

California Environmental Protection Agency



Air Resources Board

***Overview of the California
Low Carbon Fuel Standard***



**California Farm Bureau Federation
AIR AND ENVIRONMENTAL ISSUES
ADVISORY COMMITTEE
June 15, 2009**

Overview

Today's Presentation:

- **What the program accomplishes**
- **How the program works**
- **Comparison of LCFS to federal requirements**
- **Next Steps**

And if Time Permits:

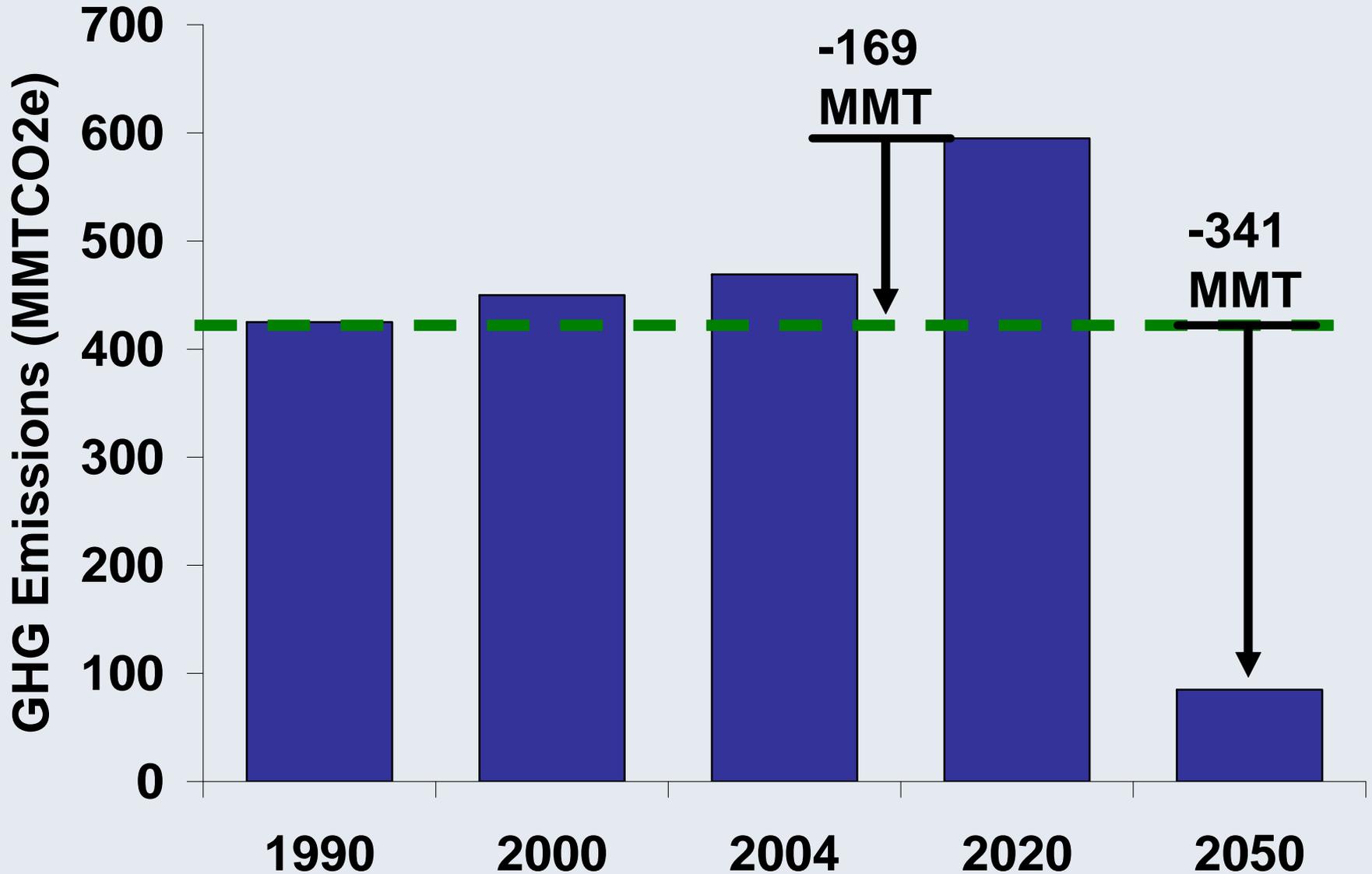
- **Lifecycle analysis**

What the Program Accomplishes

Transportation Sector Important

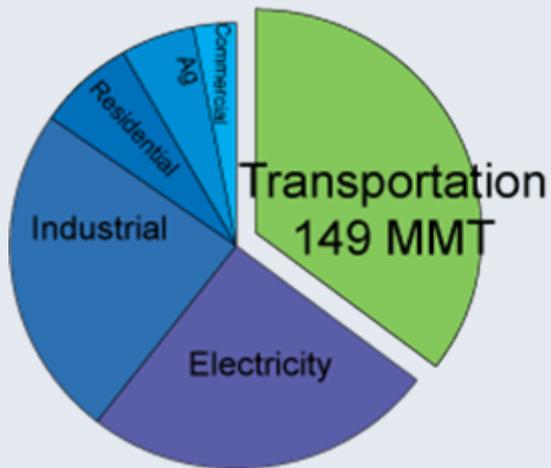
- **Significant reductions needed to achieve 2020 target and 2050 goal**
- **GHG emissions from transportation are large and increasing**
- **Transportation emissions affected by:**
 - Amount and type of transportation fuels
 - Efficiency of motor vehicles
 - Number of vehicle miles traveled

Large GHG Reductions Required



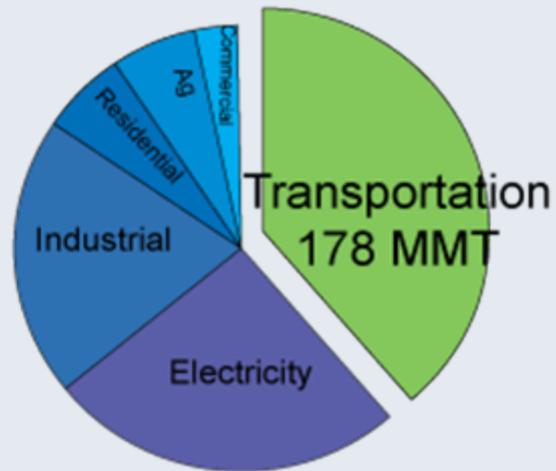
Transportation Emissions Increasing

1990



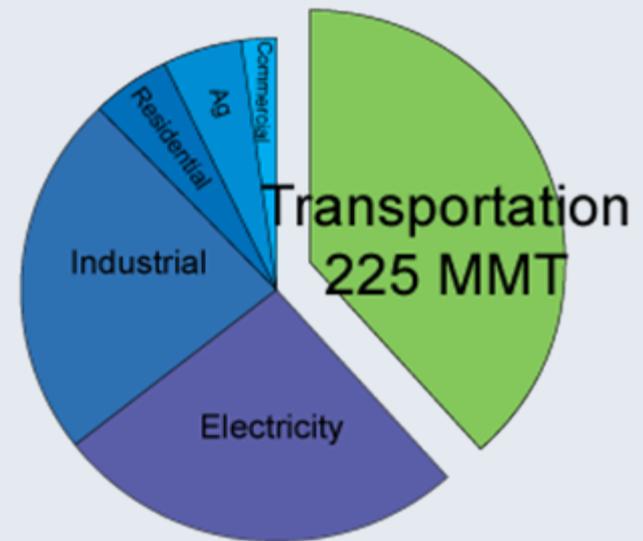
~425 MMT

2004



~469 MMT

2020



~595 MMT

LCFS Established by the Governor

- **Governor Schwarzenegger established the LCFS in January 2007**
- **University of California completed analysis demonstrating feasibility**
- **ARB identified LCFS as AB 32 early action measure in June 2007**
- **Board approved LCFS in April 2009**

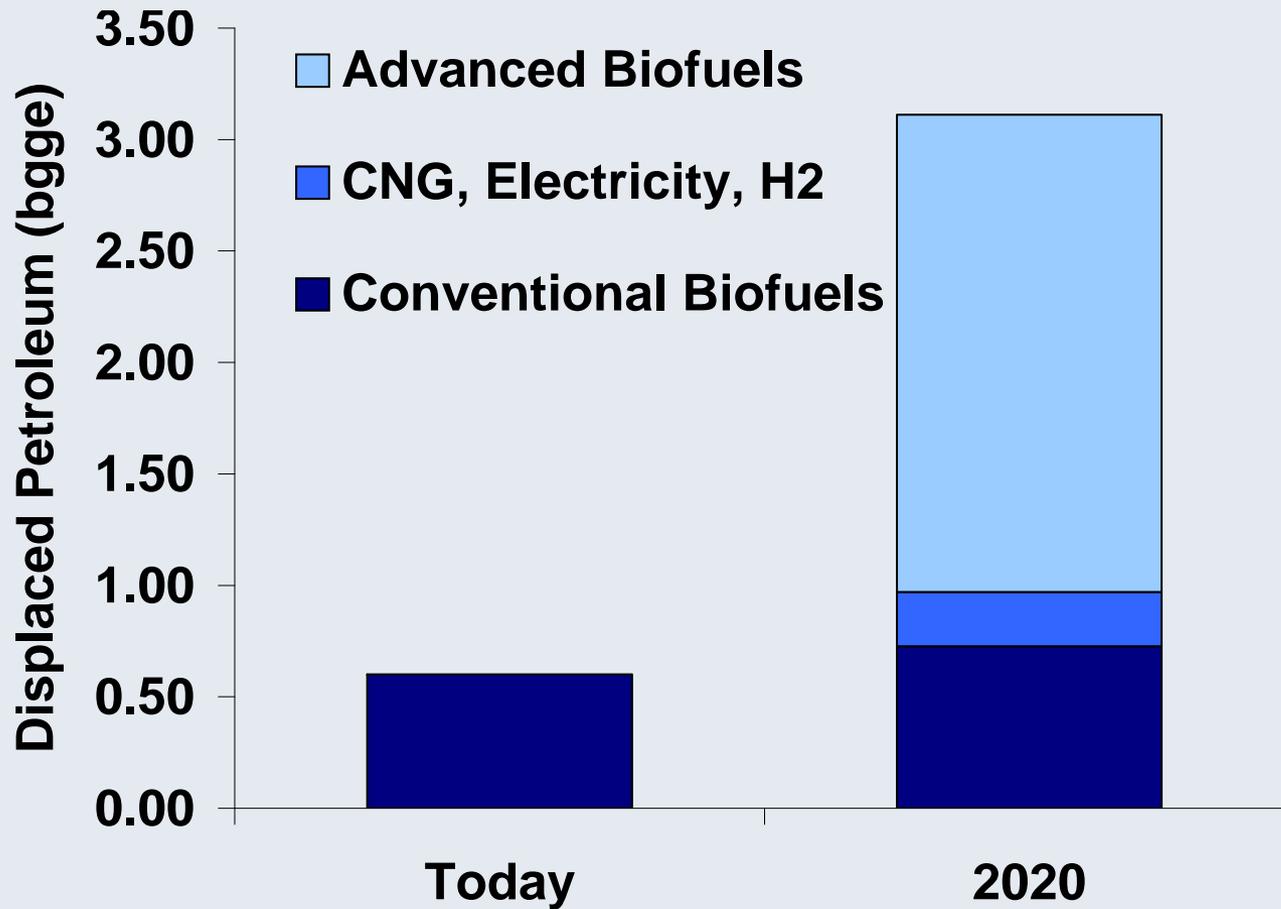
Framework for Low Carbon Fuels

- **Creates durable framework for near and long term transition to low carbon fuels**
- **Encourages technology innovation**
- **Establishes a model for regional and national standards**
- **Sets stage for future reductions**

LCFS Reduces GHG Emissions

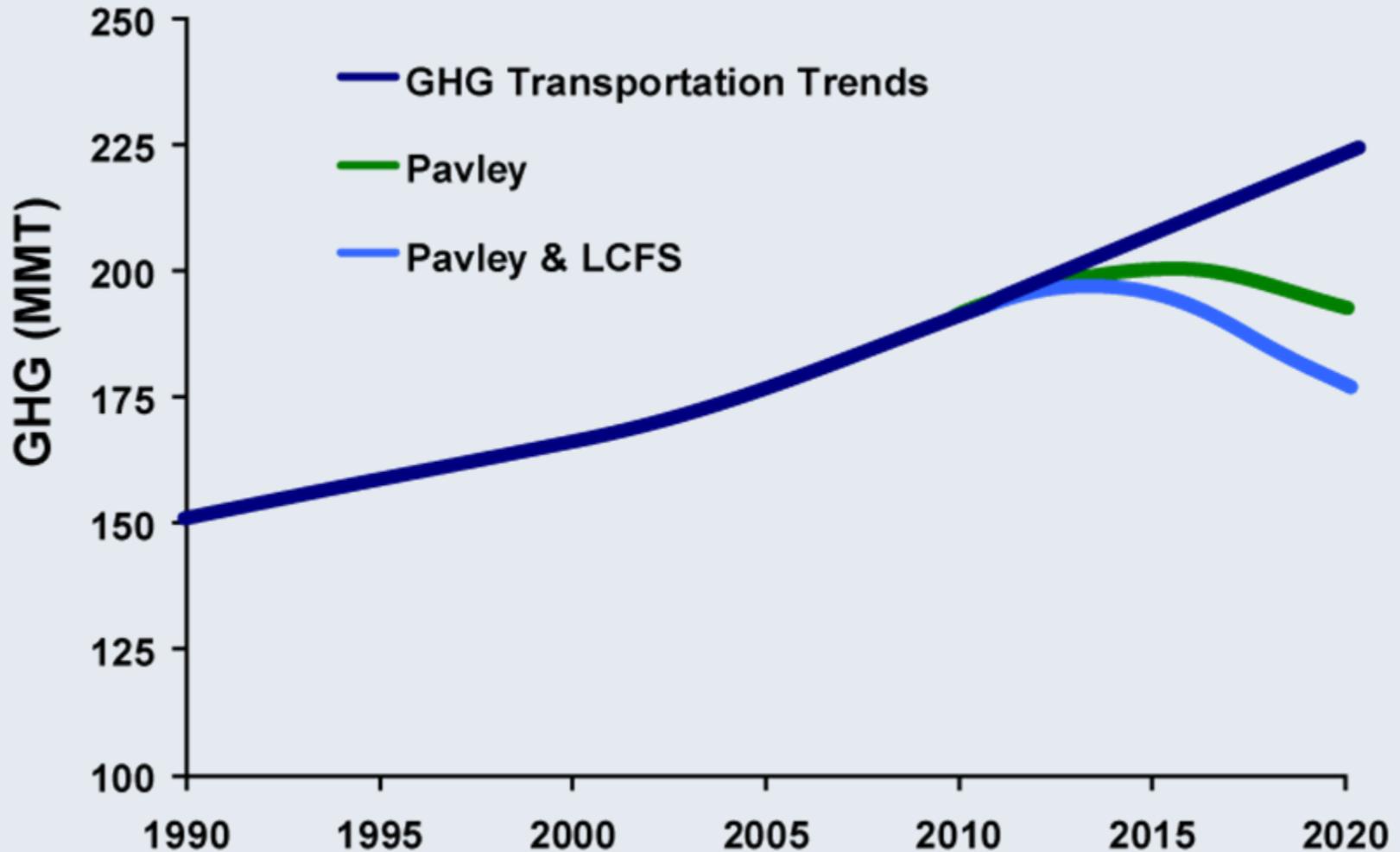
- **Results in a 10 percent reduction in the carbon intensity by 2020**
- **Reduces 16 MMT GHG emissions from the transportation sector by 2020**
- **Achieves about 10 percent of the total emission reductions required to meet the AB 32 target**

LCFS Displaces Petroleum, Mostly with New Generation Biofuels



**Biofuels will
play a major
role in
meeting the
LCFS in 2020**

Pavley and LCFS Reverse GHG Trend

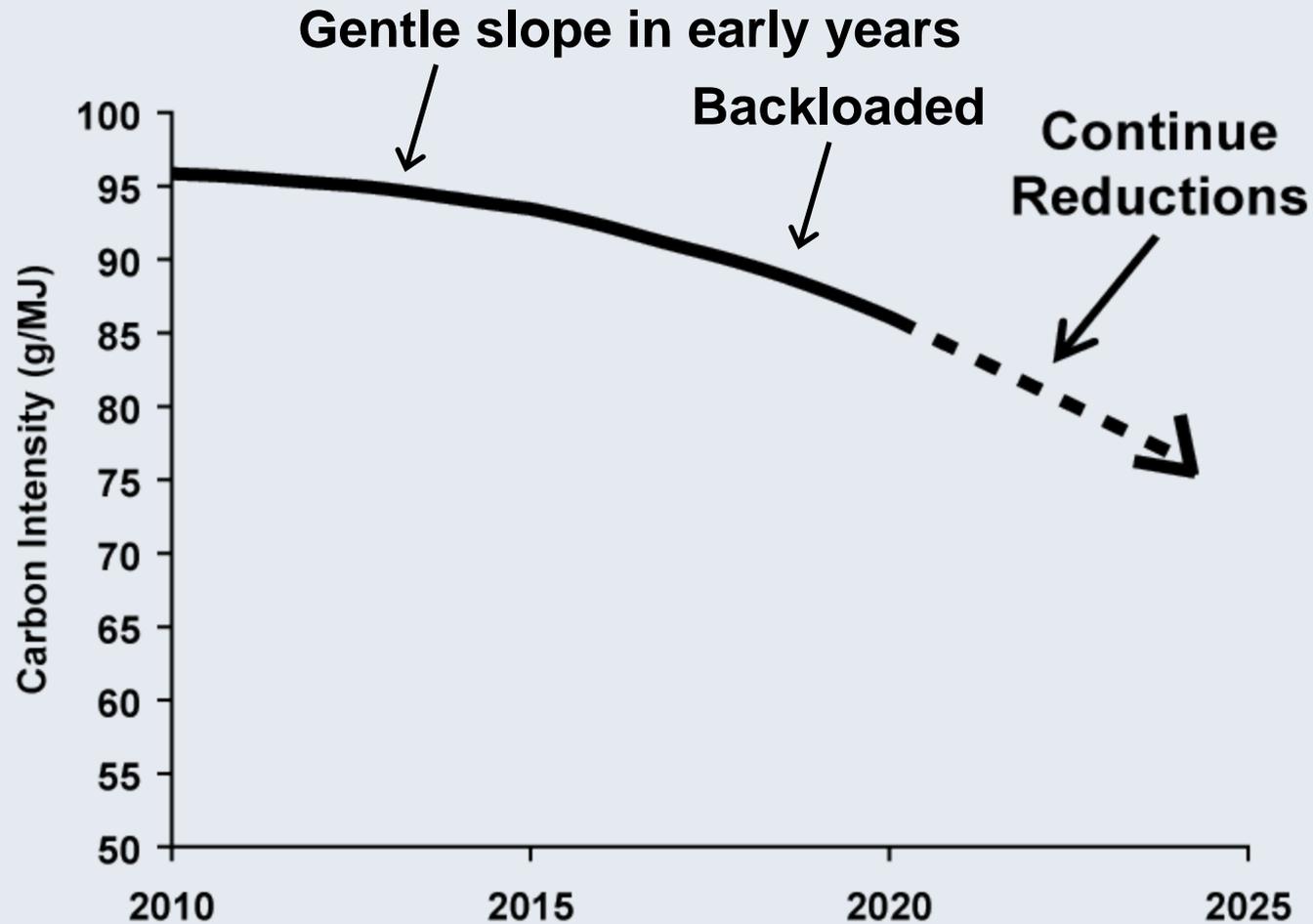


How the LCFS Works

LCFS Mechanics

- **Baseline fuel carbon “intensity” is that of 2010 gasoline and diesel fuel**
- **Carbon intensity represents the GHG emissions per unit of energy**
- **Fuel producers achieve 10 percent reduction from petroleum baseline by 2020**
- **Reduction is gradual and weighted toward later compliance years**

The LCFS Compliance Schedule



Who is Regulated?

- **Providers of most petroleum and biofuels are ‘regulated parties’**
- **Providers of fuels that meet 2020 levels must ‘opt in’ to earn credits:**
 - **Electricity**
 - **Hydrogen**
 - **Natural Gas**

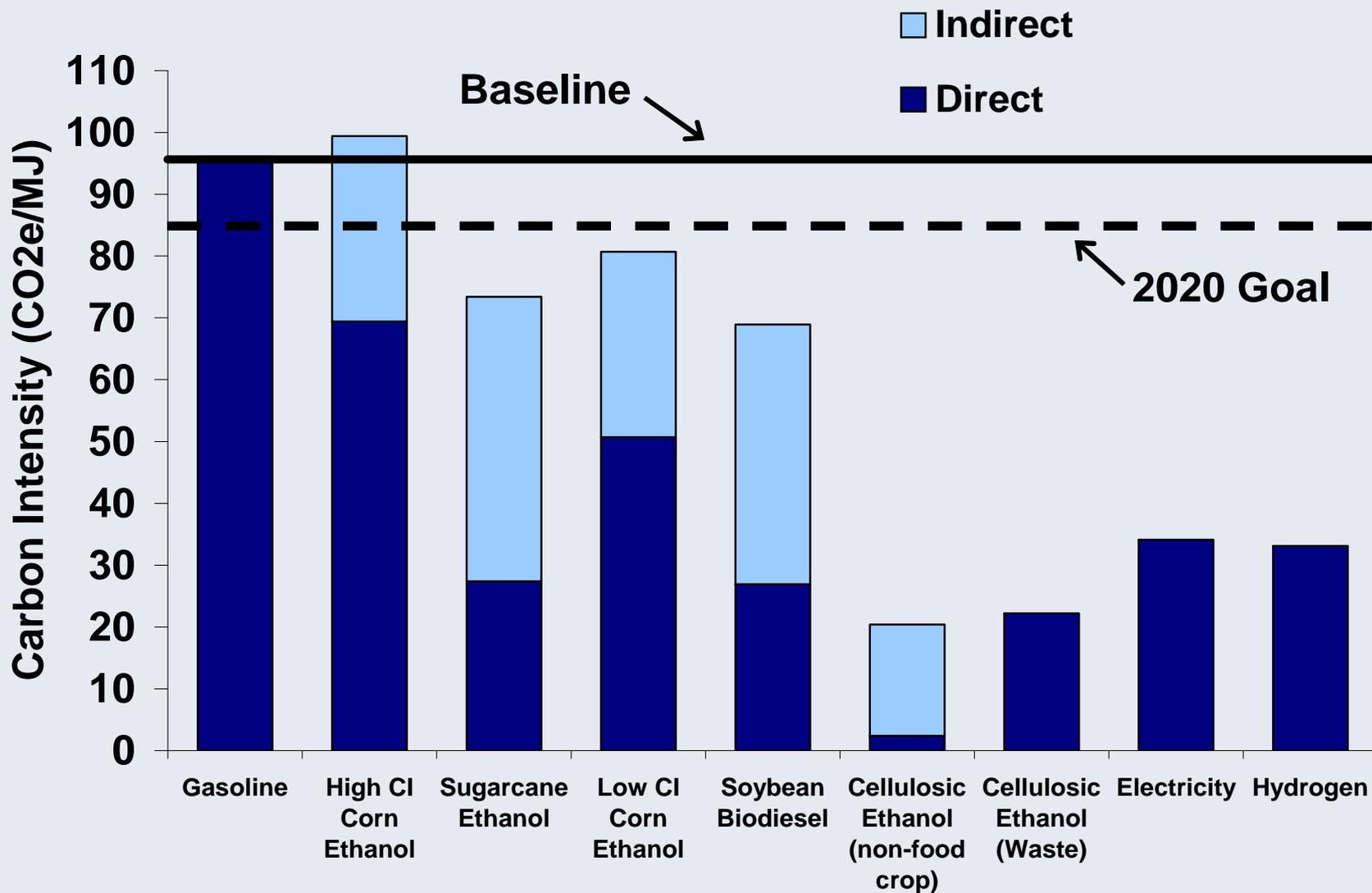
Flexible/Market-Driven Compliance

- **Supply a mix of fuels with carbon intensity equal to the standard**
- **Provide fuels that have lower carbon intensity than the standard**
- **Use purchased or banked credits to meet the standard**

Impact on Fuels

- **Increase use of:**
 - Low carbon corn or sugarcane ethanol
 - Cellulosic biofuels
 - Biofuels from waste materials
 - Renewable diesel and biodiesel
 - Electricity, hydrogen, renewable natural gas
 - Digester gas and landfill gas piped to vehicle users
- **And decrease the use of:**
 - Petroleum
 - High carbon biofuels

Carbon Intensity of Tomorrow's Fuels

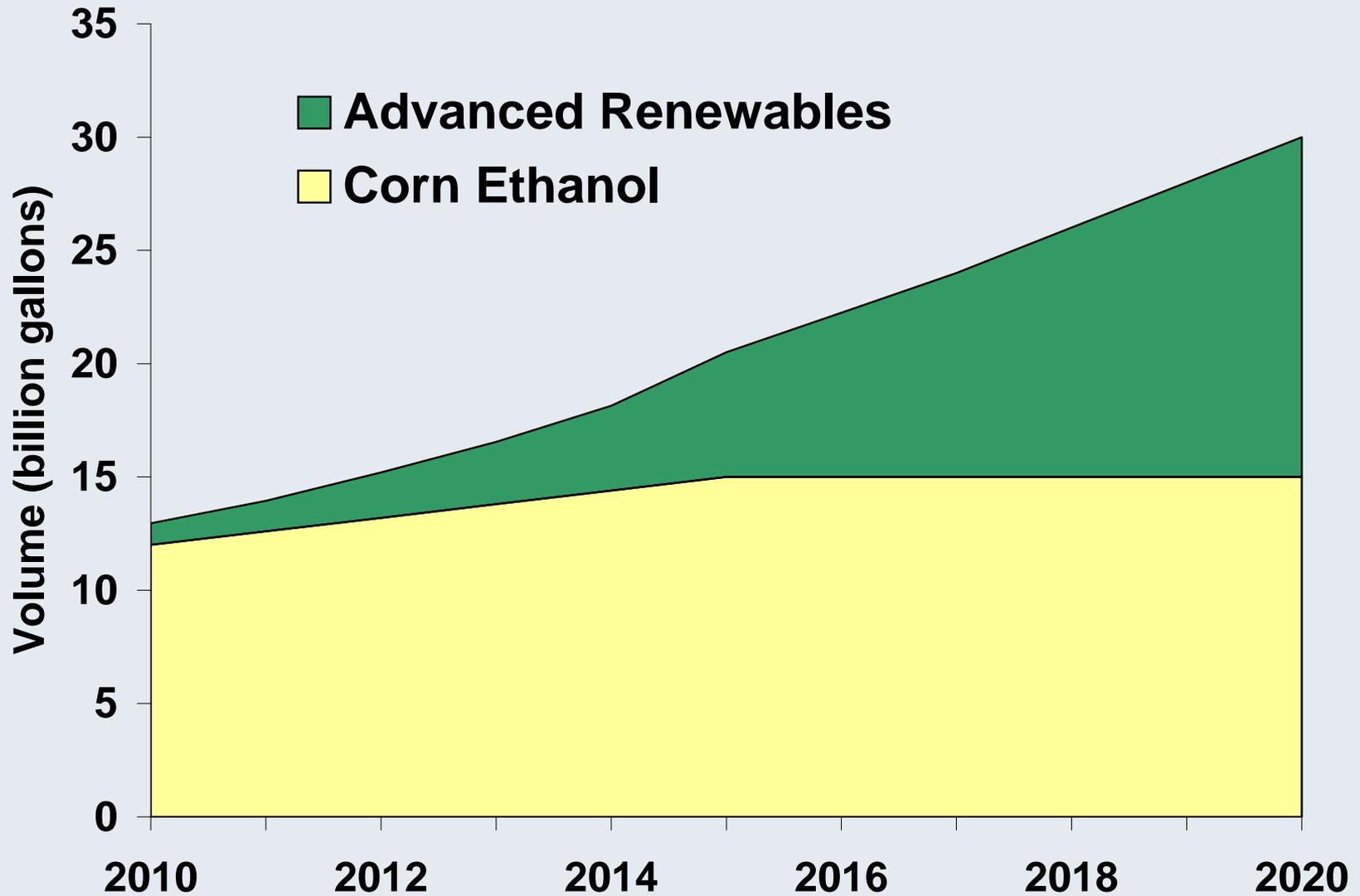


Comparison LCFS to Federal Requirements

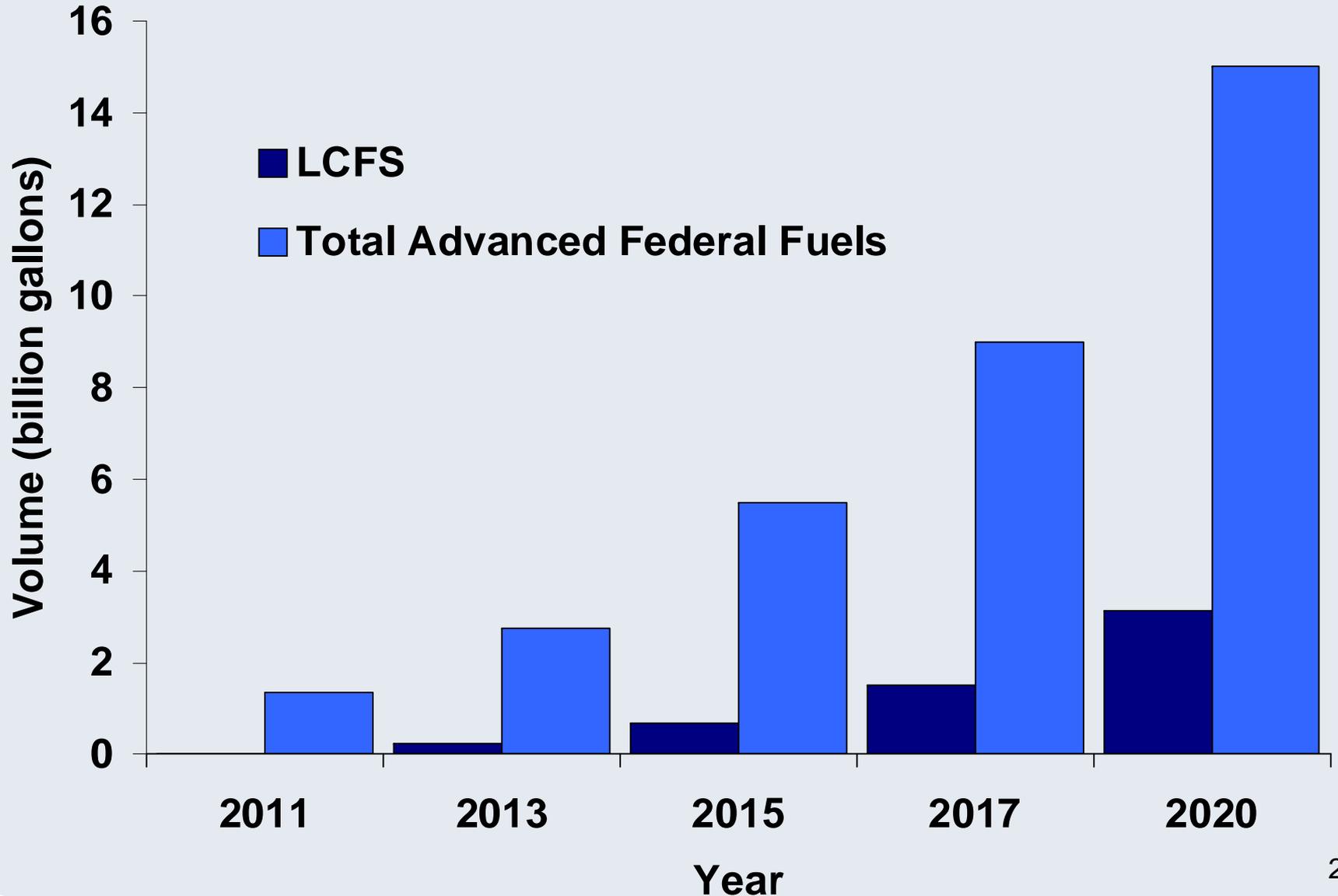
Federal Renewable Fuels Standard

- **Mandates volumes of biofuels with less focus on carbon intensity**
 - **Existing corn ethanol, no improvement**
 - **New corn facilities, 20% reduction**
 - **Other biofuels, at least 50% reduction**
 - **Cellulosic biofuels, 60% reduction**
- **Reduces GHGs nationwide by 3 percent**

Federal Fuel Volumes



Advanced Biofuel Volumes - RFS vs. LCFS



Builds Upon and Improves the RFS

- **All fuels treated the same; no exemptions for existing corn ethanol**
- **Performance-based vs. volume mandates**
- **More market incentives**
- **Includes non-liquid fuels**
- **Three times the GHG reduction benefits**

Next Steps

Additional Work Underway

- **Guidelines for developing fuel pathways**
- **Workplan for sustainability**
- **“Best Practices” guidance document for siting of new facilities**
- **List of biofuels with no land use change**
- **Prioritized list of additional fuel pathways**

Working with Stakeholders

- **Expert workgroup regarding land use change quantification method**
- **Informal carbon intensity screening process for new or modified fuel pathways**
- **Specs and multimedia evaluation of biodiesel and renewable diesel**
- **Participate in environmental review of specific projects**
- **Continue collaborations with other agencies, states, and nations**

Summary

Summary

The Low Carbon Fuel Standard:

- **Reduces emissions from transportation fuels by 10%**
- **Requires much greater investments in alternative fuels by entities that supply petroleum**
- **Will incent a large expansion in the use of biofuels:**
 - **New biofuels that are much better than today's corn ethanol will be greatly incented by the LCFS**
 - **Traditional biofuels with relatively high lifecycle GHG emissions will need to improve to compete**
- **Complements federal renewable fuel program, but achieves three times the environmental benefit**

**Additional
Information on
Lifecycle Analysis**

Lifecycle Analysis Basis for LCFS

- **Lifecycle analysis considers the GHG emissions from all facets of fuel production, distribution, and use**
- **Governor's EO directed that ARB consider lifecycle analysis**
- **UC reports confirmed that LCFS needs to be based on lifecycle analysis**

Fuel Lifecycle – Gasoline

7
g/MJ

Oil Well



1 g/MJ

Transportation



14 g/MJ

Refinery



1 g/MJ

Transportation



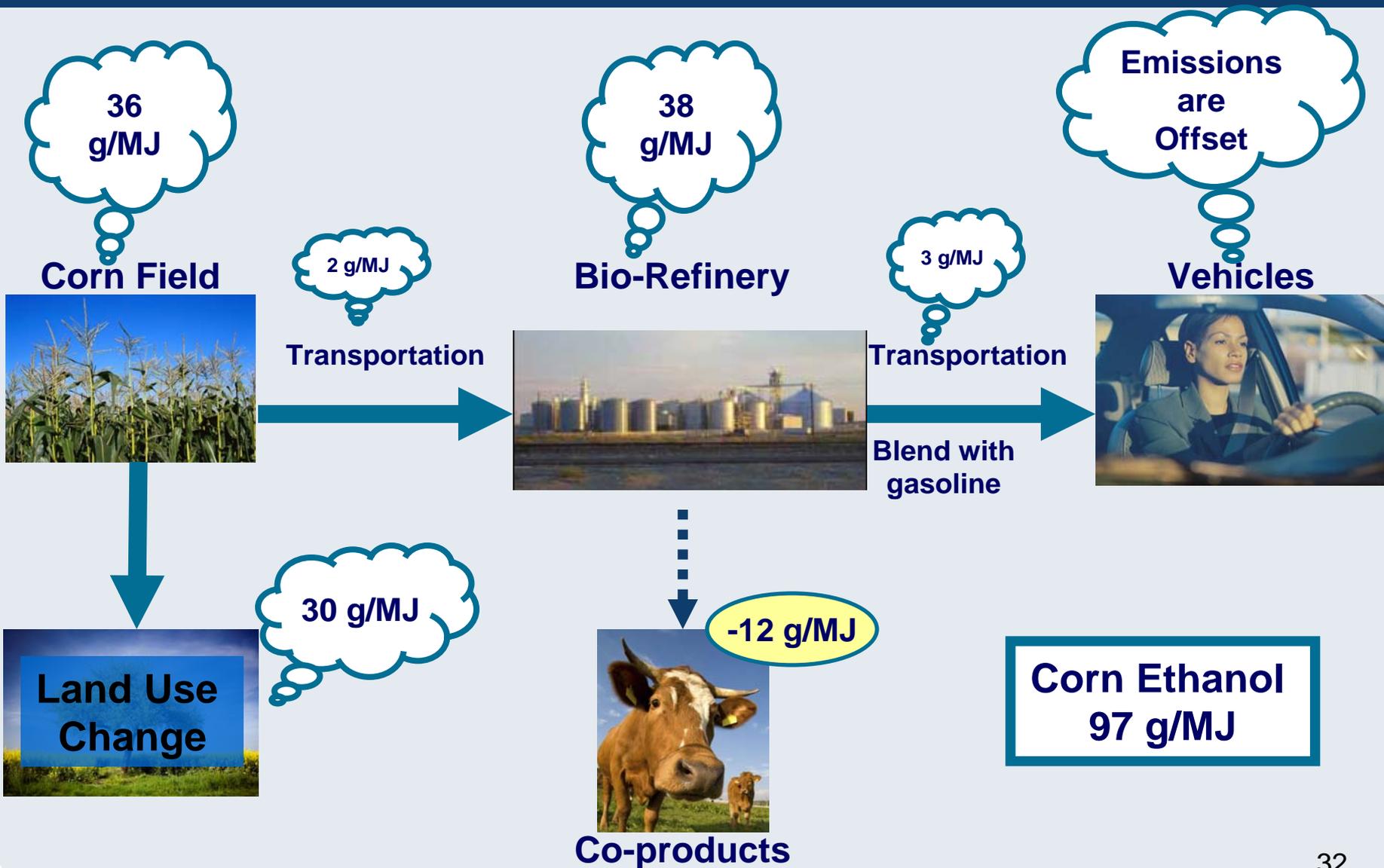
73 g/MJ

Vehicle



Gasoline
96 g/MJ

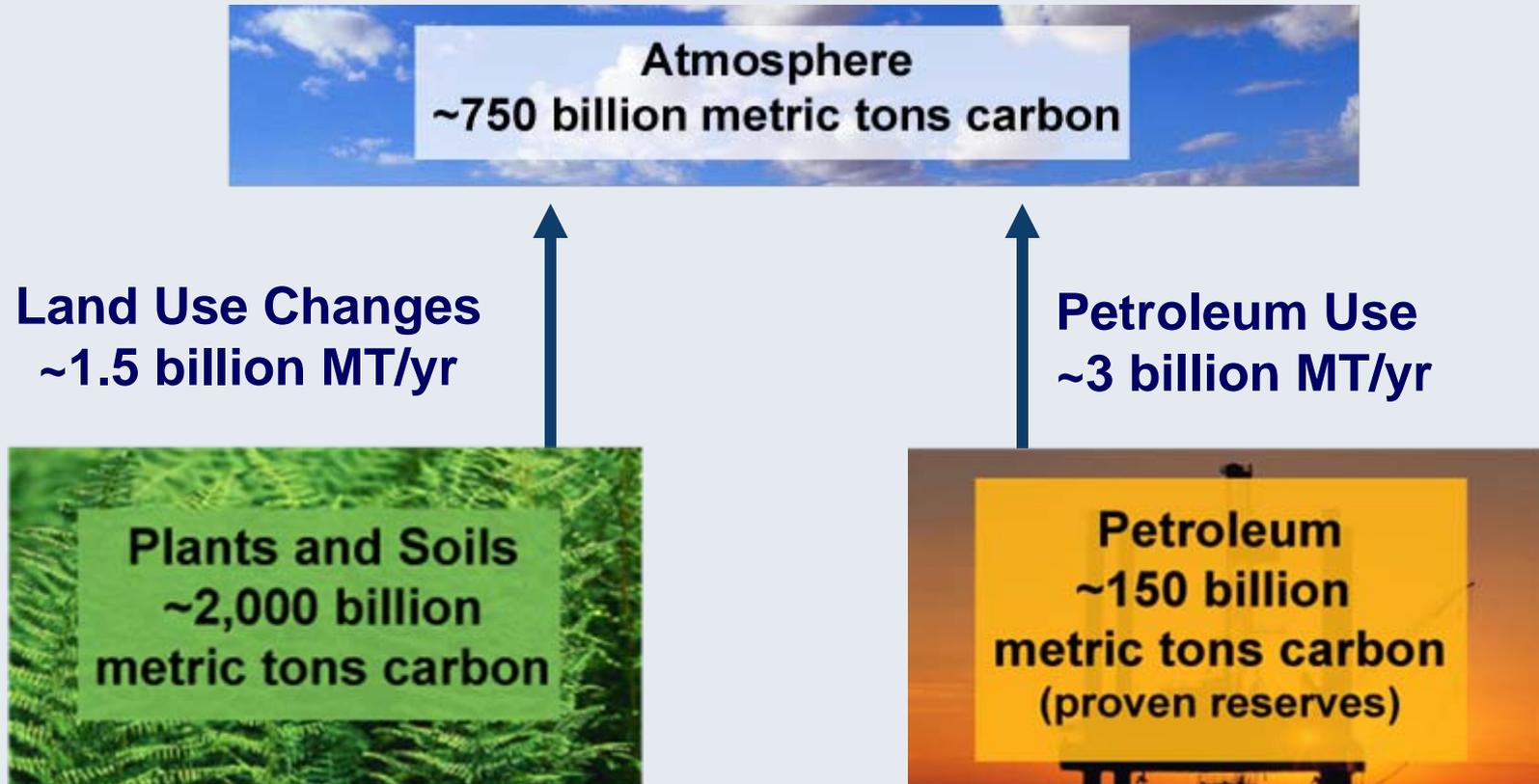
Fuel Lifecycle – Corn Ethanol



Land Conversions Release Carbon

Plants and soil store large amounts of carbon which is released during land conversion

Carbon Storage and Emissions



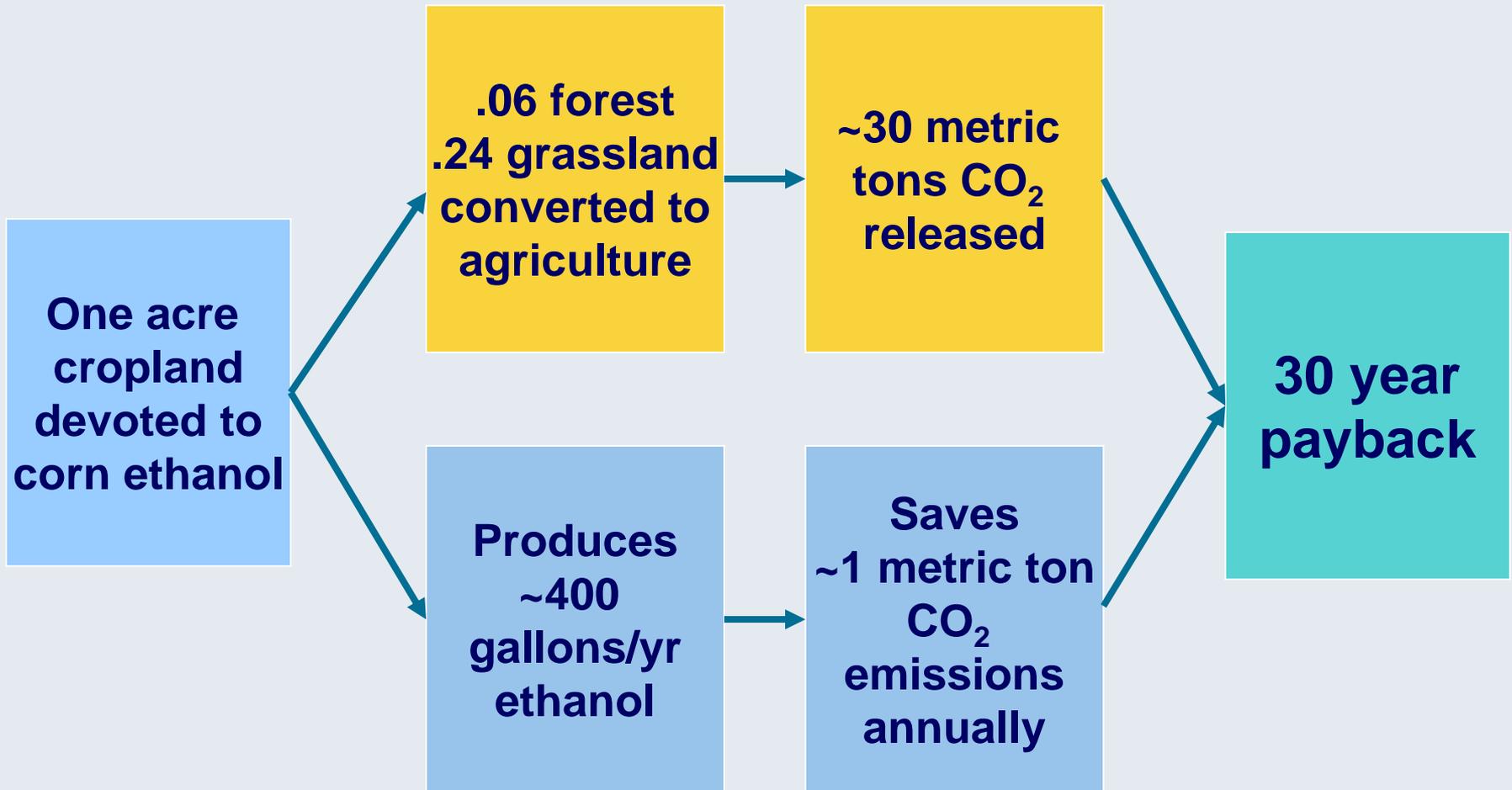
Plants and soils contain approximately 15 times the carbon in proven oil reserves.

Biofuels Affect the Carbon Cycle

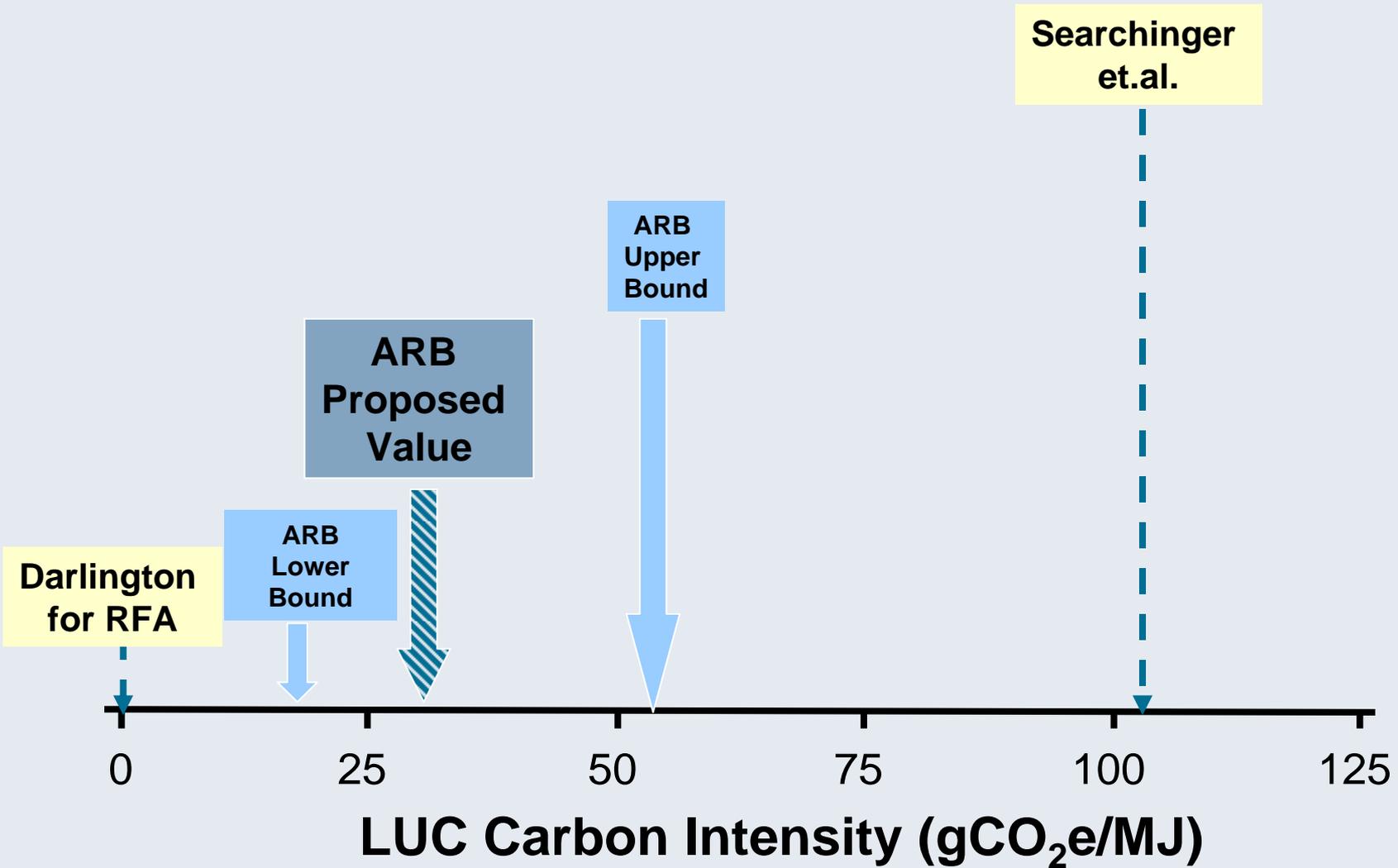
Current biofuels take decades before there is a net GHG benefit

Time to Payback

Land Use Change Emissions



Range of LUC Carbon Intensity Values for Corn Ethanol



Lifecycle Analysis Summary

- **Key to identifying & transitioning to low carbon fuels**
- **Must include all significant effects, including land use changes**
- **ARB used best available science to estimate land use changes**
- **Refine analysis through expert workgroup**