Analysis* inform compliance scenarios
- Compliance scenarios forecast anticipated supply, demand, and cost for conventional and alternative fuels and supply and demand of LCFS credits
- These projected values provide the basis for the cost analysis section of *Economic Analysis*



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Macroeconomic Model

- **REMI is a Computable General Equilibrium (CGE) model of the California economy**
- **LCFS is modeled as a disruption to various market equilibria in place throughout the economy**
- **REMI provides estimates of how economy will react to the LCFS and models any resultant changes (e.g., fuel prices, gross state product, and jobs)**

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Summary of the 2009 Environmental Analysis

- **Significant GHG reductions due to production and use of lower CI fuels**
- **Potential reductions due to changes in vehicle fleet composition**
- **Estimate reduction of 16 MMTCO₂e from fuel combustion**
- **Estimate reduction of 23 MMTCO₂e from full fuel life cycle**

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Summary of the 2009 Environmental Analysis

- **Estimated 2020 Biofuel Production Facilities**
 - **6 corn ethanol facilities**
 - **18 cellulosic ethanol facilities**
 - **6 biodiesel facilities**
- **No change in emissions from petroleum refineries, power plants, or existing corn ethanol facilities over baseline emissions**

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Summary of the 2009 Environmental Analysis

- **Criteria pollutant emissions related to truck trips associated with delivery of feedstock and finished fuel**
- **Emissions offset by using newer trucks as prescribed by other State and federal regulations (such as LEV and CAFÉ standards)**
- **Health risk analysis performed to assess localized impacts**

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Environmental Analysis for Re-Adoption

- **Estimate of 2020 biofuel production facilities in California will be reassessed**
- **CEQA review will include:**
 - Methods of Compliance**
 - Beneficial Impacts & Adverse Impacts**
 - Mitigation Measures & Alternatives**
- **CEQA Checklist used to identify and evaluate potential impacts to the environmental**

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Pacific Coast Collaborative (PCC)

Signed by California, Oregon, Washington, and British Columbia

- **Oregon and Washington will adopt low-carbon fuels standards**
- **California and British Columbia will maintain their existing standards**
- **Over time, build an integrated West Coast market for low-carbon fuels**

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PCC Activities

- **Shared LCFS Reporting Tool with British Columbia and Oregon**
- **Scheduled routine conference calls with Washington staff**
- **Period conference calls with all PCC members**
- **Have met a couple of times to discuss LCFS programs**

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<http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>

