

California Environmental Protection Agency



**Air Resources Board**

# **Low Carbon Fuel Standard (LCFS) Update**

## **2015 CRC LCA of Transportation Fuels Workshop**

**Anil Prabhu  
October 27-28, 2015**

# *Overview of Presentation*

- Background of the LCFS in California
- Updates approved by the Board in 2015
- Pathway re-certification and new application processing
- 2015 - 2020 considerations for the LCFS

# *LCFS History*

- Original adoption in 2009, amended in 2011
- Goal: Reduce carbon intensity (CI) of transportation fuel pool in CA by at least 10% by 2020
- Expected benefits:
  - Complement other measures to reduce greenhouse gases (GHG) emissions to 1990 levels by 2020
  - Transform and diversify fuel pool and reduce petroleum dependency
  - Reduce emissions of other air pollutants

# *LCFS is Part of a Portfolio of GHG Policies*

- Transportation sector responsible for:
  - 40% of GHG emissions
  - 80% NOx emissions
  - 95% PM emissions
- LCFS works with the following programs to reduce transportation GHG emissions:
  - Cap-and-Trade Program
  - Advanced Clean Car Program
  - SB 375
- Key program to achieve Governor's GHG reduction goal by 2030

# *Others are Following California: Pacific Coast Collaborative Update*

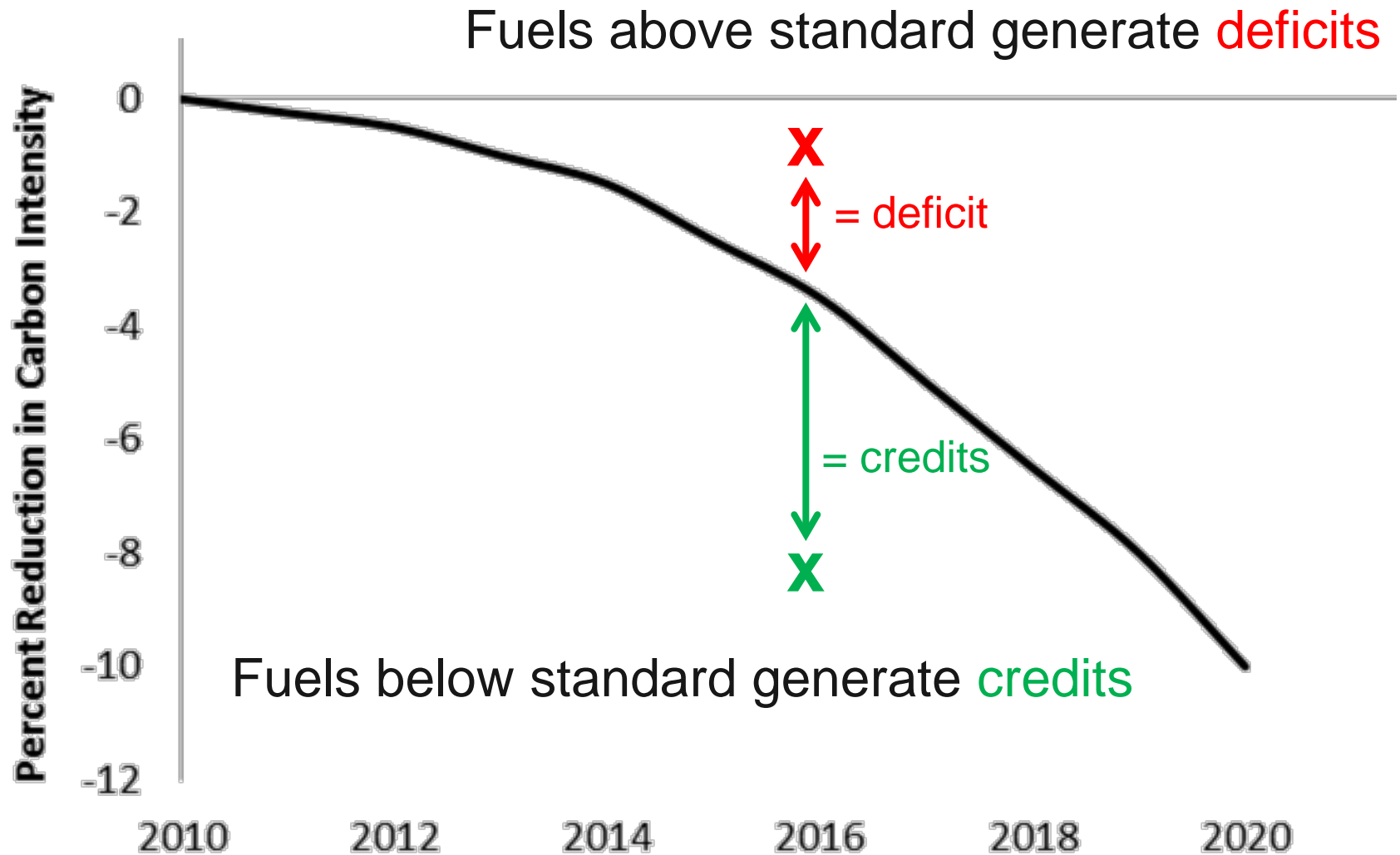


- **CA, OR, and BC:** Program in place
- **WA:** “Poison pill” prevented action

# *Basic LCFS Requirements*

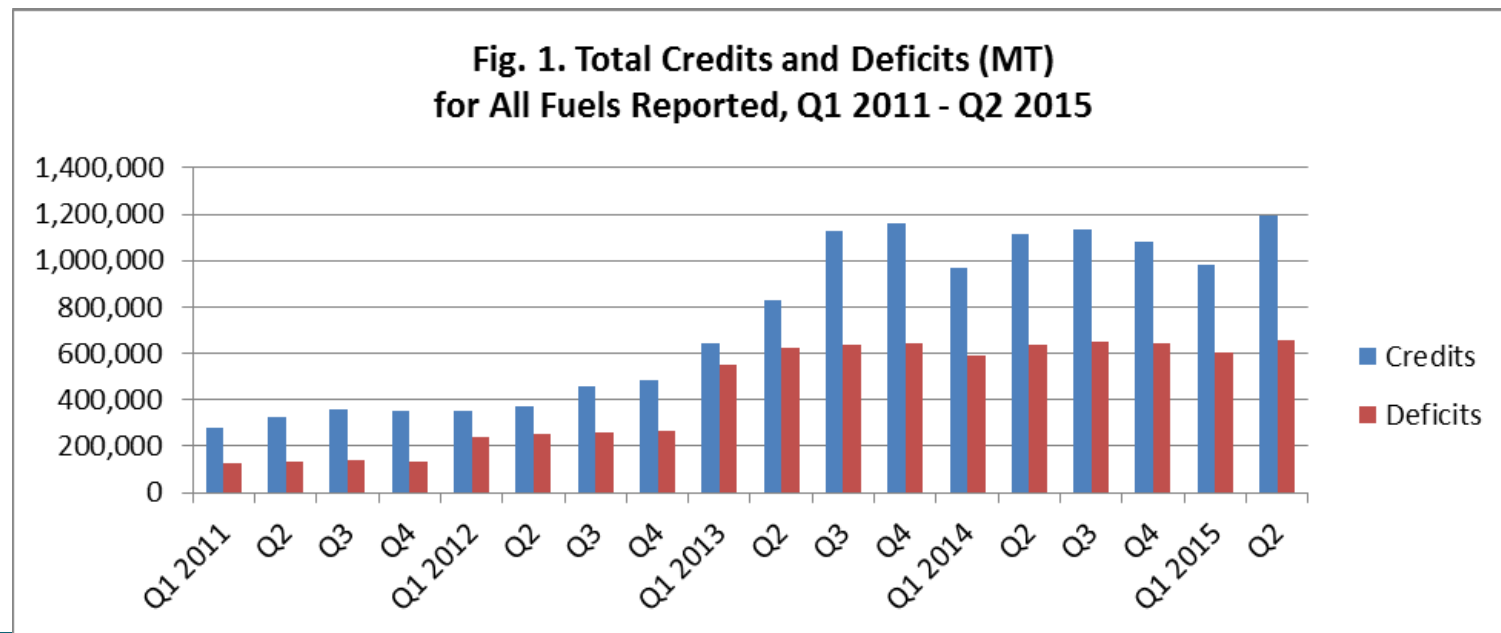
- Sets annual carbon intensity (CI) standards for gasoline, diesel, and the fuels that replace them
- CI is the measure of GHG emissions associated with producing and consuming a fuel, which is measured in grams of carbon dioxide equivalent per megajoule (gCO<sub>2</sub>e/MJ)
- CI based on Well-to-Wheel lifecycle analysis of transportation fuels used in California

# Declining Carbon Intensity Curve: Concept



# *The LCFS is Working*

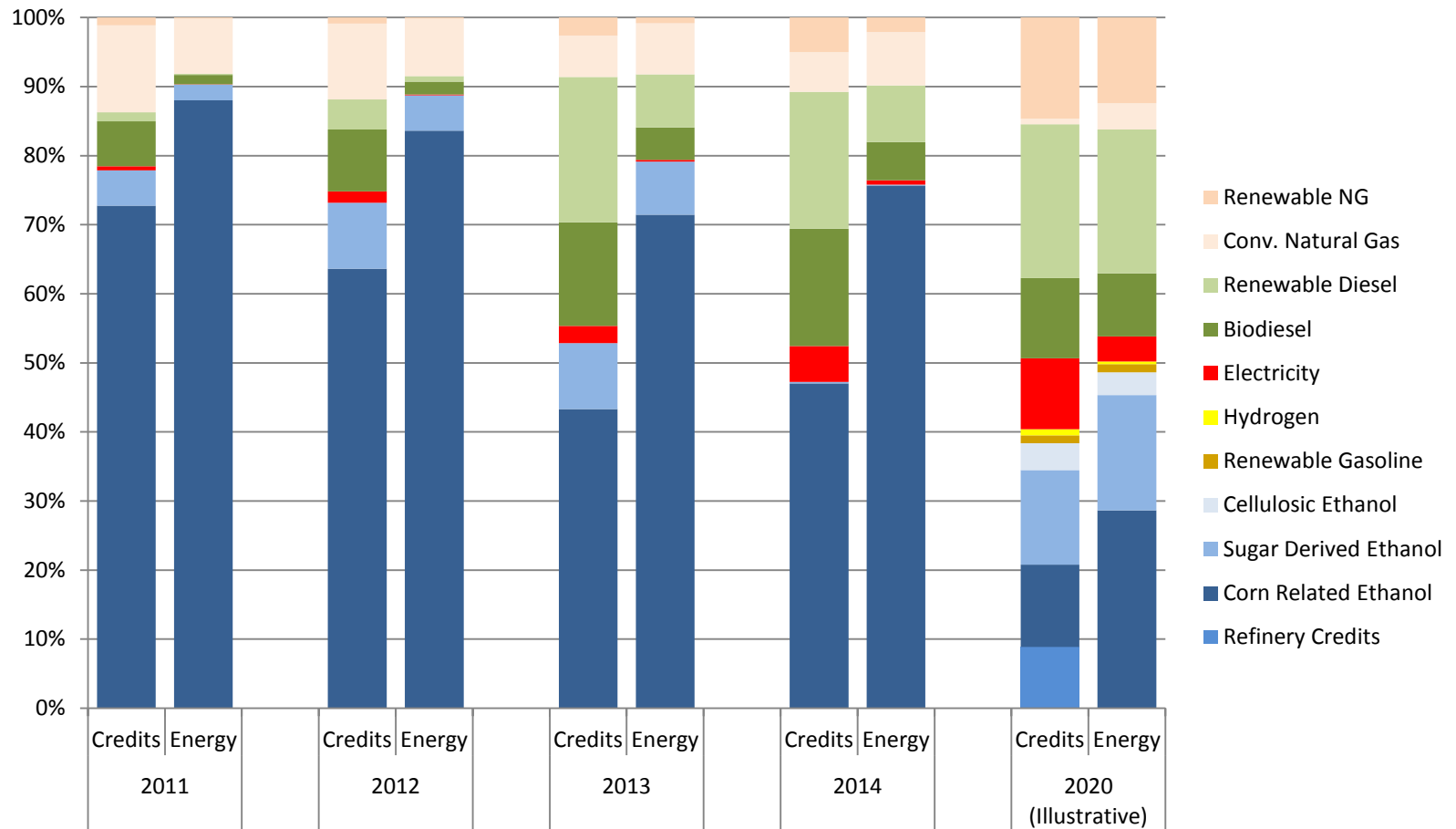
- Low carbon fuel use is increasing
- Regulated parties are engaged in transactions in the credit market, price has rebounded recently
- Credits have exceeded deficits in all quarters and a significant credit bank has been built





# Low Carbon Fuel Diversity Continues to Increase

Shift in Alternative Fuels from 2011 through 2014 in  
Comparison to 2020 Illustrative Scenario



## ***Details of Re-adoption***

# Summary of Re-Adoption



## Core Concepts Remain Unchanged

- Use of lifecycle analysis including indirect land use change (ILUC) effects
- Declining carbon intensity (CI) targets through 2020
- Credit generation and trading
- Quarterly and annual reporting requirements

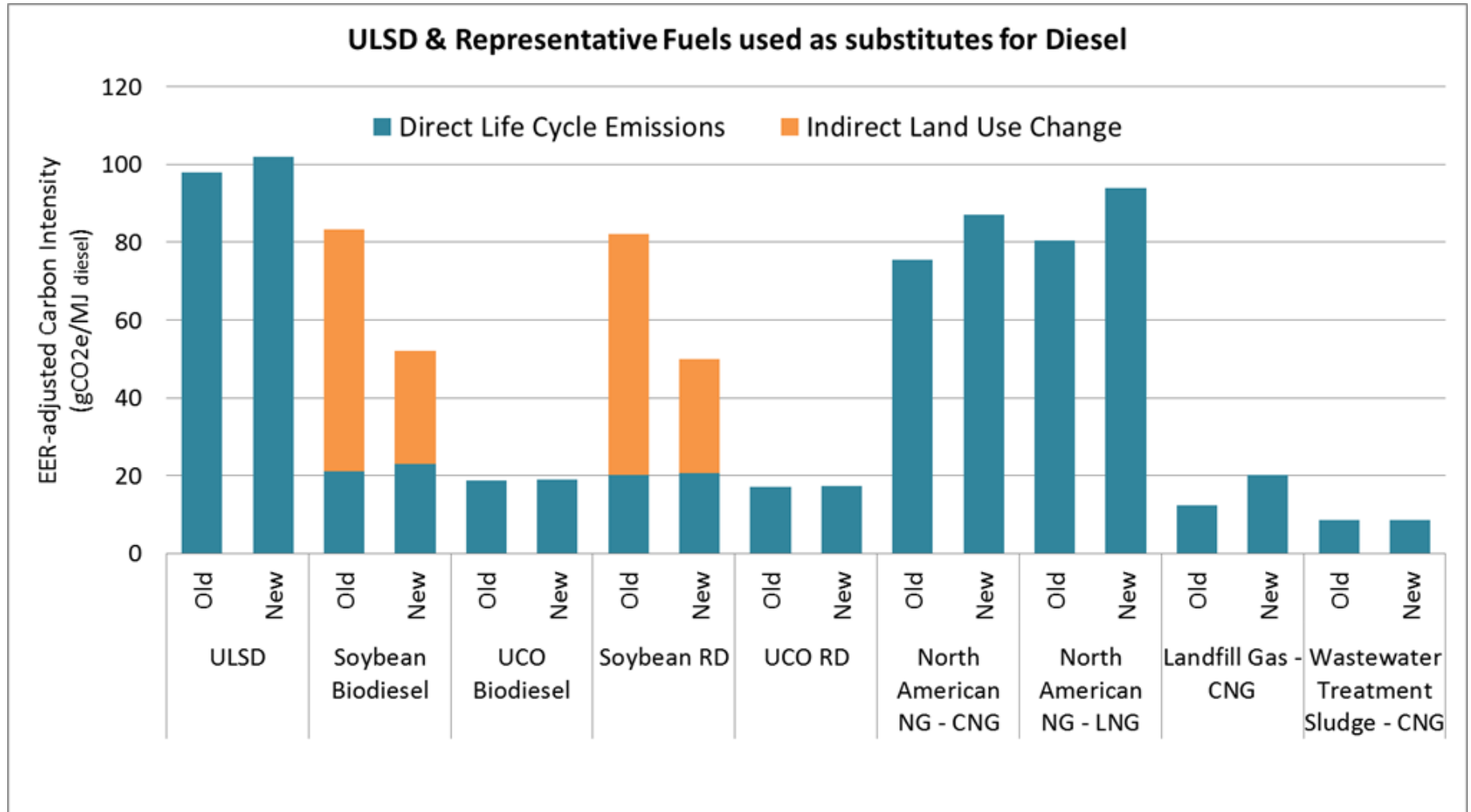
## Key Areas of Proposed Improvement

- CI calculation tools updated using latest science
- 2016-2020 targets adjusted
- Adding additional cost containment
- Streamlining implementation

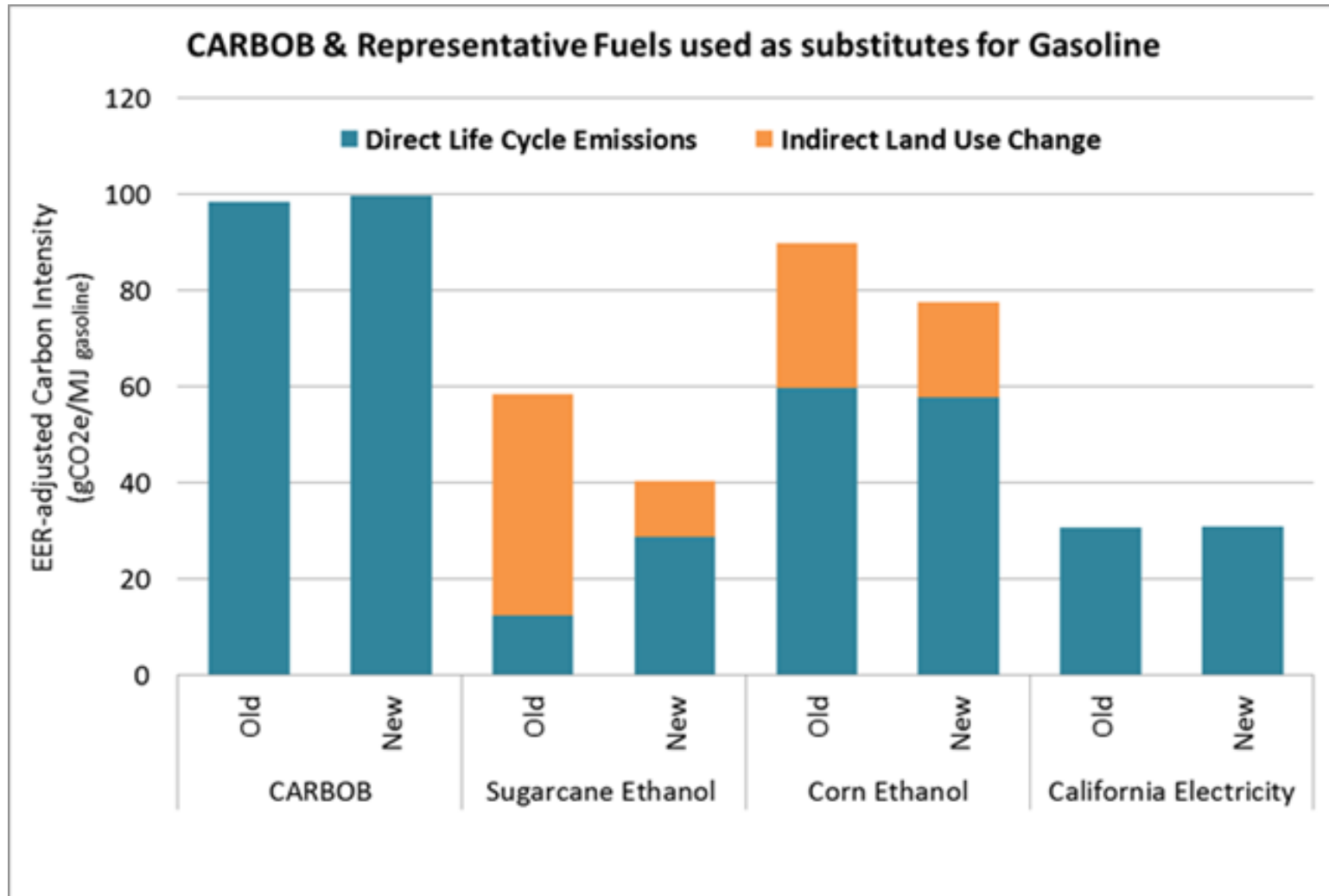
# *Carbon Intensity: Improving the Science*

- All tools were updated to provide an updated assessment of lifecycle CI for all fuels
- Direct CI tools
  - CA-GREET: Direct carbon intensity of fuel production and use
  - OPGEE: Direct carbon intensity of crude production and transport to the refinery
- Indirect CI tools
  - GTAP: Indirect land use change
  - AEZ-EF: More accurately matches land conversions estimated by the GTAP model with corresponding carbon releases from soil and biomass

# CI Changes for Diesel Substitutes



# CI Changes for Gasoline Substitutes



# ***Proposed Compliance Curve Adjustments***

- Retain requirement to reduce average carbon intensity 10% by 2020
- Modify interim (2016-2019) requirements to address delayed investment due to legal challenges

<b>Year</b>	<b>Current Reduction Percent</b>	<b>Proposed Reduction Percent</b>
<b>2016</b>	3.5 percent	2.0 percent
<b>2017</b>	5.0 percent	3.5 percent
<b>2018</b>	6.5 percent	5.0 percent
<b>2019</b>	8.0 percent	7.5 percent
<b>2020 onwards</b>	10.0 percent	10.0 percent

# *Updated Cost Containment Features*

- Purpose:
  - Ensure that the LCFS achieves its GHG goals within a reasonable and predictable range of costs.
- Goals:
  - Provide a route for compliance and certainty that parties can comply even if a credit shortfall occurs
  - Strengthen incentives to invest in low-CI fuels
  - Increase certainty regarding the maximum cost of compliance
  - Prevent extreme market volatility
  - Ensure that willing credit generators can sell available credits

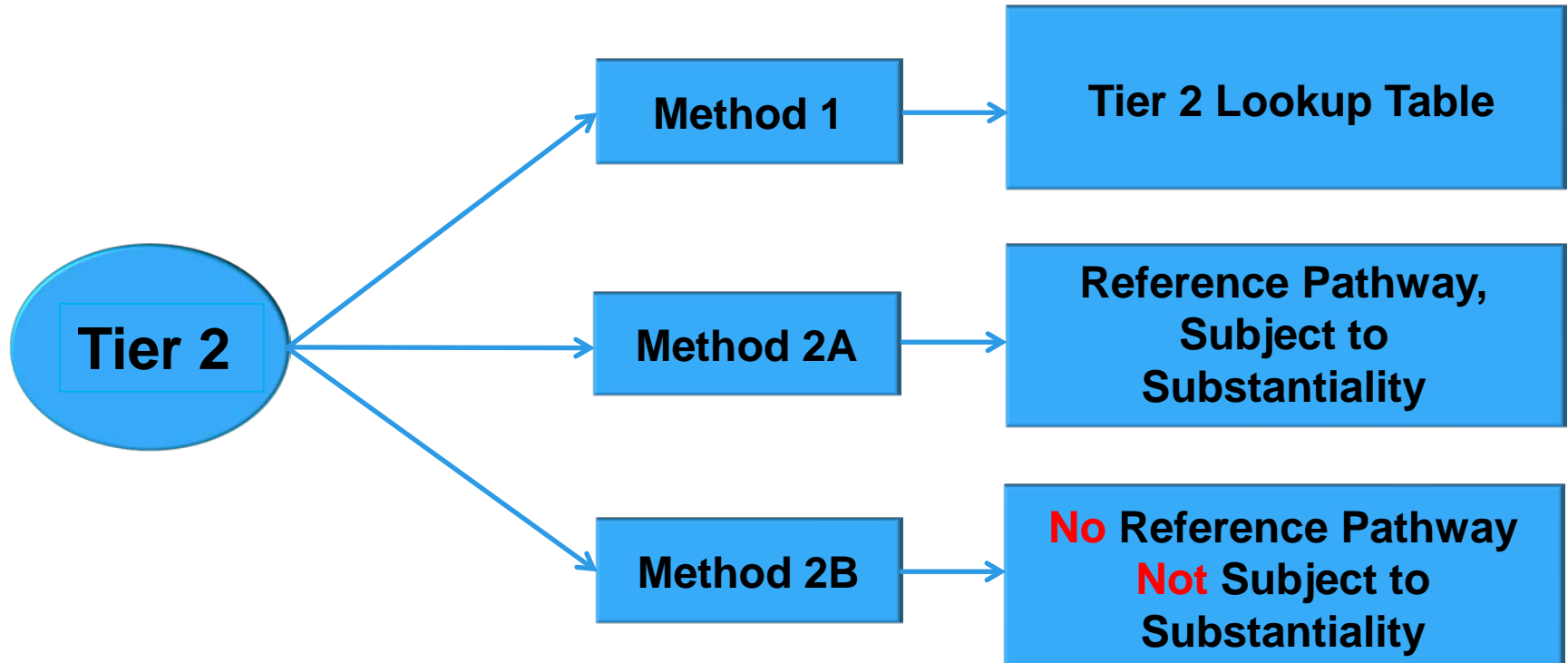


# *Re-certification and New Pathway Applications using CA-GREET 2.0*

# ***Tier 1 vs. Tier 2***

- Tier 1: for conventionally produced ***first-generation*** fuels (starch- and sugar-based ethanol, BD, RD, CNG, LNG)
- Tier 2: for ***next-generation*** fuels (cellulosic alcohols, hydrogen, drop-in fuels, etc.) or fuel production using innovative processes (could include conventional first-generation fuels)

# *Tier 2 Pathway Classifications*



# Potential Pathway Re-certifications

Pathway by Feedstock & Fuel	TIER 1	TIER 2
Corn Ethanol	81	31
Sugarcane-based Ethanol	50	16
Sorghum & Mixed Feedstock Ethanol	15	15
Cellulosic Ethanol	0	4
Biodiesel / Renewable Diesel	87	0
CNG / LNG	64	0
<b>TOTAL</b>	<b>297</b>	<b>66</b>

**Total of 363 pathways for potential re-certification**

# ***Audit and Verification: Concepts under Consideration***

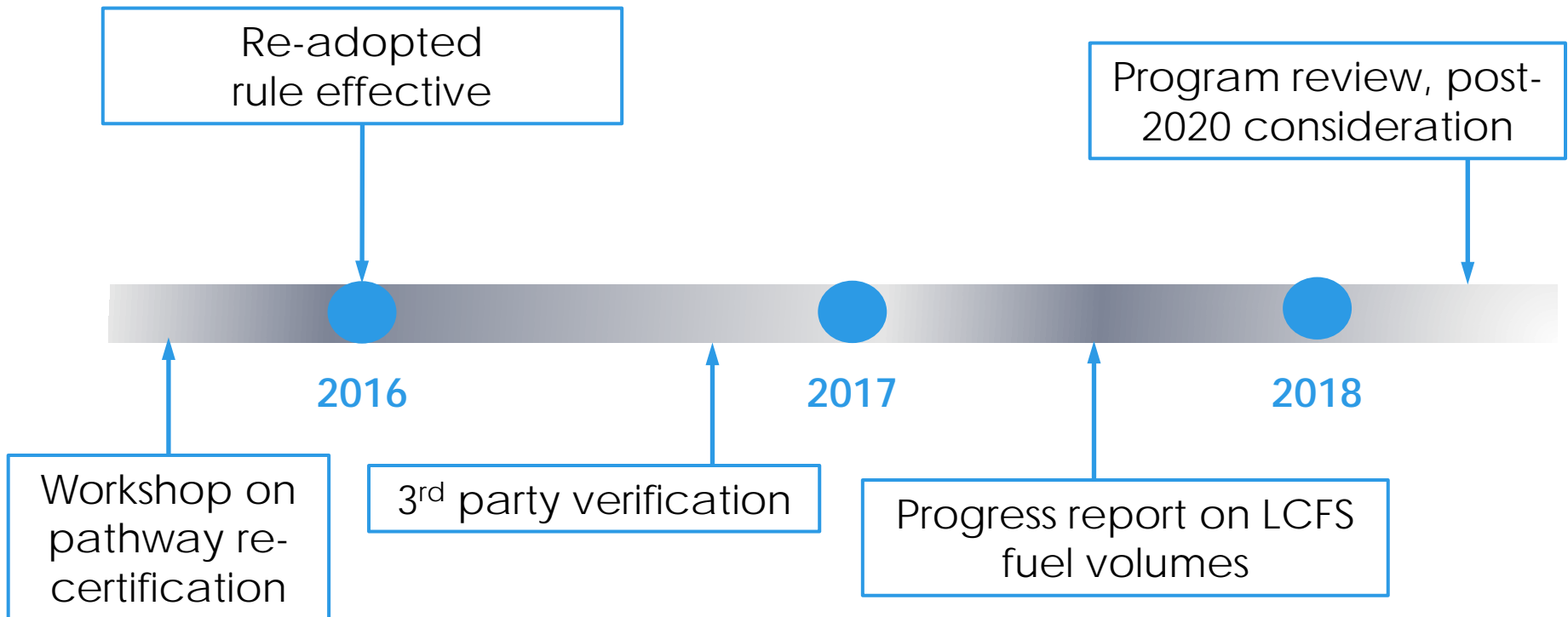
# *Verification Required for the LCFS?*

- Yes, identified need from LCFS implementation
- Ensures greater compliance
- Adds support to lifecycle GHG accountability
- Validates LCFS credits
- Protects LCFS credit market
- Strengthens integrity of LCFS

# ***Mandatory Reporting of GHG Emissions (MRR) under Cap and Trade***

- MRR was built and amended to support Cap and Trade
- Establishes an ARB accreditation program for individual verifiers and verification bodies
- Applies risk management approach
- Requires “reasonable assurance,” which means “a high degree of confidence that submitted data and statements are valid”
- Requirements for conflict of interest assessment

# 2015 - 2020 Considerations for the LCFS





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***Thank you. Questions?***