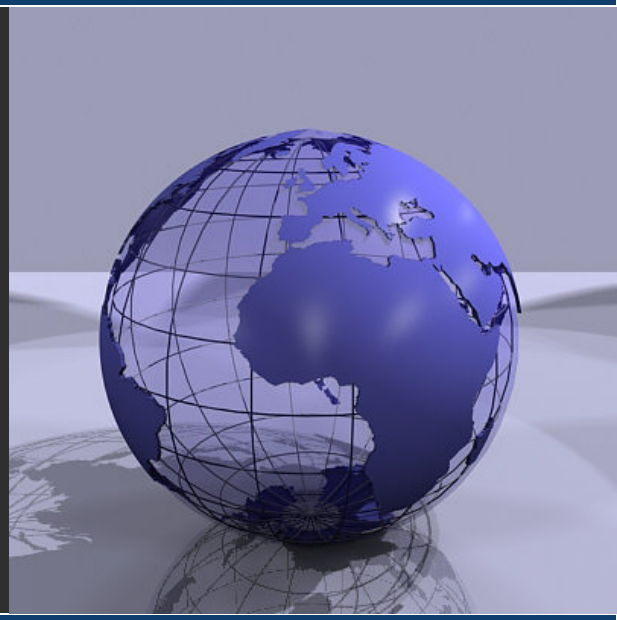
The California Low Carbon Fuel Standard

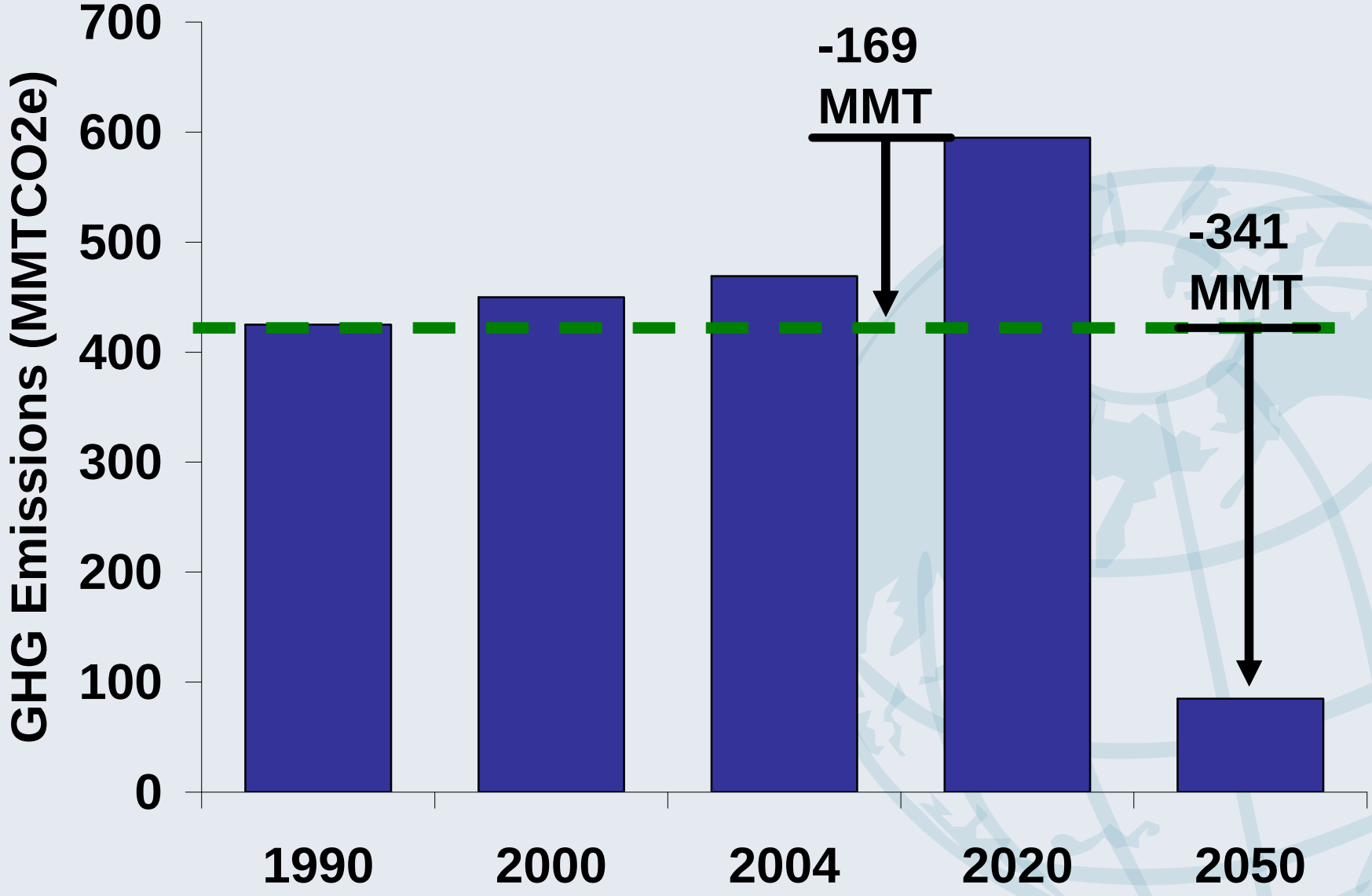


John D. Courtis

August 10-12, 2009

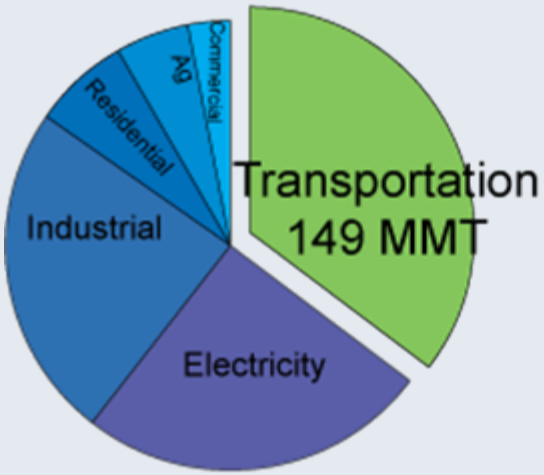
Why LCFS

Large GHG Reductions Required to Meet 2020 Target and 2050 Goal



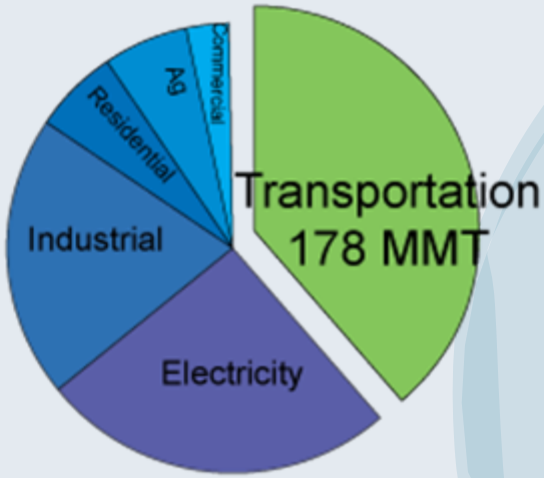
Transportation Emissions are Large and Increasing

1990



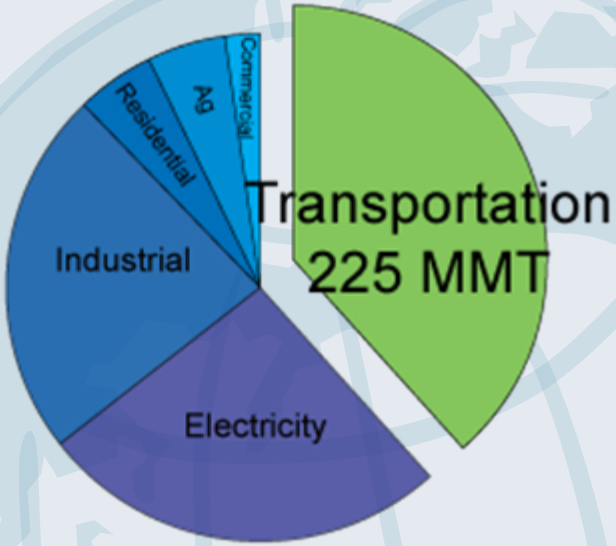
~425 MMT

2004



~469 MMT

2020



~595 MMT

LCFS Framework

- **Governor Schwarzenegger established the LCFS in January 2007**
- **UC completed analysis for LCFS feasibility in 2007**
- **ARB identified LCFS as AB 32 discrete early action measure in June 2007**
- **Board approved LCFS on April 2009**
- **Final adoption LCFS on December 2009**

Overview

- **Regulatory requirements**
- **Importance of lifecycle analysis and results**
- **Economic impacts**
- **Current activities**

LCFS Requirements

Regulated Parties

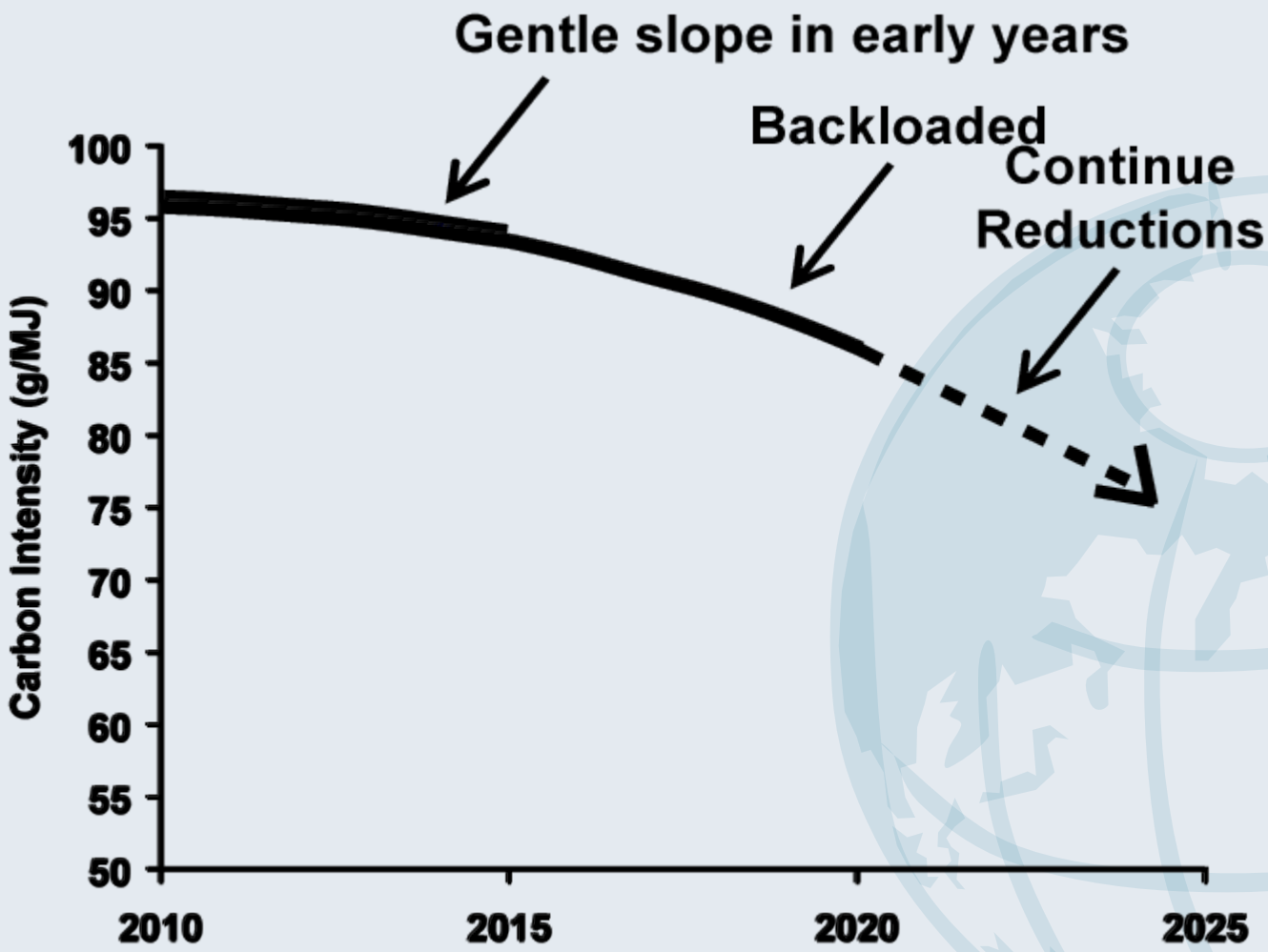
- **Petroleum and biofuels providers are the ‘regulated parties’**

- **Providers of other fuels that meet 2020 or earlier levels must ‘opt in’ to earn credits:**
  - **Electricity**
  - **Hydrogen**
  - **Natural Gas**

LCFS Standards

- **Require a 10 percent reduction in fuel carbon intensity(CI) by 2020; baseline 2010**
  - **Apply to fuel (fossil+biofuel) mix**
  - **Separate standards for gasoline and diesel**
- **ARB has established CI values for most fuels and will establish CI values for other potential fuels.**

The LCFS Compliance Schedule



Compliance and Enforcement Requirements

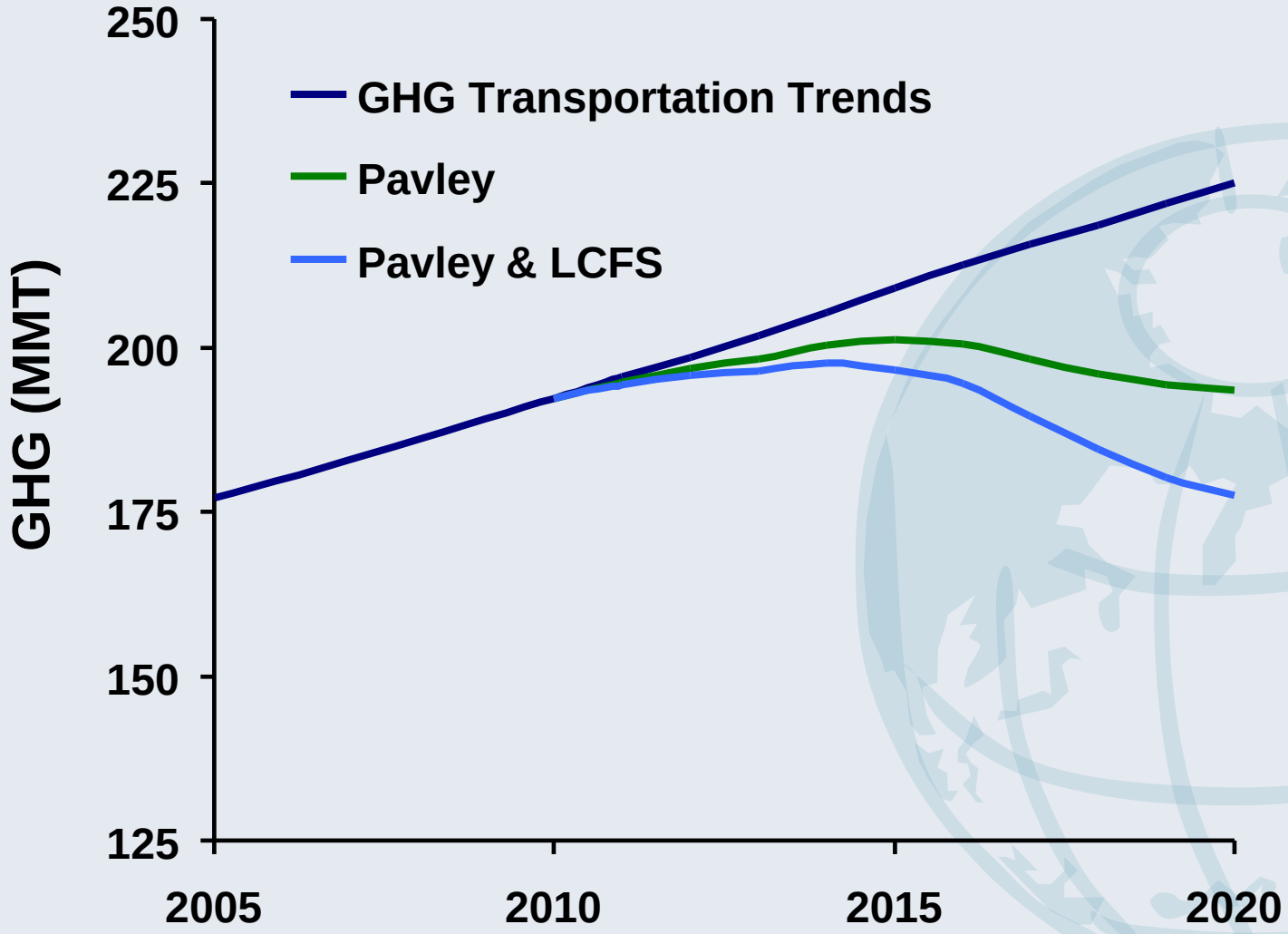
- **Regulated parties required to report quarterly and annually**
- **Enforcement includes records review, field inspections, and audits and penalties**
- **ARB is developing a software tool for fuel carbon reporting and credit tracking**

LCFS Flexibility: Market-Driven Compliance

- **Supply a mix of fuels with average carbon intensity(over a year) equal to the standard**
- **Allows purchased or banked credits to be used to meet the standard**
- **Allows companies to generate their own CI values (certain criteria must be met)**

LCFS Benefits

Benefits: Pavley and LCFS Reverse GHG Trend



LCFS: Benefits

- **Reduces GHG in California by 16 MMT in 2020; total GHG benefits 23 MMT**
- **No significant adverse impacts**
- **Co-Benefits: Potential reductions in criteria pollutants with advance vehicles**
- **Encourages technology innovation and sets stage for future GHG reduction**

LCFS: Impact on Fuels

- **Increase use of:**
  - **Low carbon corn or sugarcane ethanol**
  - **Cellulosic ethanol**
  - **Renewable diesel and biodiesel**
  - **Electricity, hydrogen, natural gas**

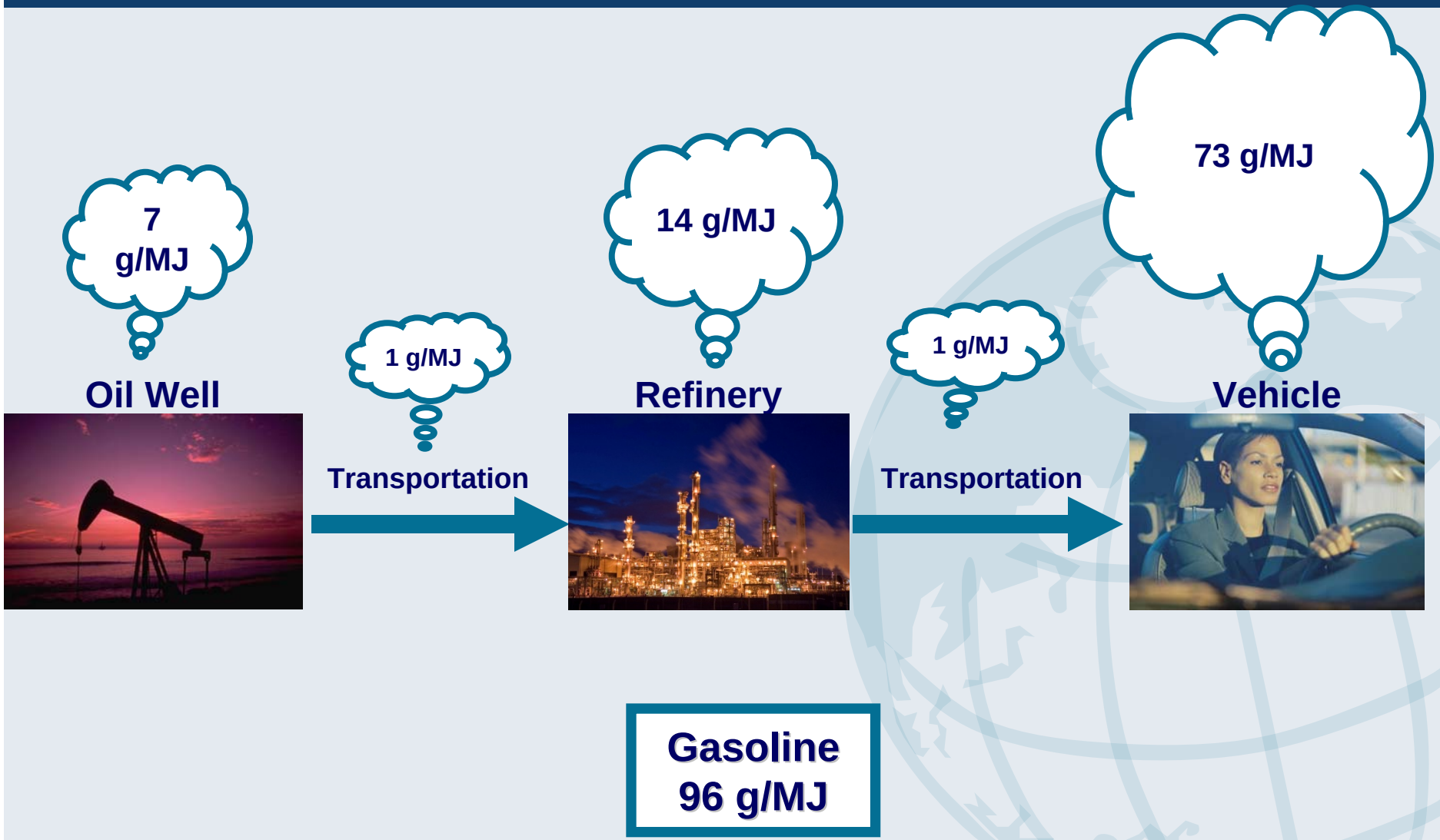
- **And decrease the use of:**
  - **Petroleum**
  - **High carbon biofuels**

Importance of Lifecycle Analysis

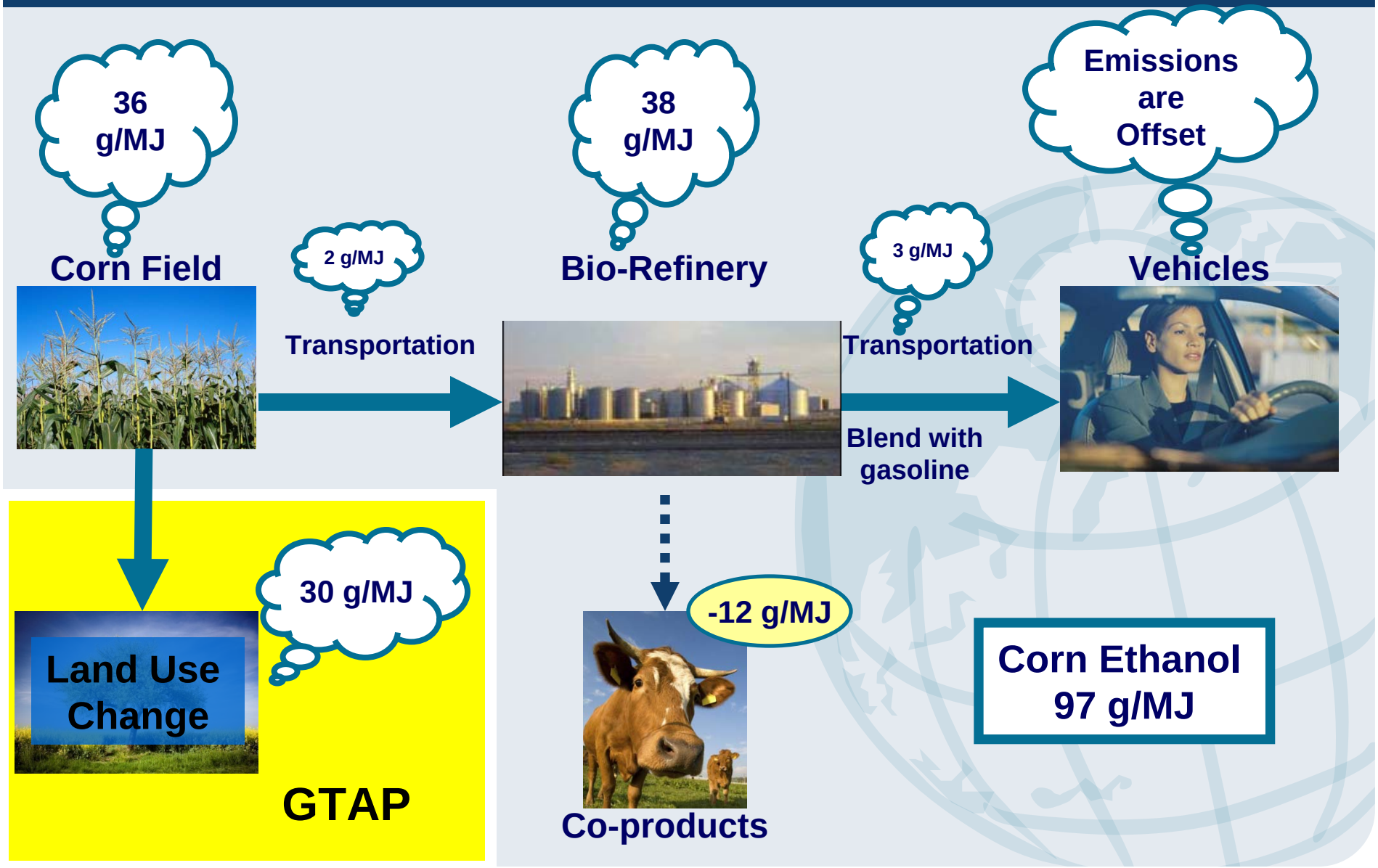
Estimating CI for LCFS

- **Use lifecycle analysis for GHG emissions from all facets of fuel production, distribution, and use**
- **Selected methodological approach:**
  - **Part 1: Direct effects**
    - **Use CA GREET**
  - **Part 2: Land Use Change effects (or iLUC)**
    - **Use GTAP for estimating effects of land use change**

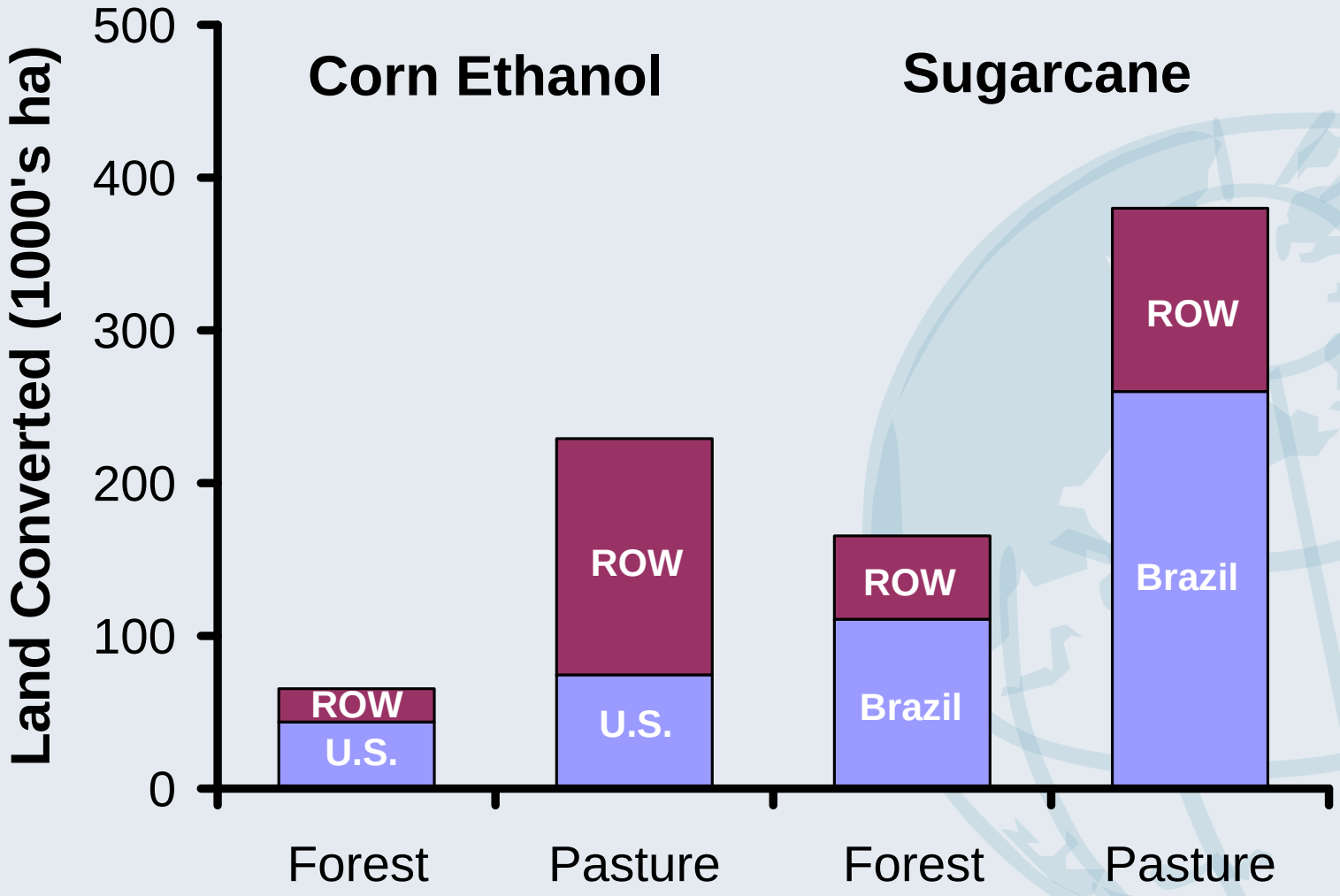
Gasoline: Direct Effects (CA GREET)



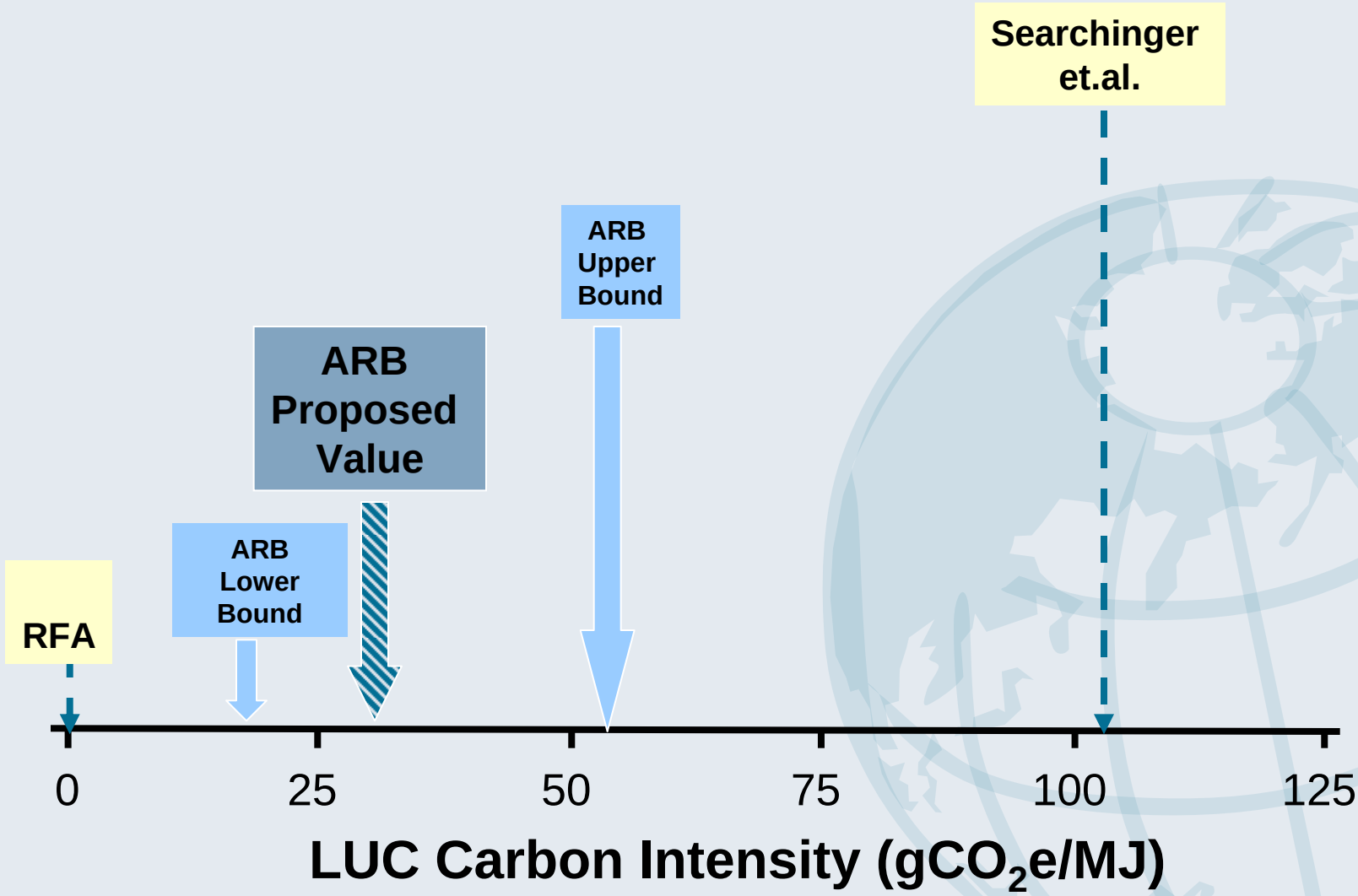
Corn Ethanol: Direct and LUC Effects (CA GREET+GTAP)



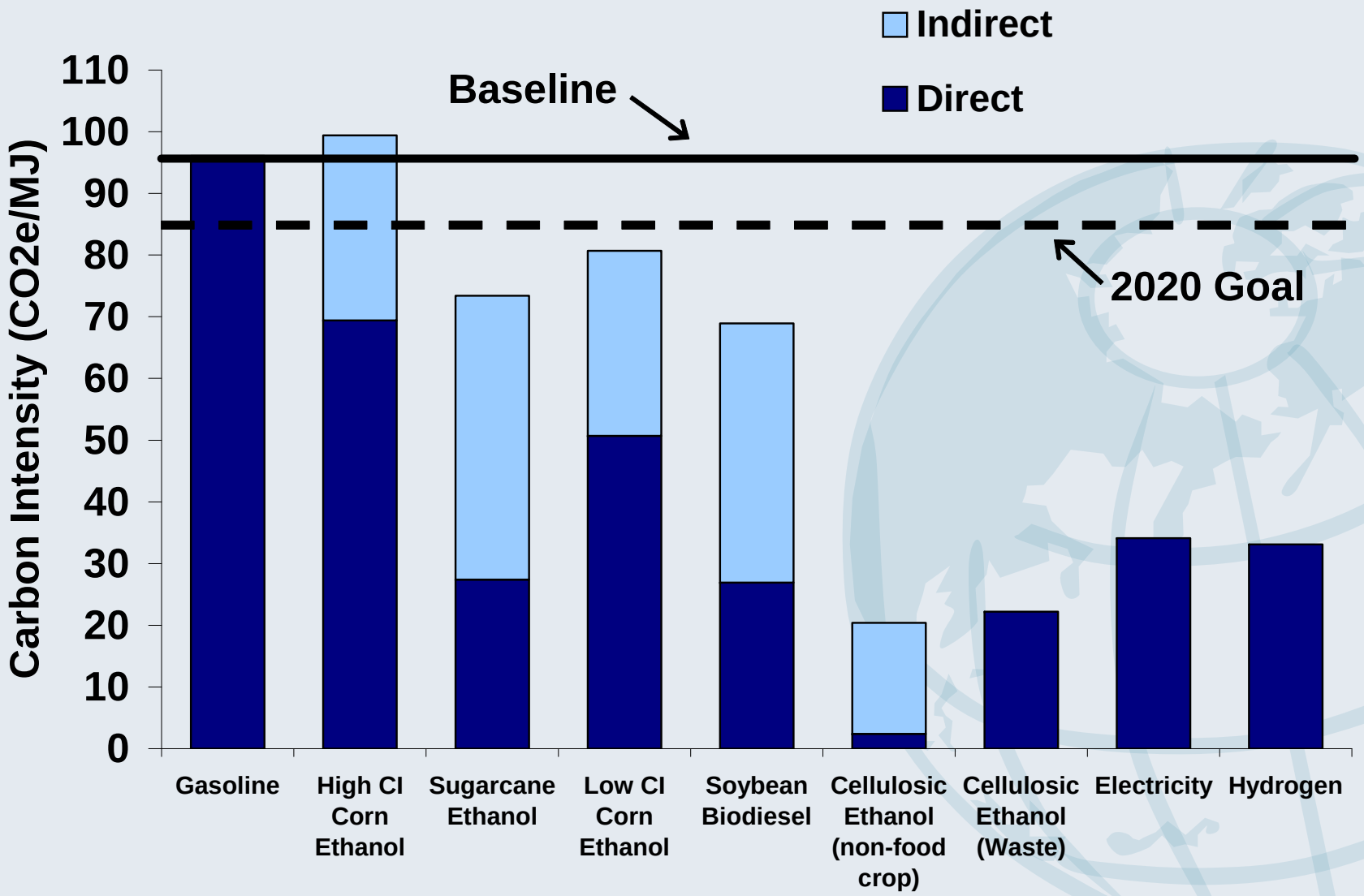
GTAP Results: Land Conversion (per Bgal biofuel production increase)



Range of LUC Carbon Intensity Values for Corn Ethanol



Carbon Intensity of Tomorrow's Fuels



Status of LUC Analysis

- **Completed LUC analysis for corn ethanol and Brazilian sugarcane ethanol**
- **Work in progress**
  - **Soy biodiesel: preliminary results Sept. 2009**
  - **Cellulosic ethanol: later this year**

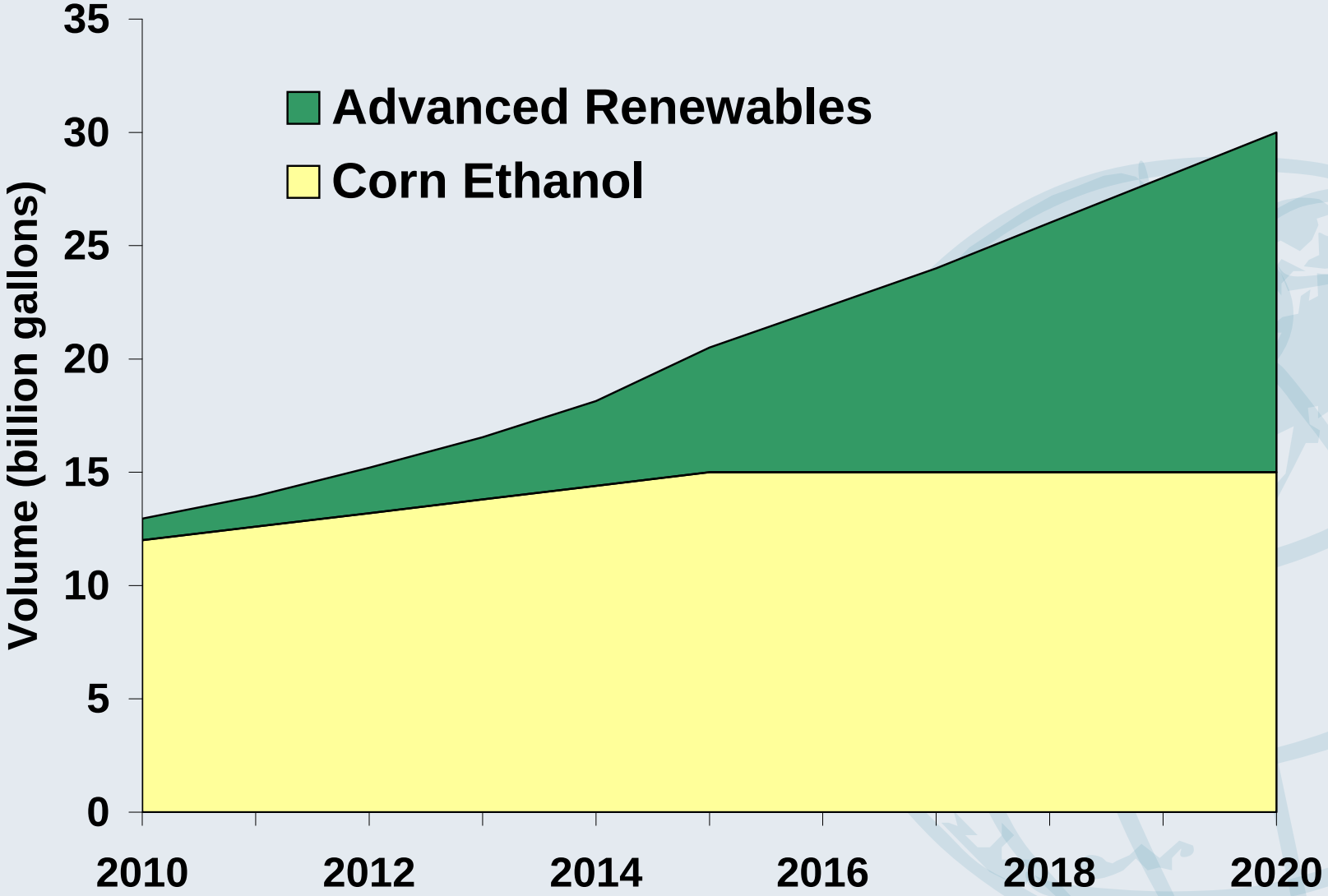
LCFS Treats All Fuels Fairly

- **Land use change contributes to carbon intensity of certain biofuels**
- **ARB have not identified any significant indirect effects from non-biofuels, though research is ongoing**
- **Open process; results and assumptions shared with stakeholders**

Economic Impacts

- **Cost-of-compliance basis**
- **Overall savings estimated for 2010-2020**
- **Impact dependent on crude prices and production costs of alternative fuels**
- **Recognized uncertainties could result in slight costs**

Federal Fuel Volumes



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**

LCFS
Current Activities

Current Activities

- **Finalize the regulation**
  - **Incorporate specific regulatory amendments**
    - **Applicability, definitions, reporting, credits & deficits, etc**
  - **Include additional fuel pathways**
    - **Brazilian sugarcane changes, LNG, digesters, LFG, etc**
  - **Workshops**
  - **Prepare FSOR and submit to OAL**
  - **Expected final approval-end 2009**
- **Develop Compliance and Reporting Tool**

Current Activities (cont.)

- **Prepare guidance document to streamline the approval process for new pathways**
- **Create an expert workgroup to refine and improve land use and indirect effects analysis (report to the Board by end 2009)**
  - **Land use effects of biofuels, indirect effects of other fuels, GREET issues, comparative modeling aproaches, etc**

Current Activities (cont.)

- **Evaluate electric vehicle issues in LCFS**
  - **Third party charging, alternatives to metering, credits for off-road (forklifts, etc.)**
- **Create best practices guidance for siting biorefineries**
- **Establish the details of LCFS credit trading program**
- **Workplan on sustainability**

Current Activities (cont.)

- **Coordinate with regional, national, and international groups**
- **Create an advisory panel; regulatory review 2012, 2015**

Summary

- **LCFS is on track**
  - **2010(reporting year), 2011 (compliance year)**
- **Very Optimistic**
  - **Significant interest from 1st generation biofuel producers to improve CI**
  - **Working with 2nd,3rd generation biofuel producers to define CI for new fuel pathways**