

California Environmental Protection Agency



Air Resources Board

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

**2015 CRC LCA of Transportation Fuels
Workshop**

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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

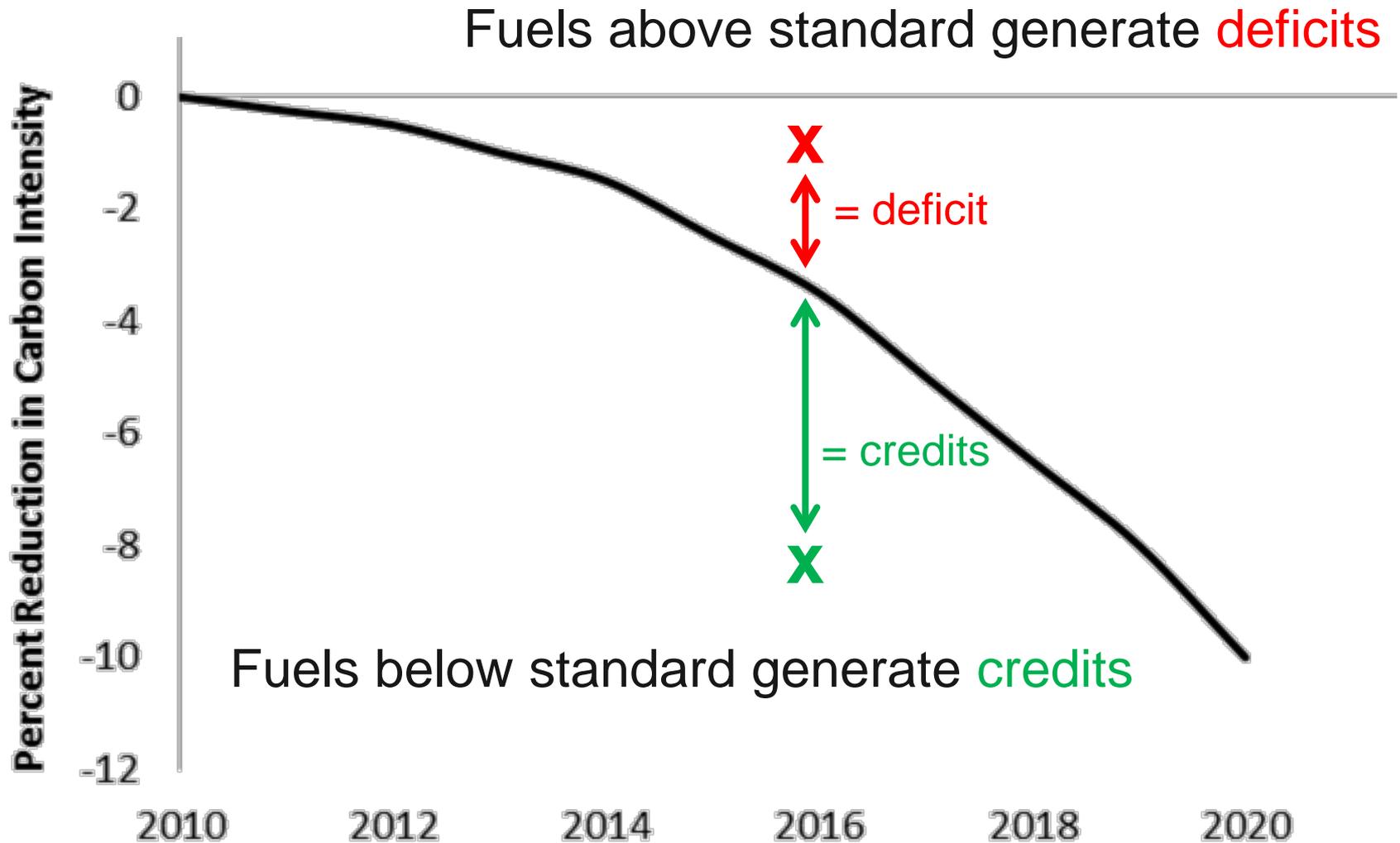


- **CA, OR, and BC:** Program in place
- **WA:** “Poison pill” prevented action

Basic LCFS Requirements

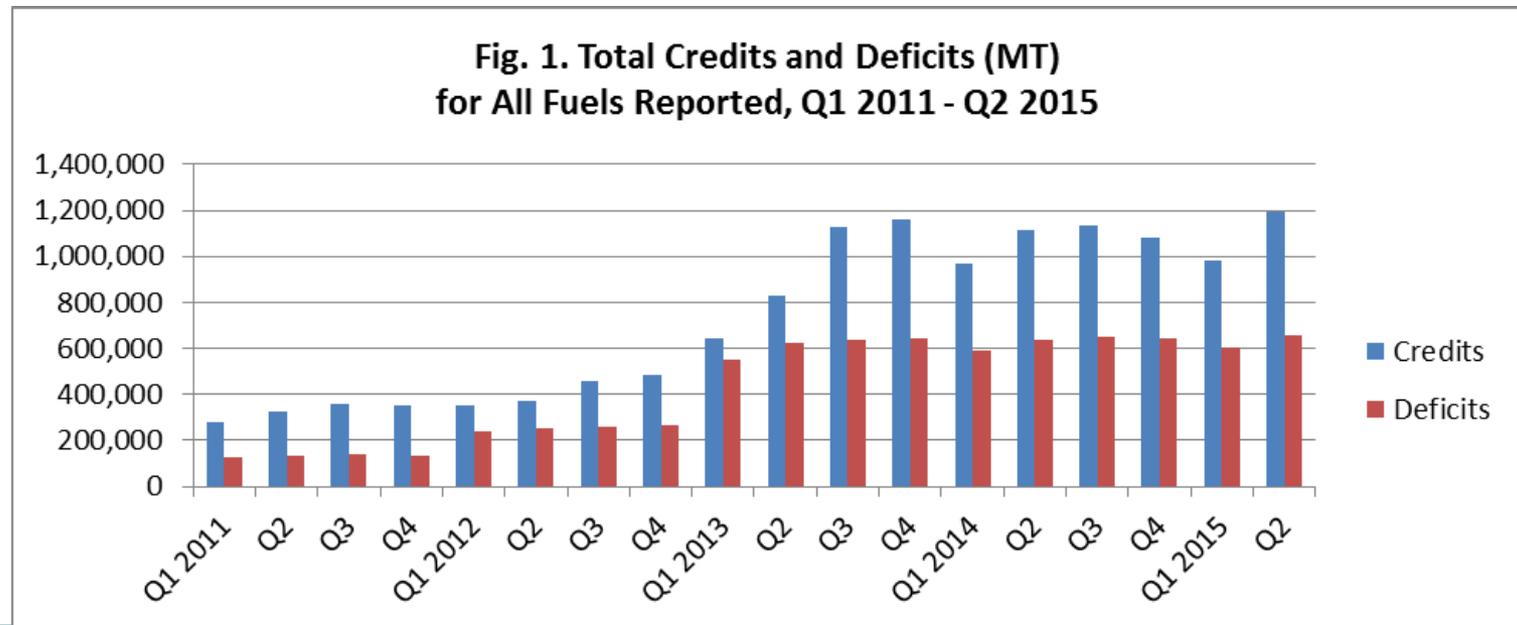
- Sets annual carbon intensity (CI) standards for gasoline, diesel, and the fuels that replace them
- CI is the measure of GHG emissions associated with producing and consuming a fuel, which is measured in grams of carbon dioxide equivalent per megajoule (gCO₂e/MJ)
- CI based on Well-to-Wheel lifecycle analysis of transportation fuels used in California

Declining Carbon Intensity Curve: Concept



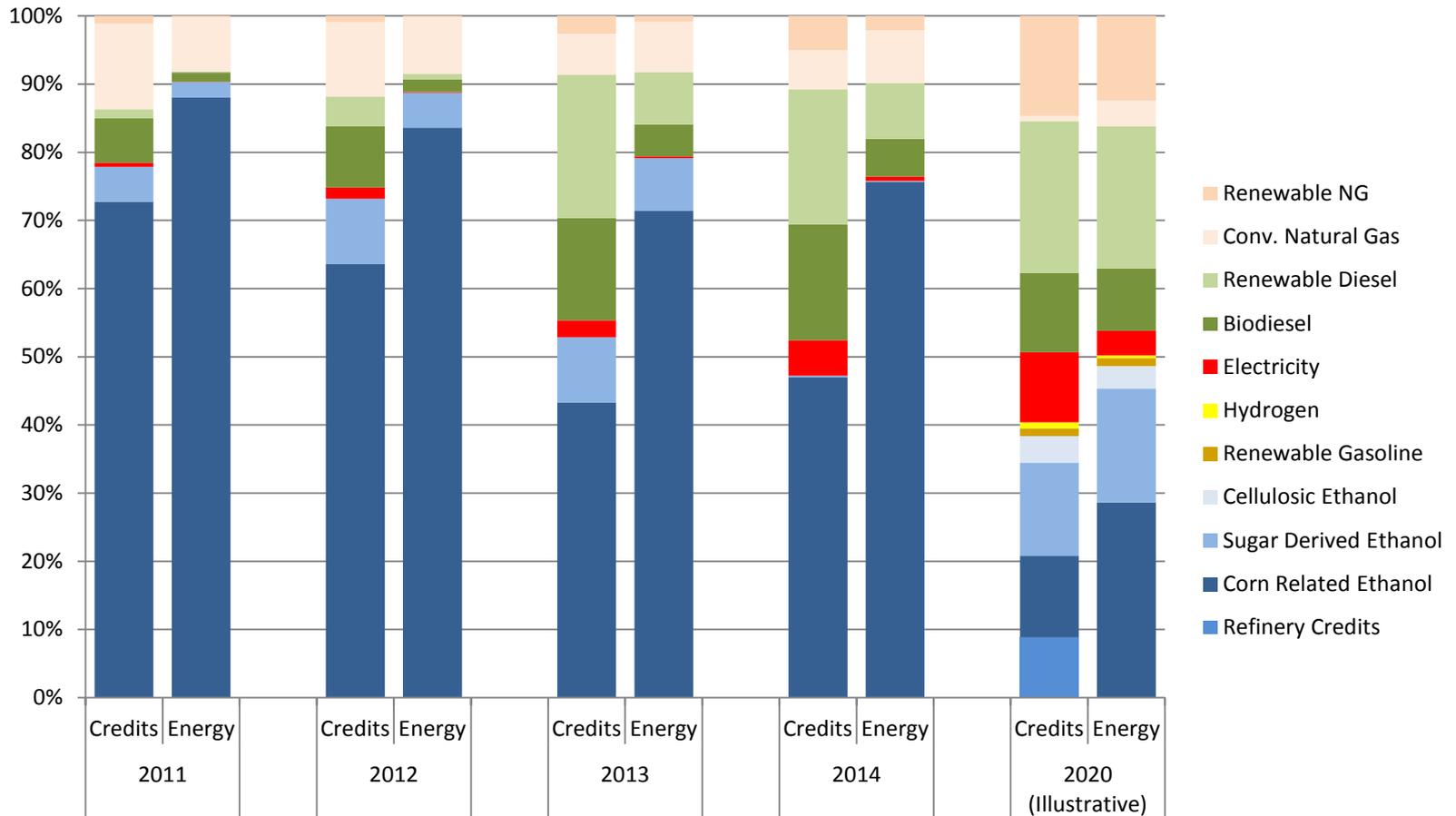
The LCFS is Working

- 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



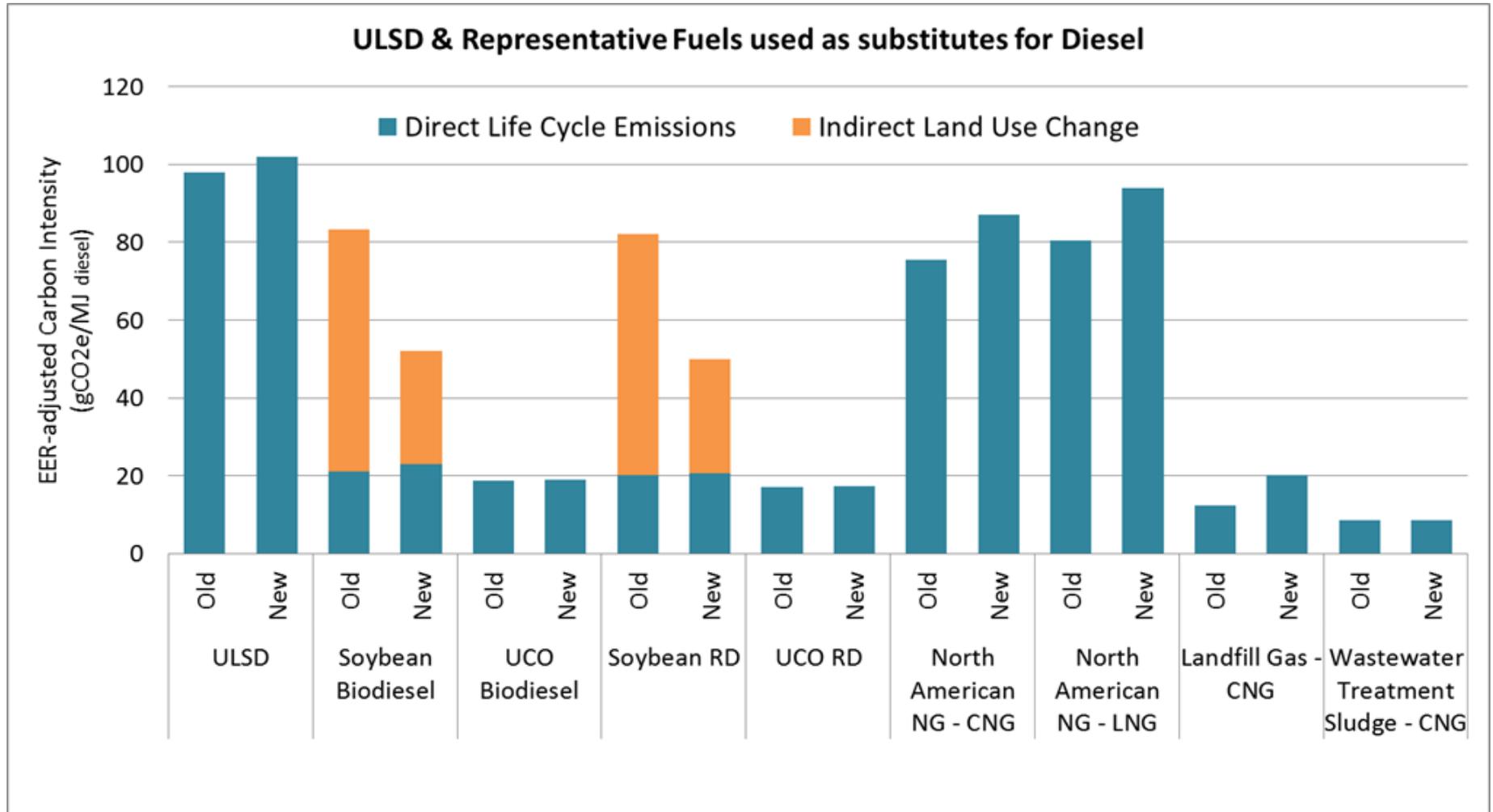
Key Areas of Proposed Improvement

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

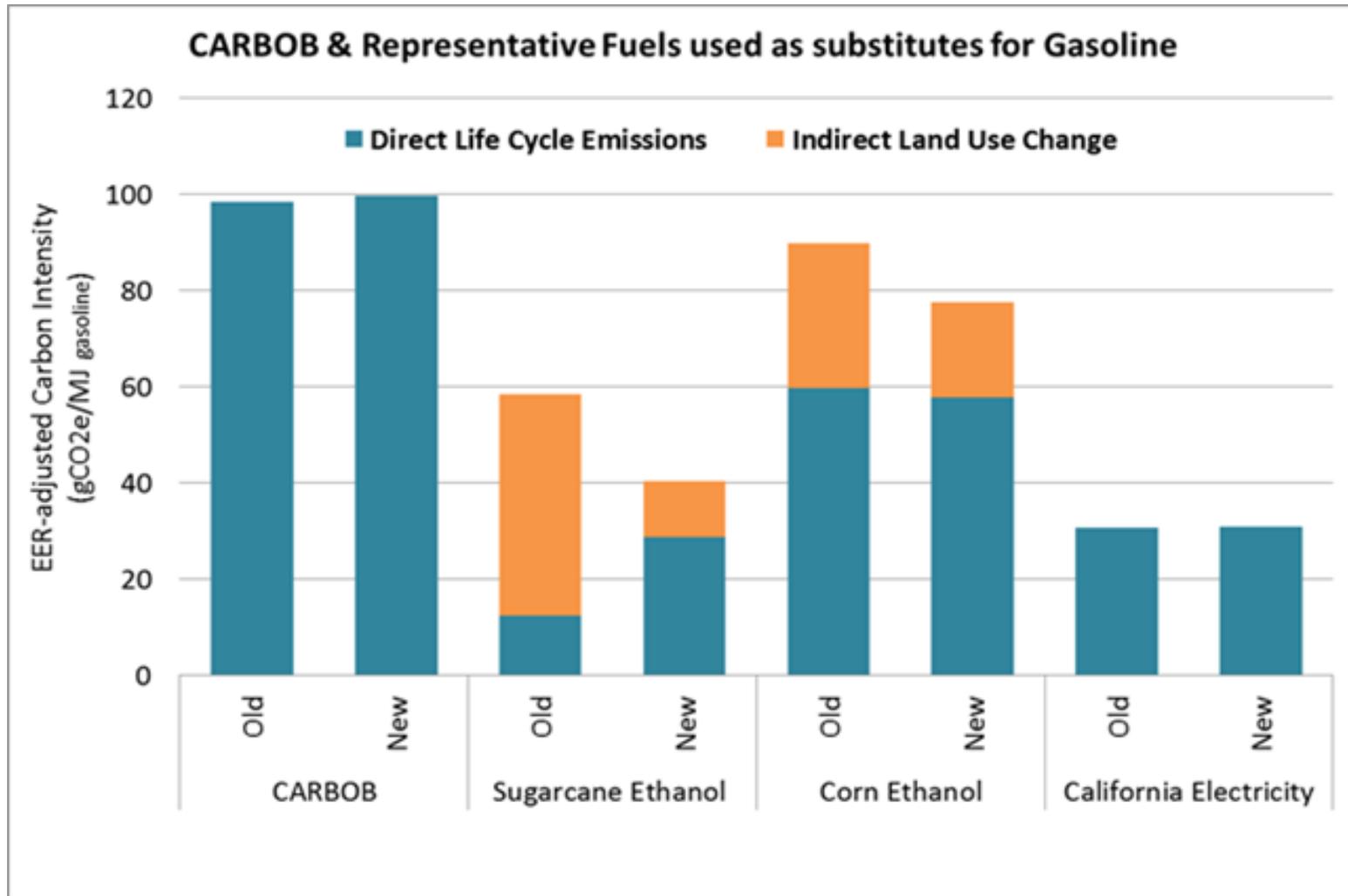
Carbon Intensity: Improving the Science

- 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

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

Updated Cost Containment Features

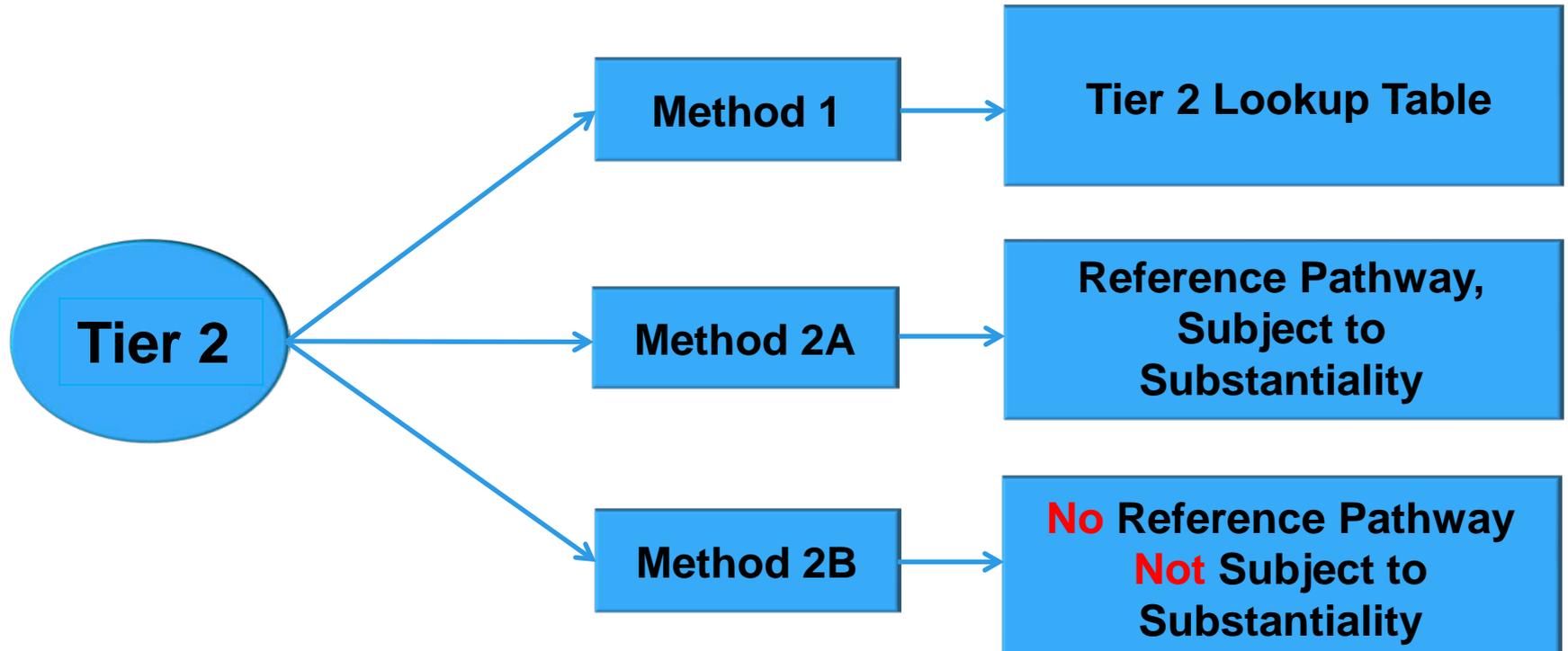
- Purpose:
 - Ensure that the LCFS achieves its GHG goals within a reasonable and predictable range of costs.
- Goals:
 - Provide a route for compliance and certainty that parties can comply even if a credit shortfall occurs
 - Strengthen incentives to invest in low-CI fuels
 - Increase certainty regarding 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
TOTAL	297	66

Total of 363 pathways for potential re-certification

Audit and Verification: Concepts under Consideration

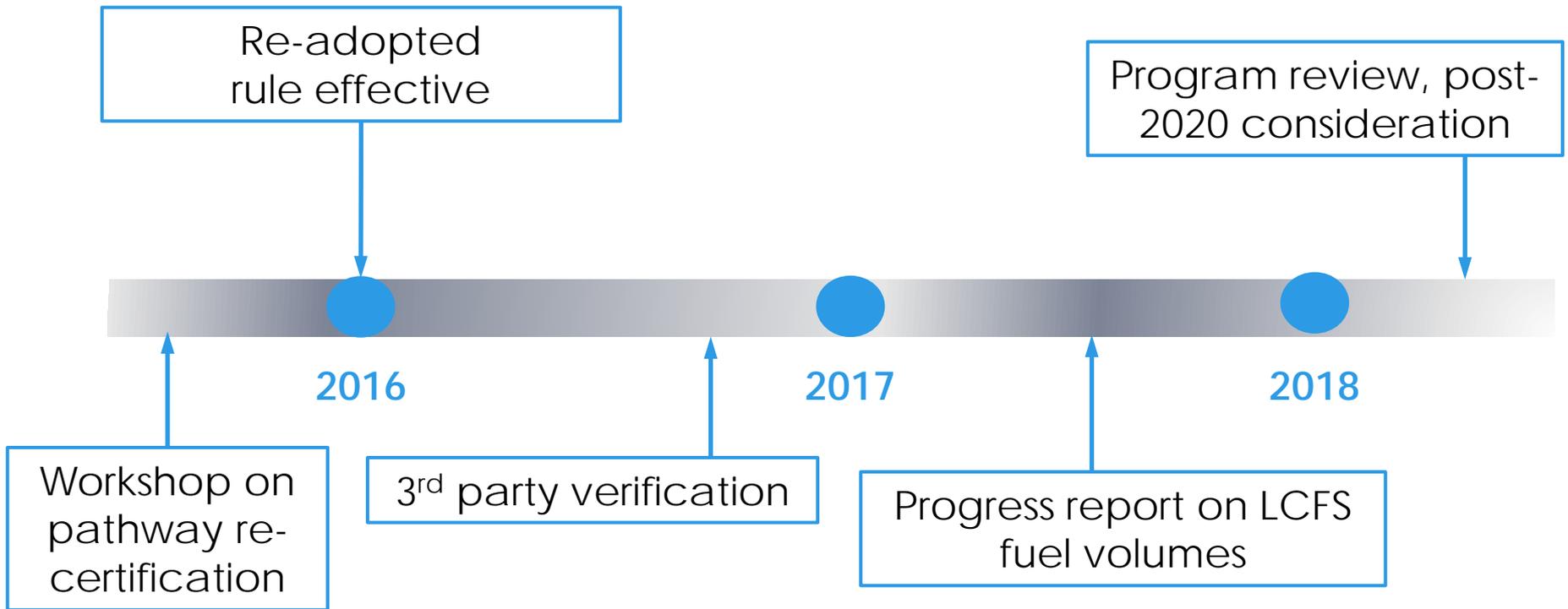
Verification Required for the LCFS?

- 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?