California Environmental Protection Agency

Air Resources Board

Status of California's Low Carbon Fuel Standard

January 13, 2009

CEC Joint IEPR and Transportation Committee Workshop on Biofuels in California

LCFS Dependent on Market Mechanisms & Technology Innovations

- Creates durable framework for near and long term transition to low carbon fuels
- Establishes stable investment environment
- Expands alternative fuels market in CA three to five times by 2020
- Encourages technology innovation, rewards transportation fuels with lower carbon footprint
- Promotes alternative fuel and hybrid vehicles

Overall Approach

- A reduction of 10 percent or greater in the average fuel carbon intensity by 2020
- Declining carbon intensity standard determined separately for gasoline and diesel
- Alternative fuels use either the gasoline or diesel standard
- Compliance based on tracking credits and deficits of transportation fuels
- Requires lifecycle analysis, including indirect effects

Baselines Used for the Standards

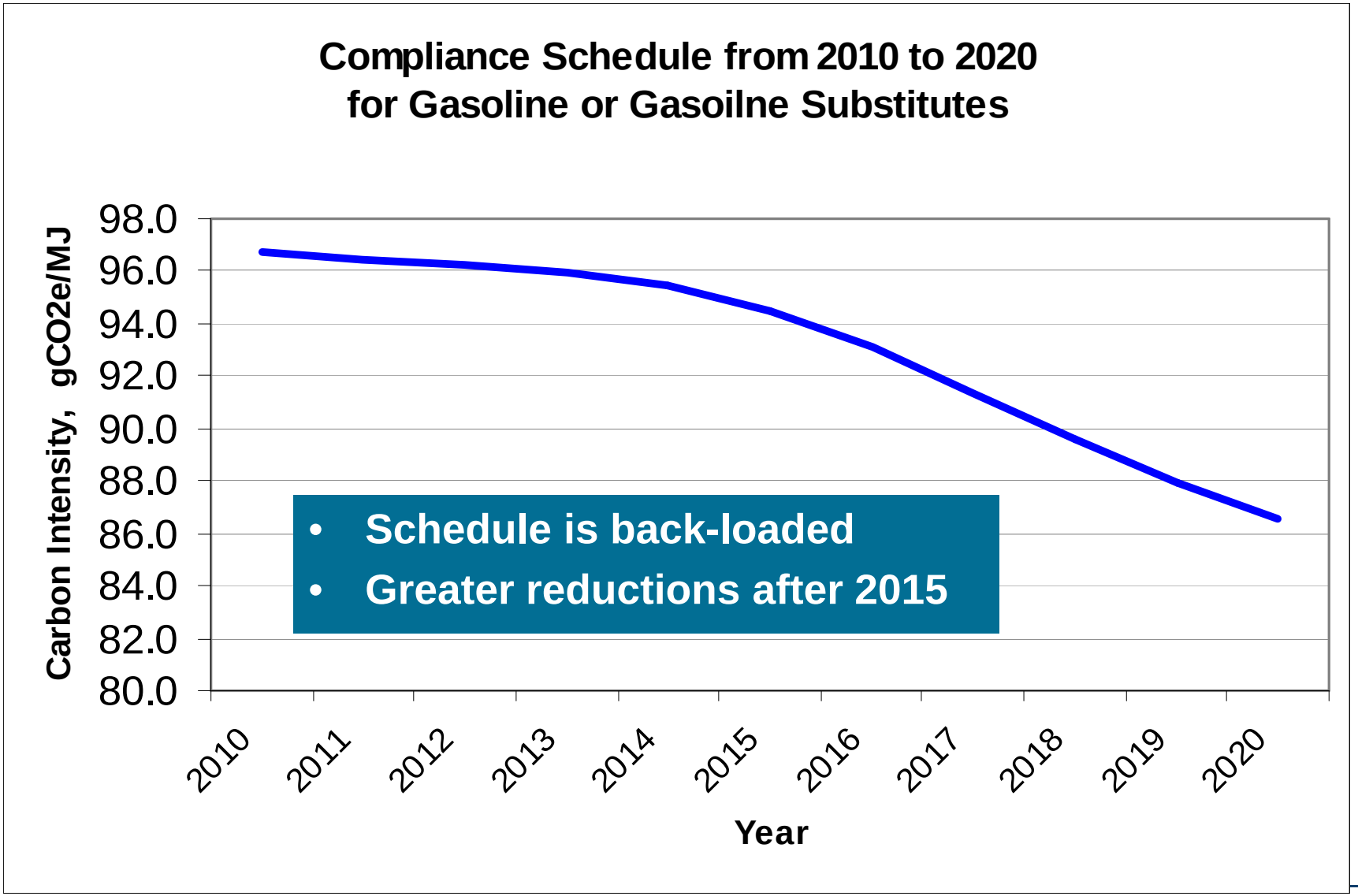
Gasoline:

- Carbon intensity: 96.7 gCO2e/MJ
- Year: 2010
- Fuel: CaRFG containing 10% ethanol derived from corn

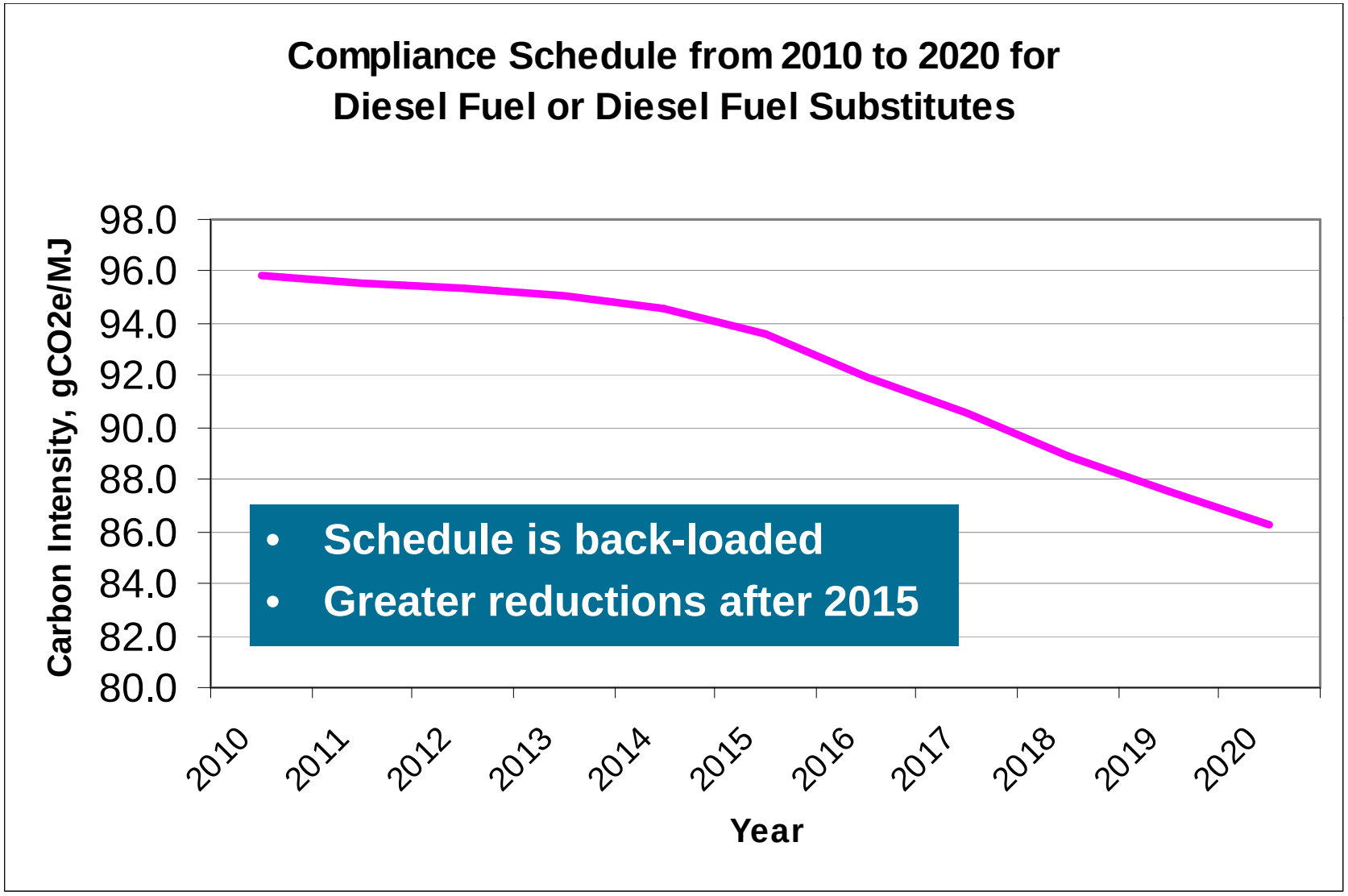
Diesel:

- Carbon intensity: 95.8 gCO2e/MJ
- Year: 2010
- Fuel: ULSD without biomass-based diesel

Compliance Schedule
Gasoline and Gasoline Substitutes



Compliance Schedule
Diesel and Diesel Substitutes



Fuel Providers Have Flexible Compliance Options

- Only produce fuels that meet the standard
- Blend or sell a mix of higher and lower carbon fuels that on average meet the standard
- Use previously banked credits
- Purchase credits from other fuel providers who earned credits by exceeding the standard

LCFS Issues

- Establishing fuel pathway carbon intensities
- Evaluating availability, cost, and impacts of low GHG fuels and vehicles using these fuels
- Establishing indirect land use change and other indirect effects
- Defining regulated parties and other regulation mechanics
- Incorporating sustainability provisions

Fuel Pathway Carbon Intensities

- The latest release of CA-GREET v1.8b is know posted on our website
- Updated published pathways should be posted very soon:
  - Corn ethanol
  - CaRFG and ULSD
  - CNG, H_2, and Electricity
  - Soybean Biodiesel and Land Fill Gas

Fuel Pathway Carbon Intensities (cont.)

- Additional pathways to be published
  - Brazilian sugarcane ethanol
  - Renewable diesel from soybeans
  - LNG (5 sub-pathways)
  - Palm Oil based biodiesel
  - Cellulosic ethanol from forest residue
  - Cellulosic ethanol from farmed trees
  - Renewable diesel from waste
  - GTL from natural gas

What is Land Use Change?

Conversion of new or existing land brought on by increased demand for a commodity (e.g. biofuel). This effect is at a different location.

Example:

Native grasslands converted to soybean farming due to increased demand arising from soybean cultivation being replaced by corn cultivation

Sequence of Steps in Estimating Preliminary GHG Impacts

Step 1: Perform GTAP run to predict types of land converted in each region

Step 2: Use estimated carbon release/sequestered for each land type using Woods Hole data and calculate total GHG carbon emissions increase

Step 3: Annualize total GHG emissions over 30 years

Parameters to be Evaluated

- Biofuel Types and Volumes (Corn Ethanol, Biodiesel and Renewable Diesel and Sugarcane ethanol with appropriate volumes based on projected requirements for these fuels)
- Land Types (forest, pasture, savannah, shrubland, etc.)
- Co-products (animal feed, feedstock for another process, etc.)
- Yields (differences in yields in different countries, yield changes with time, price driven yield changes, etc.)
- Emission Factors (data sources for carbon release are limited and also inclusion of above ground and below ground carbon)
- Amortization timelines (time over which to distribute carbon release from land conversion, 10, 20, 30 years, etc.)

Land Use Change: Ongoing Work

- Preliminary estimate of 35g CO_2e/MJ for midwest corn ethanol
- Land use change impact estimates in progress for:
  - Biodiesel for soybean oil
  - Brazilian sugarcane ethanol
  - Cellulosic Ethanol

No Land Use Change Effects?

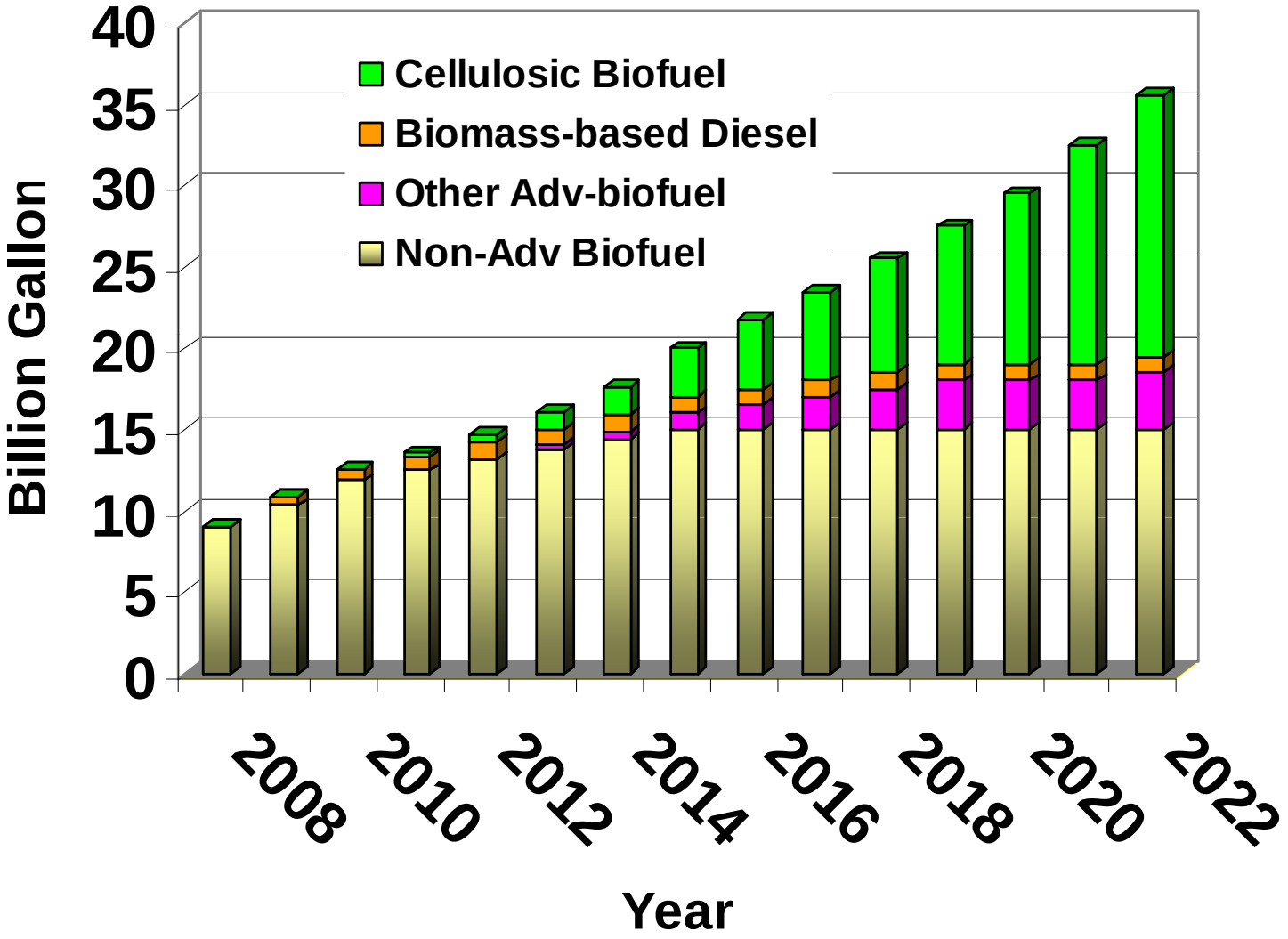
A biofuel will likely have no Land Use Change when it:

- is not derived from crops;
- is derived from cover crops, or similar types;
- is derived from crops grown on land not supporting other crop growth

Compliance Scenarios

- Seven compliance scenarios
  - 4 gasoline and gasoline substitutes
  - 3 diesel fuel and diesel fuel substitutes
- Scenarios based on
  - Availability of low-carbon ethanol with carbon intensity 10 or 20% better than CARBOB
  - Availability of feedstocks for cellulosic ethanol, sugarcane ethanol, biodiesel, renewable diesel, and other renewable fuels
  - Sufficient numbers of flexible fuel vehicles (FFVs) or advanced technology vehicles to meet the demand for E85, electricity (BEVs, PHEVs), or hydrogen (FCVs)

Federal Energy Act Biofuel Volumes



LCFS Timeline Jan 09 – March 09

January 2009	• Conduct Public Workshop on January 30 • Release revised regulatory language • Release updated land use change estimates • Release updated pathway analyses • Release draft economic/environmental analyses
February 2009	• Publish staff report with proposed LCFS regulation • Initiate multi-media analyses • Continue public workshops • Peer Review of LCFS
March 2009	• Continue public workshops • Board meeting to consider LCFS
December 2009	• Complete OAL Process • Board meeting to consider updated LCFS provisions

Summary

- **LCFS needed to reach California's GHG reduction goals for transportation**
- **LCFS provides framework for transition to sustainable alternative fuels**
- **Innovation is the key to advanced biofuels**
- **Market mechanisms integral component**
- **Technical issues can be addressed**

Thank You

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For more information about the LCFS, visit
http://arb.ca.gov/fuels/lcfs/lcfs.htm