California Environmental Protection Agency

Air Resources Board

Low Carbon Fuel Standard Overview

Sam Wade
Chief, Transportation Fuels Branch
February 10, 2015 PMAC Meeting

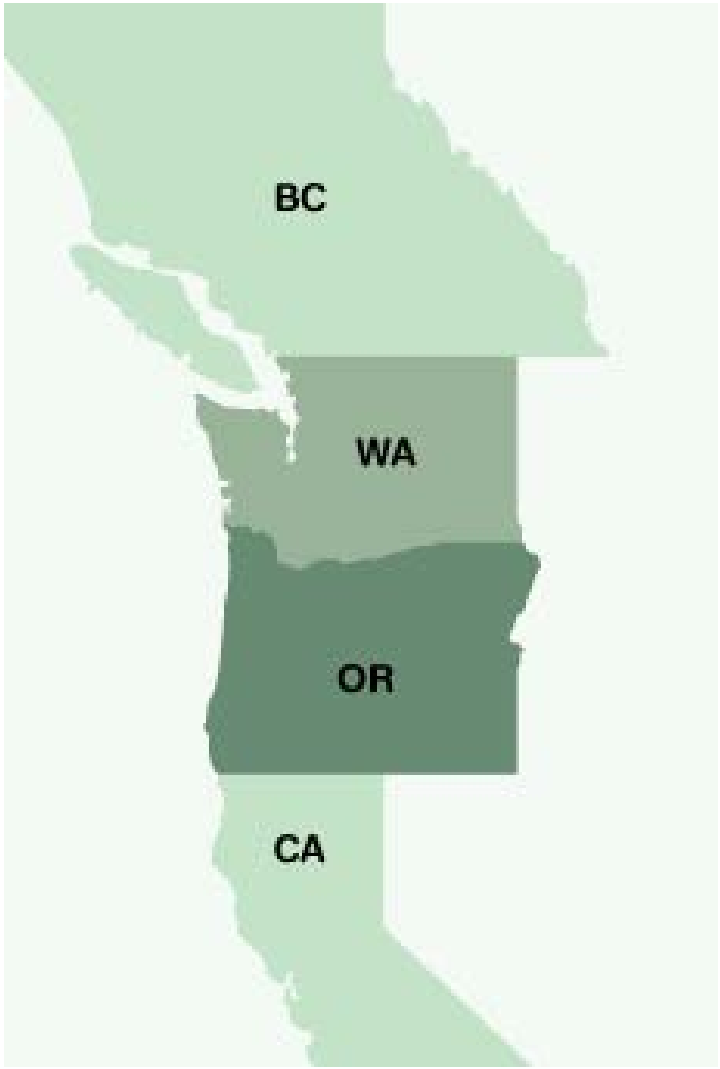
LCFS History

- Original adoption in 2009, amended in 2011
- Goal: Reduce carbon intensity (CI) of transportation fuel pool by at least 10% by 2020
- Expected benefits:
  - Help reduce greenhouse gases (GHG) emissions to 1990 levels by 2020
  - Transform and diversify fuel pool
  - Air quality benefits

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

Others are Following California: Pacific Coast Collaborative Update



Toward an integrated West Coast market for low-carbon fuels

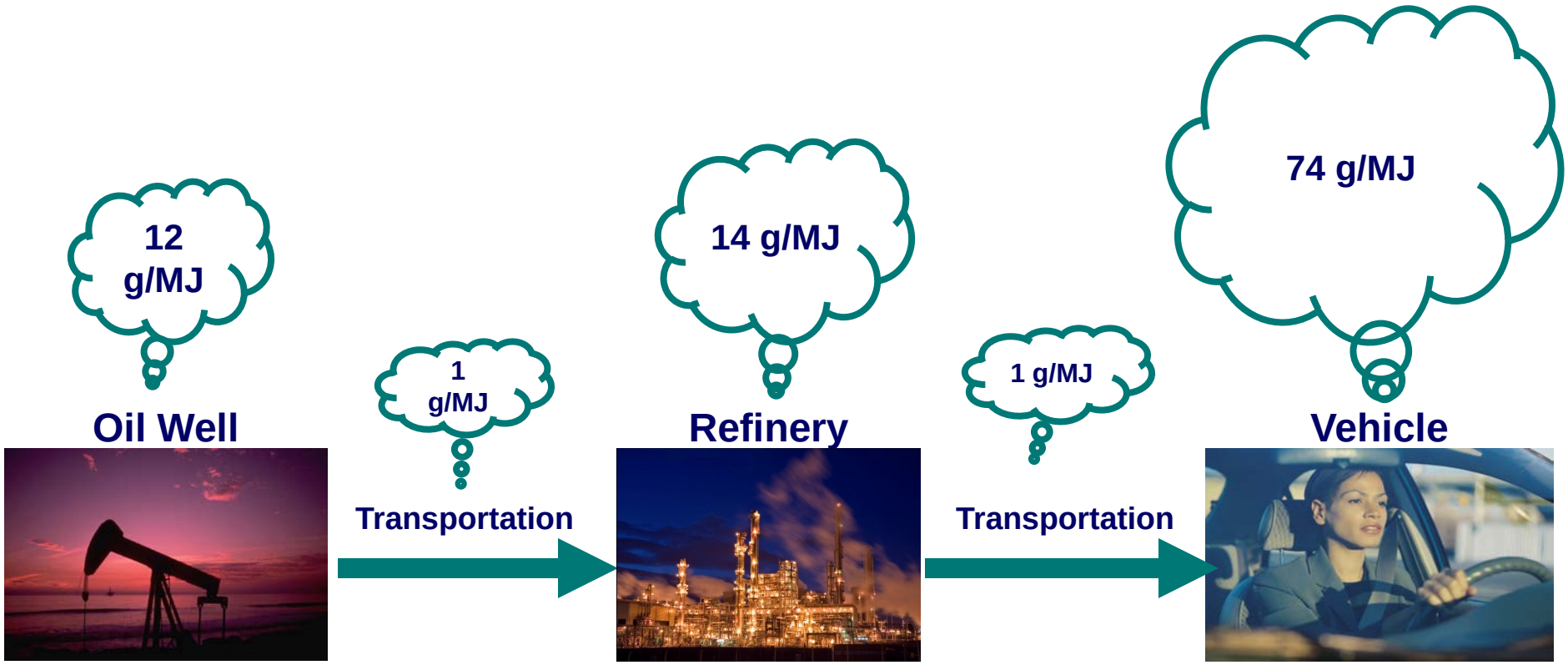
- ***CA and BC:*** Program in place
- ***WA***: Gov. Inslee's EO 14-04
- ***OR***: Legislation pending to remove 2015 sunset
- Recent ICCT research finds that the clean fuel goals of all jurisdictions achievable simultaneously[1]

[1] http://www.theicct.org/potential-low-carbon-fuel-supply-pacific-coast-region-north-america

Basic LCFS Requirements

- Sets annual 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_2e/MJ)
- CI based on complete lifecycle analysis

Fuel Life Cycle – CARBOB



CARBOB
101 g/MJ

Fuel Life Cycle – Biogas CNG

1 g/MJ

Biogas Extraction

18 g/MJ

Processing

2 g/MJ

Pipeline Transmission

2 g/MJ

CNG Stations

61 g/MJ

CNG Trucks

- 66 g/MJ

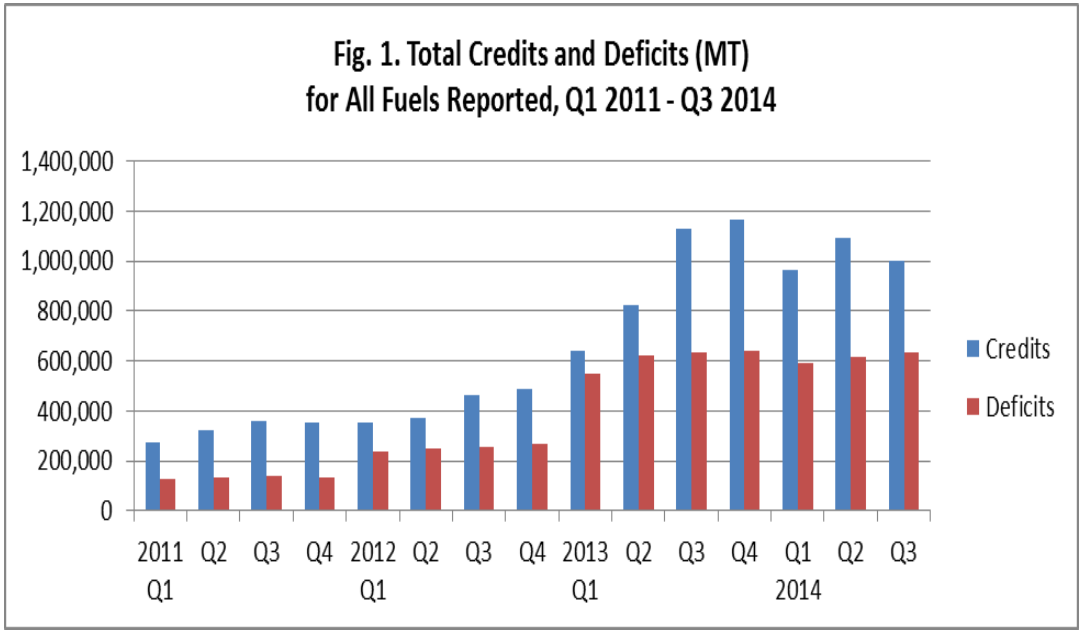
Flare Credit

Biogas to CNG in California
~18 g/MJ

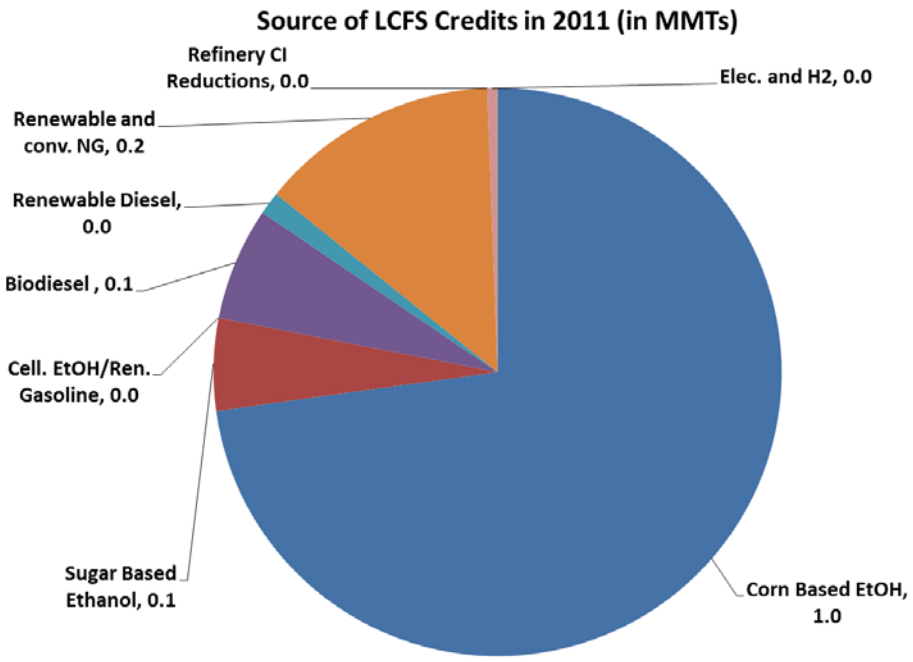
With Energy Efficiency Ratio
~20 g/MJ

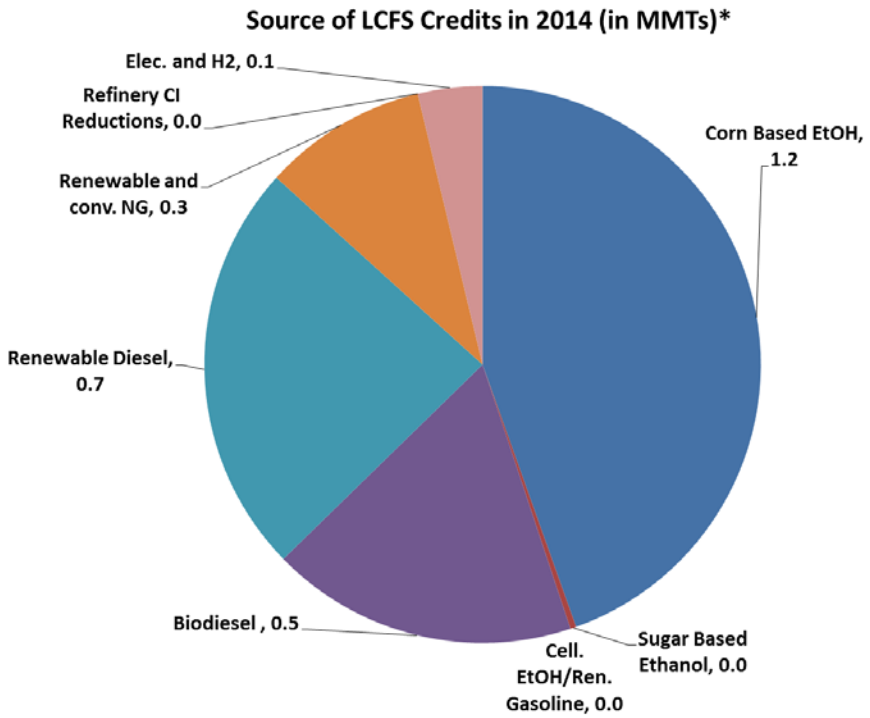
The California LCFS is Working

- Low carbon fuel use is increasing
- The LCFS credit market is functioning well
- Credits have exceeded deficits in all quarters and a significant credit bank has been built



Sources of Credits: 2011 vs. 2014

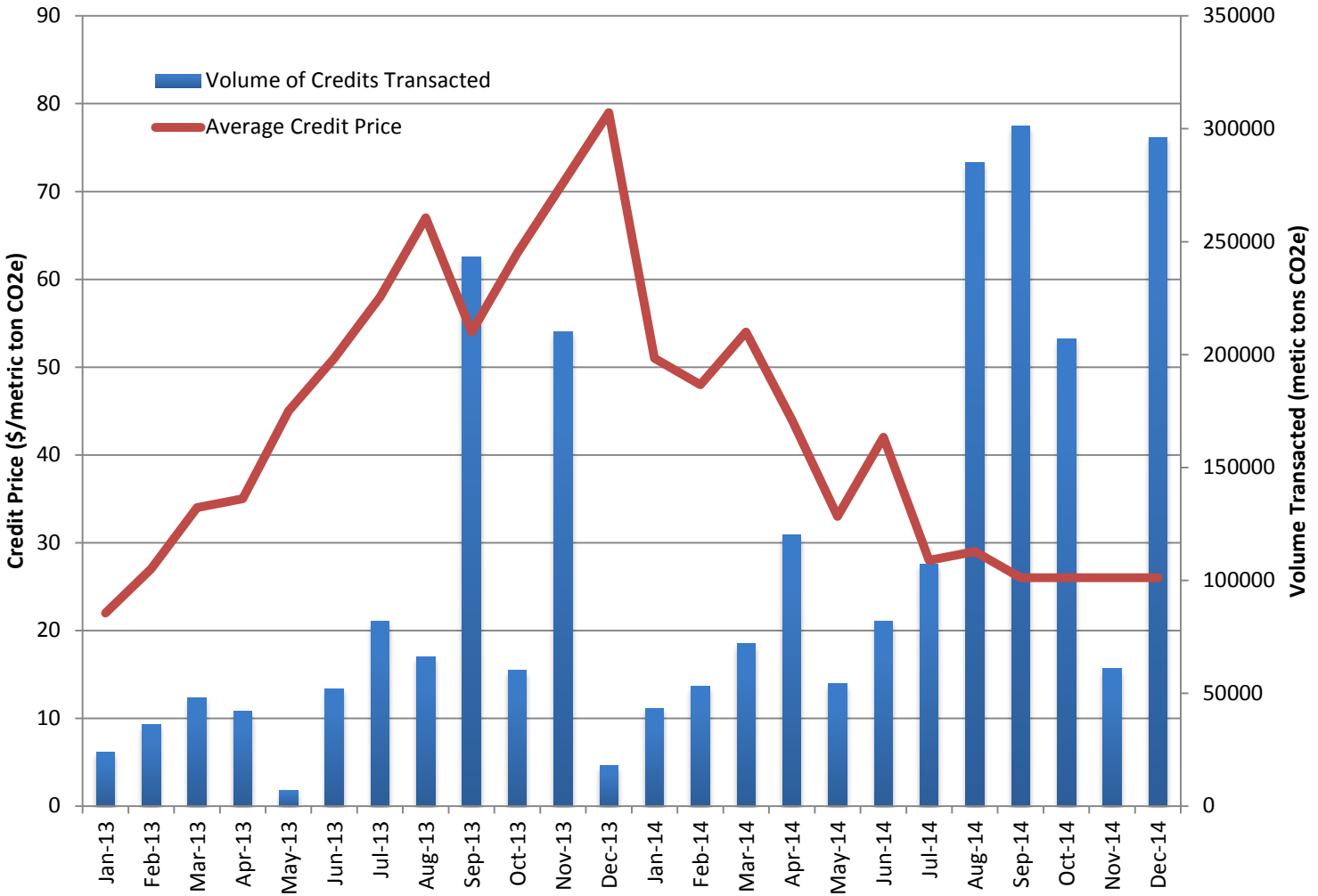




The contribution of non-ethanol alternative fuels continues to expand

*** Through first 3 Quarters of 2014**

Credit Prices and Volumes



ARB data, for 2014 values see monthly Credit Trading Activity Reports available from:
http://www.arb.ca.gov/fuels/lcfs/lrtmonthlycreditreports.htm

Legal Challenges have Hindered Low Carbon Fuel Investment

- **Federal: 9th Circuit Court of Appeals**
  - Rejected several constitutional claims
  - Returned case to district court for additional determinations
  - U.S. Supreme Court denied plaintiffs' request for review
- **State: Court of Appeal**
  - Found procedural issues with CEQA and APA
  - Rejected plaintiff's request to enjoin LCFS
  - Allowed ARB to enforce program while addressing court's concerns

Proposed Re-Adoption

Staff developed the proposed rulemaking package to:

- Work with the ADF rule to address the court's concerns
- Clarify and enhance the regulation
- Incorporate Board's direction, stakeholder input, and lessons learned from five years of implementation
- Incorporate latest science and technical knowledge

Summary of Re-Adoption

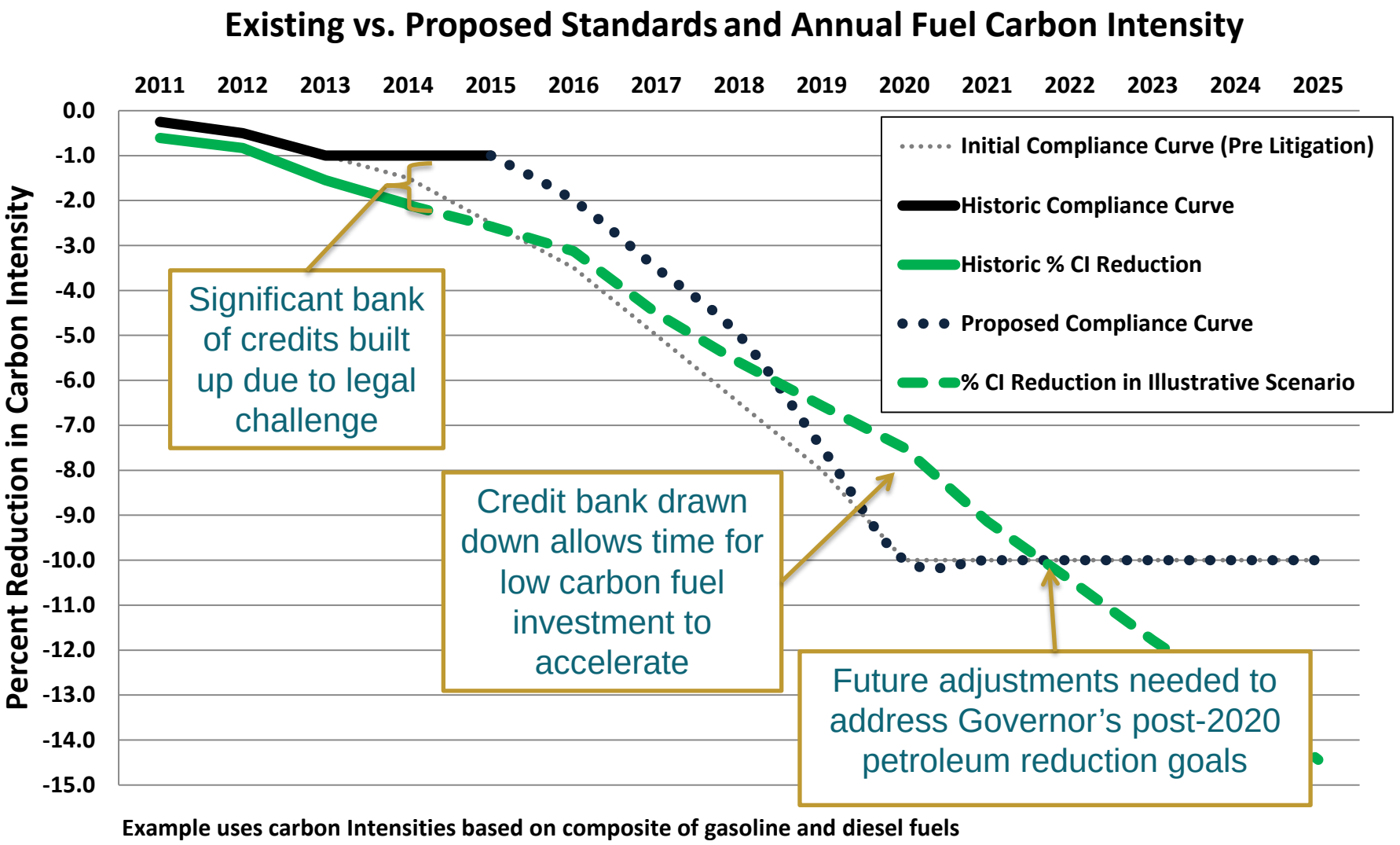
Core Concepts Remain Unchanged	Key Areas of Proposed Improvement
• Use of lifecycle analysis including indirect land use change (ILUC) effects	• CI calculation tools updated using latest science
• Declining carbon intensity (CI) targets through 2020	• 2016-2020 targets adjusted
• Credit generation and trading	• Max credit price capped at $200 per credit
• Quarterly and annual reporting requirements	• Streamlining implementation

Proposed Curve Update

- 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

Proposed Curve Helps Draw Down Credit Bank



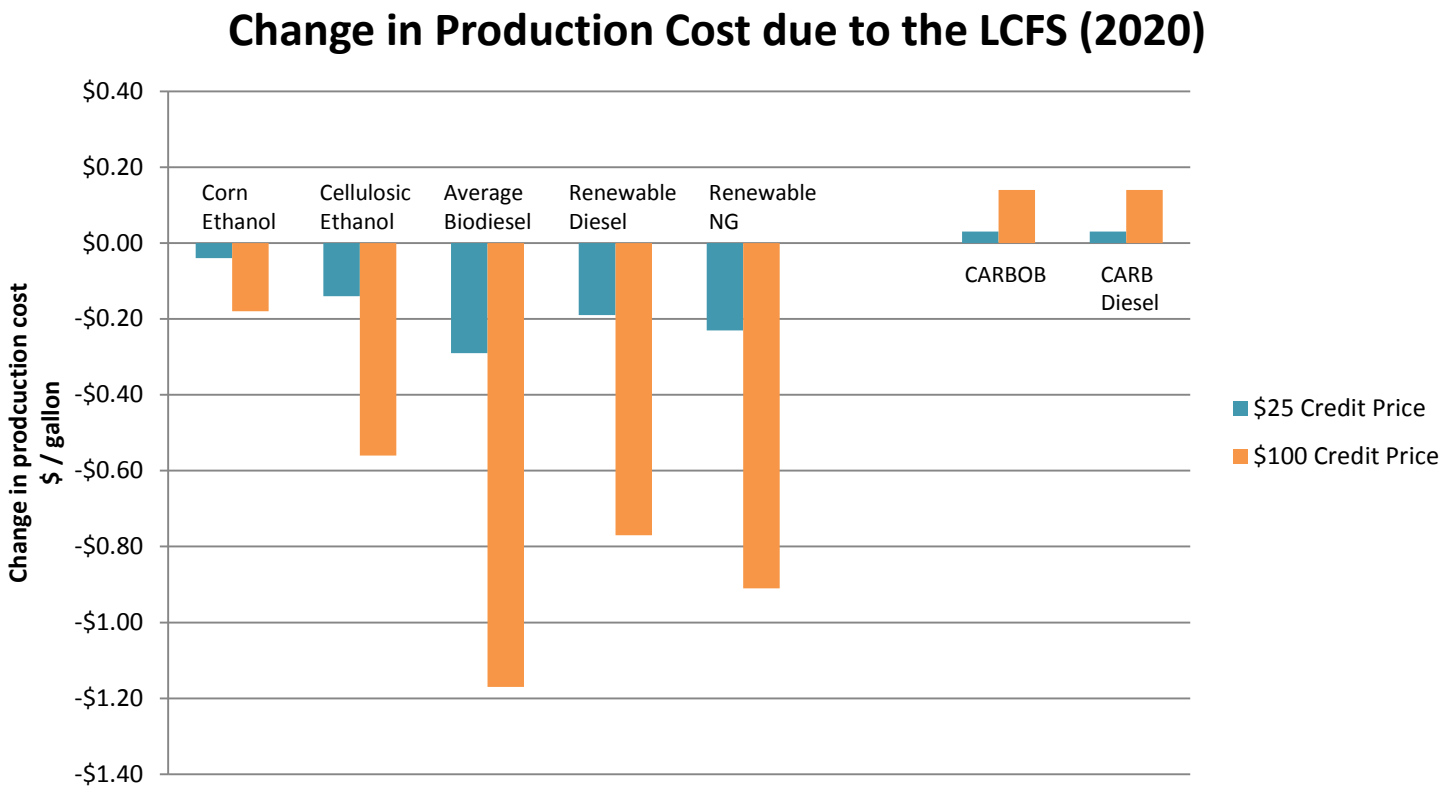
Example uses carbon Intensities based on composite of gasoline and diesel fuels

New Concept: Cost Containment

- Year-End Credit Clearance Market will prevent price spikes in the unlikely event of credit shortages
- Defer deficits if pro-rata share of credits made available are purchased
- Price cap in 2016: $200/MTCO$_2$e (adjusted for inflation in future years)
- Compliance debt carried over is assessed a 5% annual interest rate
- All deferred deficits must be repaid within 5 years

LCFS Credit Value

- LCFS credits and deficits reduce the production costs of low carbon fuels and increase the production cost of fossil fuels
- Increased/decreased production costs may or may not translate to higher or lower retail and wholesale prices for these fuels[1]



[1] For one description of the complexity of this issue see (Lade and Lin 2013): http://www.its.ucdavis.edu/research/publications/publication-detail/?pub_id=1996

2015-2016 LCFS Timeline