



# Proposed Regulation on the Commercialization of Alternative Diesel Fuels

California Air Resources Board  
Industrial Strategies Division  
Oil and Gas and GHG Mitigation Branch

# Overview

- Need for ADF Proposal
- Regulatory Development
- Specific Application to Biodiesel
- Impacts & Benefits
- Potential 15-Day Changes



# *Need for ADF Proposal*



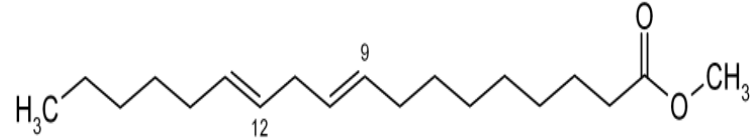
# What Are ADFs?

- Alternative Diesel Fuels are diesel substitutes:
  - Not liquid hydrocarbons & no ARB fuel specification
- Examples of ADFs
  - Biodiesel (completing evaluation), Dimethyl Ether (undergoing evaluation)
- Not ADFs
  - Renewable diesel, Natural Gas
- ADF Blends
  - Typically labeled “BXX” where XX is the percent ADF in a blend
  - Example: B10 is 10 percent biodiesel, 90 percent diesel

# Comparison of Biodiesel & Renewable Diesel

## Biodiesel (ADF)

- Fatty acid mono-alkyl esters



## Renewable Diesel (non-ADF)

- Hydrocarbon alkanes  
(indistinguishable from conventional diesel)



## Complementary Fuels

- Both generally low carbon, can use same feedstocks, different production process
- Substantial GHG, criteria, toxics reductions
- Biodiesel has good lubricity
- Renewable diesel has good cold temp. performance

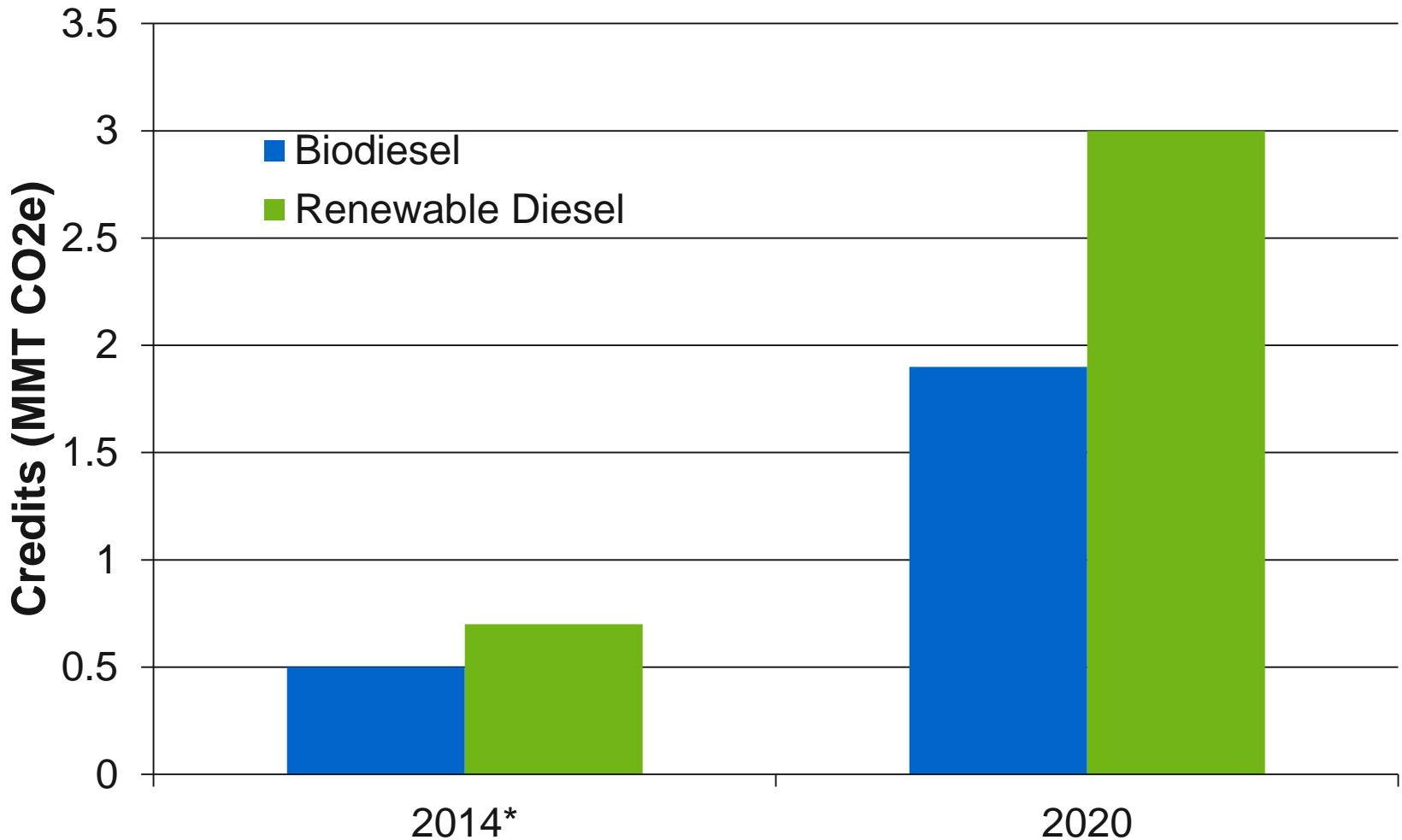
# *Why is ADF Proposal Needed?*

- Alternative diesel fuels bring significant benefits
- State (LCFS) and federal (RFS) programs incent low carbon ADF fuels in California
- Emerging ADFs need market certainty, clear ground rules for commercialization in CA
- Need to maintain environmental & public health protections
- Court ruling in *POET* case reinforced need for an ADF regulation to address biodiesel NOx emissions

# *LCFS Attracts ADFs & Other Low Carbon Fuels*

- Biodiesel and renewable diesel have benefits:
  - Both lower GHG, PM, toxic emissions
  - Renewable diesel also decreases NOx
- Biodiesel can increase NOx in older heavy-duty vehicles
- Proposal applies lessons learned during biodiesel testing, realizes benefits while preventing NOx increase

# LCFS Attracts ADFs & Other Low Carbon Fuels (cont.)



\* Through first 3 Quarters of 2014



# *Emerging ADFs Need Clear Ground Rules*

- Current evaluation process comprises elements from various regulations and statutes
- ADF proposal codifies separate elements and procedures into one regulation
- Sets clear ground rules for application, review, approval
- Provides market certainty
- Encourage emerging fuels like DME

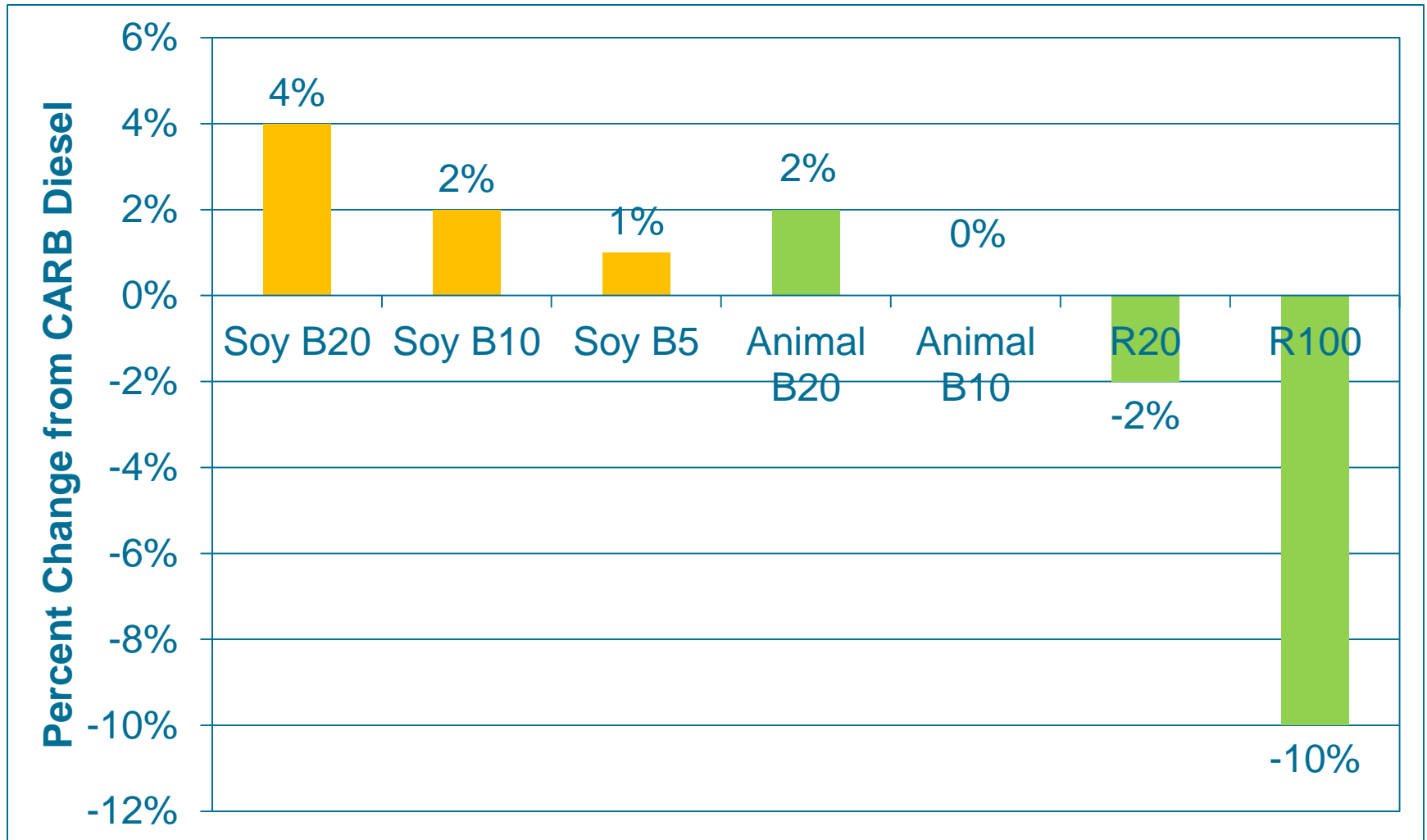
# Regulatory Development



# *Extensive Public Development Process*

- Eight years of biodiesel emissions testing, ~\$3 million on test programs
- Literature review, independent statistical analysis
- Thirteen public meetings to discuss test protocols, results, multimedia evaluation
- Seven public workshops to discuss ADF proposal (2013 – 2014)
- Comprehensive biodiesel testing (including different blends and types) and public participation informed ADF proposal

# ***NOx Effect of Biodiesel and Renewable Diesel Fuels in Older HD Vehicles\****



\*NOx effect measured in pre-2010 engines

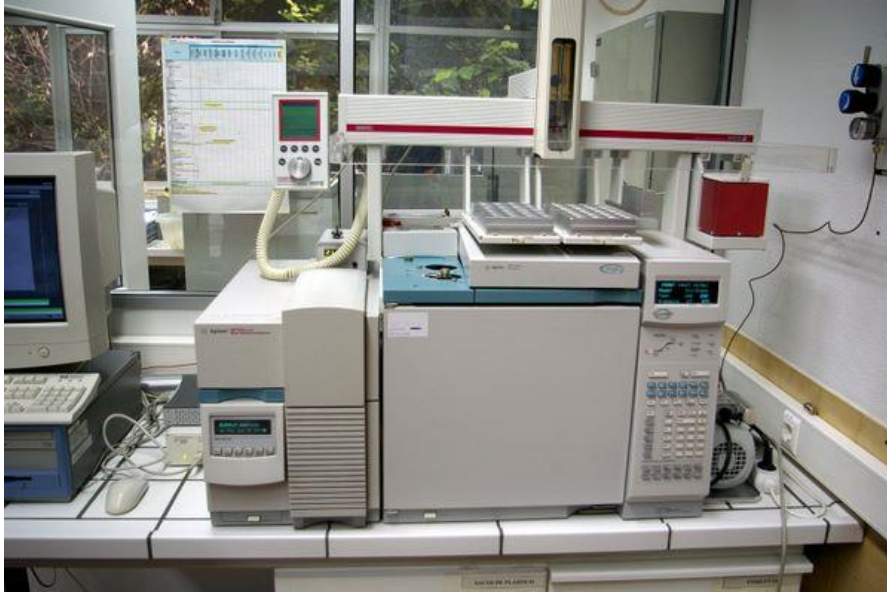
# *Objectives of Proposed Regulation*

- Works with LCFS to advance production and import of low carbon ADFs
- Establish clear pathway for commercialization of biodiesel and emerging ADFs
- Maintain public health and air quality protections
- Prevent NOx emission increases from biodiesel use

# *ADF Proposal Overview*

- Two main provisions
  - Three stage evaluation of ADFs and effects on the environment
    - Follows ADFs from lab to demonstration to commercial scale
    - Protects environment during evaluation
    - May lead to additional controls or simply reporting depending on ADF environmental effects
  - Fuel specifications and in-use requirements for biodiesel as first ADF
    - Biodiesel undergoing multimedia evaluation, near completion
    - Evaluation of biodiesel was model for phase-in requirements

# *Evaluation Process for Emerging ADFs*

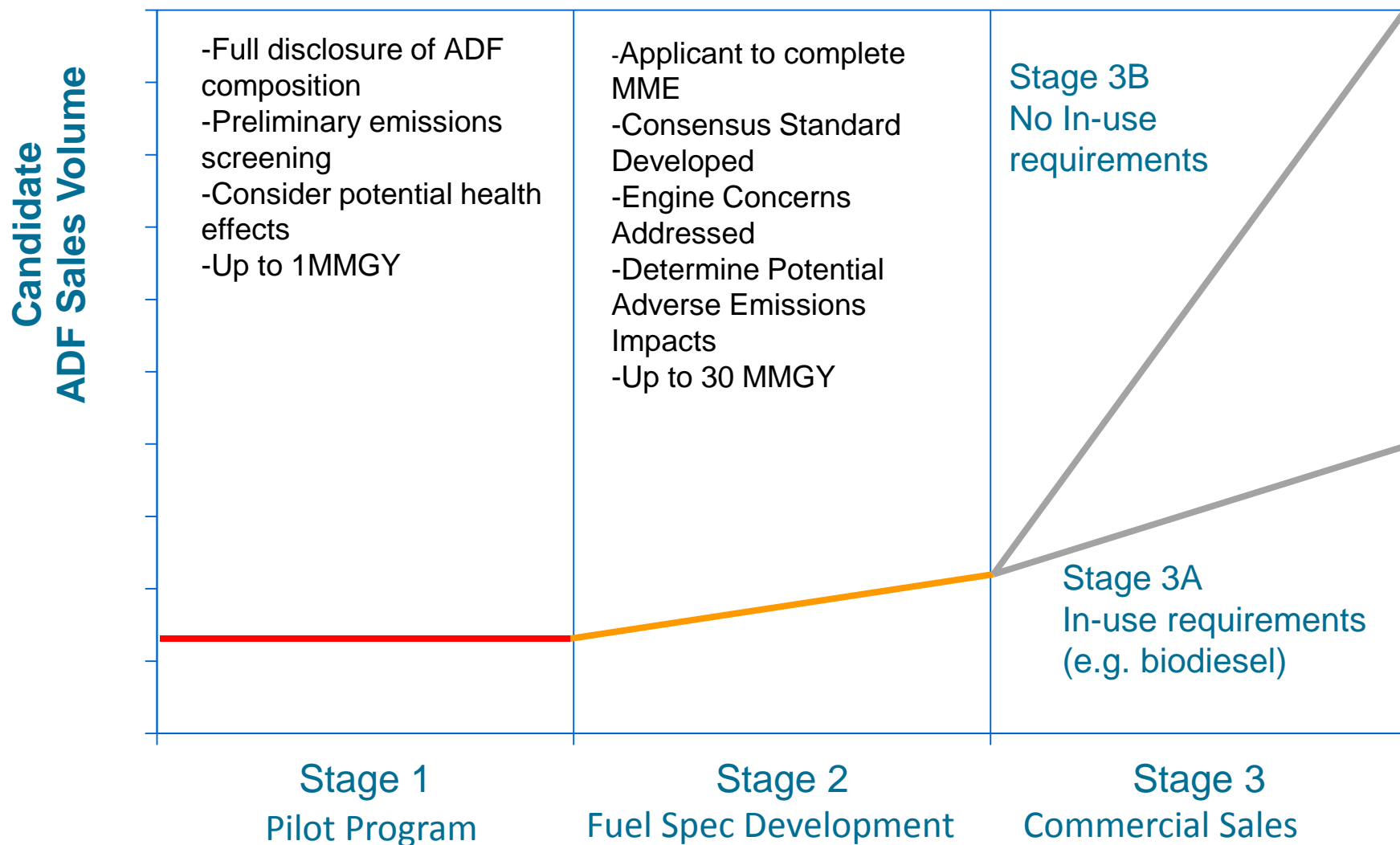


# *General Three-Stage Process for Emerging ADFs*

- Three-stage process to evaluate environmental impacts of emerging ADFs prior to widespread use
- Multimedia Evaluation determines potential adverse emissions impacts for pollutant(s) of concern
  - analysis considers offsetting factors
  - need for in-use requirements and fuel specifications
- In-use requirements including Pollutant Control Level control adverse emissions
- Establishes safeguards to maintain air quality protections



# General Three-Stage Process for Emerging ADFs



# *Specific Application to Biodiesel*



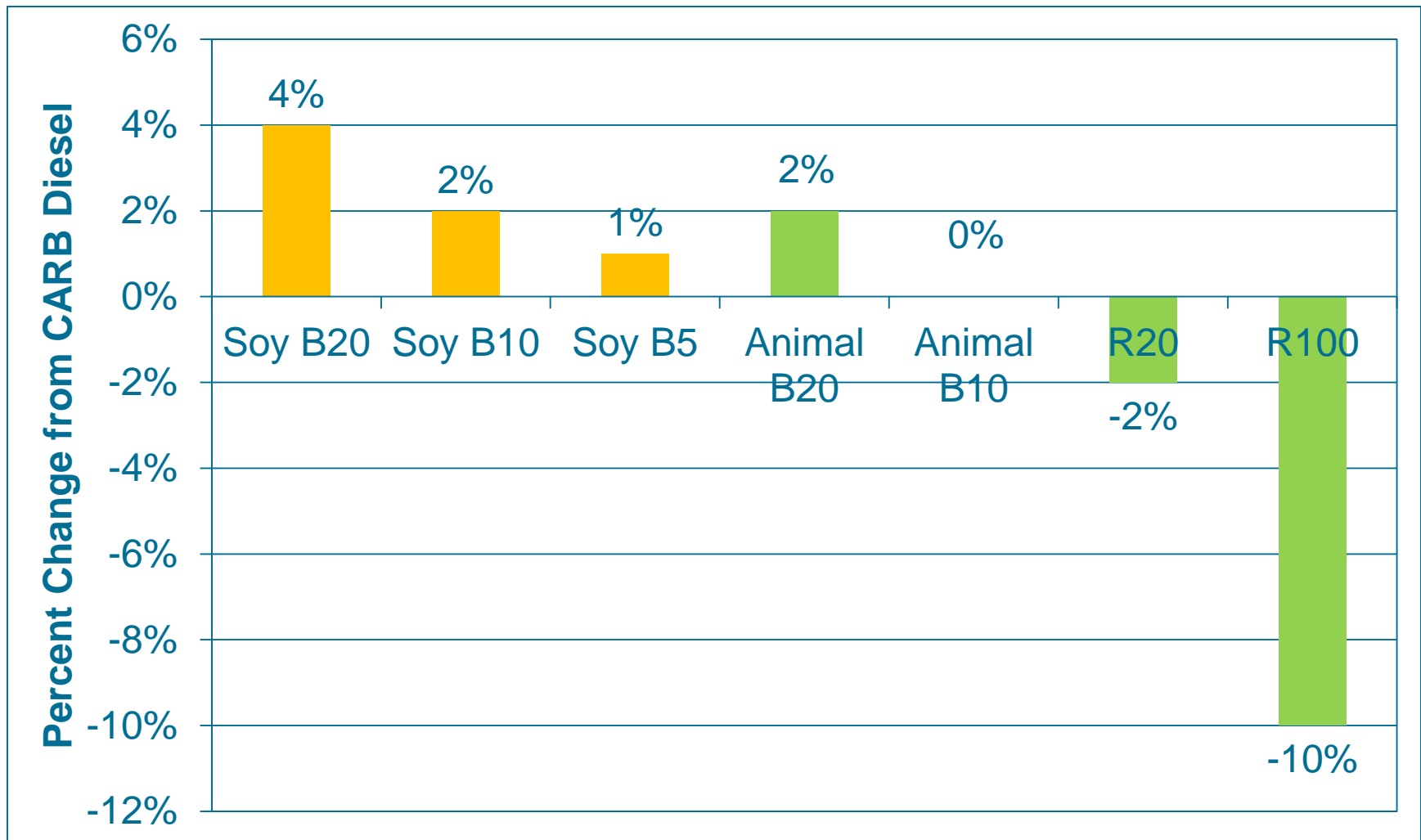
# *Summary of Biodiesel Requirements*

- Reporting provisions begin in 2016
- In-use requirements begin in 2018
- Certification procedures included in proposal
  - Allow for innovative additives, feedstocks, production
- In-use requirements sunset once new vehicles comprise 90 percent of on-road HD fleet; ~2023
- Program review by 2020

# *Summary of Biodiesel Requirements (cont.)*

- Biodiesel limited to B5 or B10 per gallon depending on feedstock, season
  - Feedstocks distinguished by cetane number, higher cetane leads to lower NOx emissions, higher blends allowed
  - Additives allow higher blends up to B20
- Light and medium-duty, and new heavy-duty diesel vehicles shown not to increase NOx with biodiesel use
  - SCR controls in heavy duty eliminate NOx increase (NTDE)
  - Exemptions granted on a case-by-case basis

# *NOx Effect of Biodiesel and Renewable Diesel Fuels in Older HD Vehicles\**

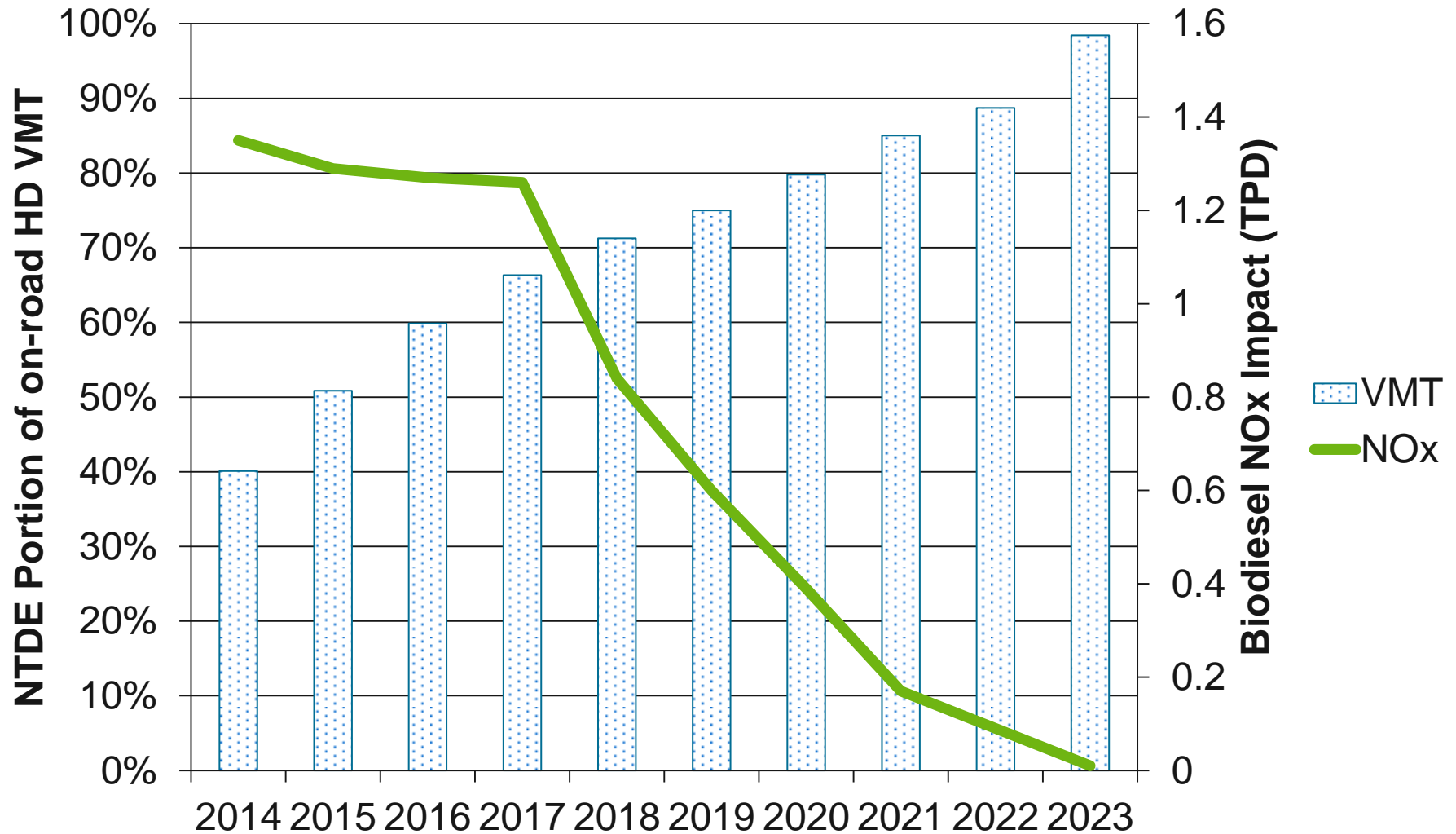


\*NOx effect measured in pre-2010 engines

# *Offsetting Factors that Reduce Biodiesel NOx*

- Primary market for biodiesel is heavy-duty vehicles
- Renewable diesel decreases NOx compared to conventional diesel, offsets NOx from biodiesel
- Renewable diesel use has increased significantly and expected to increase over time.
- Newer HD vehicles (2010+), passenger vehicles no increased NOx
- Offsetting factors expected to reduce biodiesel NOx emissions over time, controls needed in interim

# Fleet Turnover = Long-term Biodiesel Control Unnecessary



# *Biodiesel Compliance Options*

- Blend at or below B5
- High cetane feedstock, winter, blend up to B10
- Targeted fleet sales, blend up to B20
- Use additive, blend up to B20
- NOx control level for biodiesel:

<b>NOx Control Levels</b>	<b>Per-Gal Blend Limit (April 1 to October 31)</b>	<b>Per-Gal Blend Limit (November 1 to March 31)</b>
<b>Low Cetane BD (&lt;56)</b>	B5	B10
<b>High Cetane BD (≥56)</b>	B10	B10



# *Review of Biodiesel Blend Limits*

- Program review to be completed by 2020
  - Evaluate adoption rate of SCR in off-road diesel fleet
  - Assess projected volumes of biodiesel, renewable diesel
  - Review will ensure proposal effectively protects emissions program
- Blend limits for biodiesel sunset once HD fleet penetration exceeds 90 percent model yr 2010+

# Impacts and Benefits



# *ADF & LCFS Environmental Impacts: Background*

- One Draft Environmental Analysis was prepared for both Proposed LCFS & ADF Regulations.
- Existing regulatory and environmental setting in 2014 is used as baseline for the analysis.

# *ADF & LCFS Environmental Impacts: Results*

- Beneficial Impacts:
  - GHGs, air quality, and energy
- Less-than-significant adverse impacts
- Potentially significant adverse impacts:
  - Some related to long-term changes in fuel production and supply
  - Others related to construction of new facilities, and shorter duration
- Significant cumulative impacts also identified for some resources.

# *Economic Impacts of ADF & LCFS*

- Two economic evaluations were completed:
  - Statewide macroeconomic effects of LCFS + ADF proposals
  - Evaluation of direct costs of ADF proposal
- Macroeconomic evaluation used REMI model, shows very small impacts on employment
- Direct costs of ADF proposal expected to be ~1/10 of a cent per gallon of B5 diesel in 2018, decreasing to zero by ~2023
- Challenges for small producers reliant on sales of higher biodiesel blends

# *Benefits of ADFs*

- Can have lower NO<sub>x</sub>, PM, toxic risk
  - Biodiesel, renewable diesel and DME reduce PM
  - Renewable diesel reduces NO<sub>x</sub>
  - Reductions in localized toxic exposure
- Generally have lower GHG emissions
- Reduce petroleum use - can help achieve 2020-2030 goals for GHGs, criteria, toxics
- Energy security
  - Biodiesel derived from feedstocks primarily sourced in USA
  - DME derived from domestic natural gas, methanol, or biomethane

# Potential 15-Day Changes



# *Potential 15-day Changes*

- Further blend level flexibility for captive fleets
- Clarification of certification procedures
- Definitional changes
- Minor clarifications and corrections
- Timeline will mirror LCFS



# *Staff Recommendation*

- No Board adoption recommended today
- Direct staff to continue working with stakeholders to refine proposal
- Coordinate with development of LCFS regulation

# *Next Steps*

- Complete environmental analysis document
- Respond to comments on environmental analysis
- Complete biodiesel multimedia and peer review
- 15-day changes