Renewable Diesel Growth & LCFS Outlook

Jacobsen Fuel and Feedstock Conference - 2021

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Independent Engineering Services

- Conventional Biofuels, RNG/LFG, WTE, Biochemicals, Sustainable Aviation Fuel, Renewable Diesel, Cellulosic and other Advanced Biofuels
- Private, DOE, and USDA Guaranteed Loans

Market Advisory Services

- **Investment Grade LCFS and RIN Forecasting**
- Alternative Technology Risk Analysis

Carbon Services

- **LCFS Pathway Registration Assistance**
- Investment Grade Carbon Intensity Evaluations

Utility Decarbonization

- **Resource Assessments**
- Climate Business Planning

ICF's bioenergy footprint

Global advisory, digital services provider

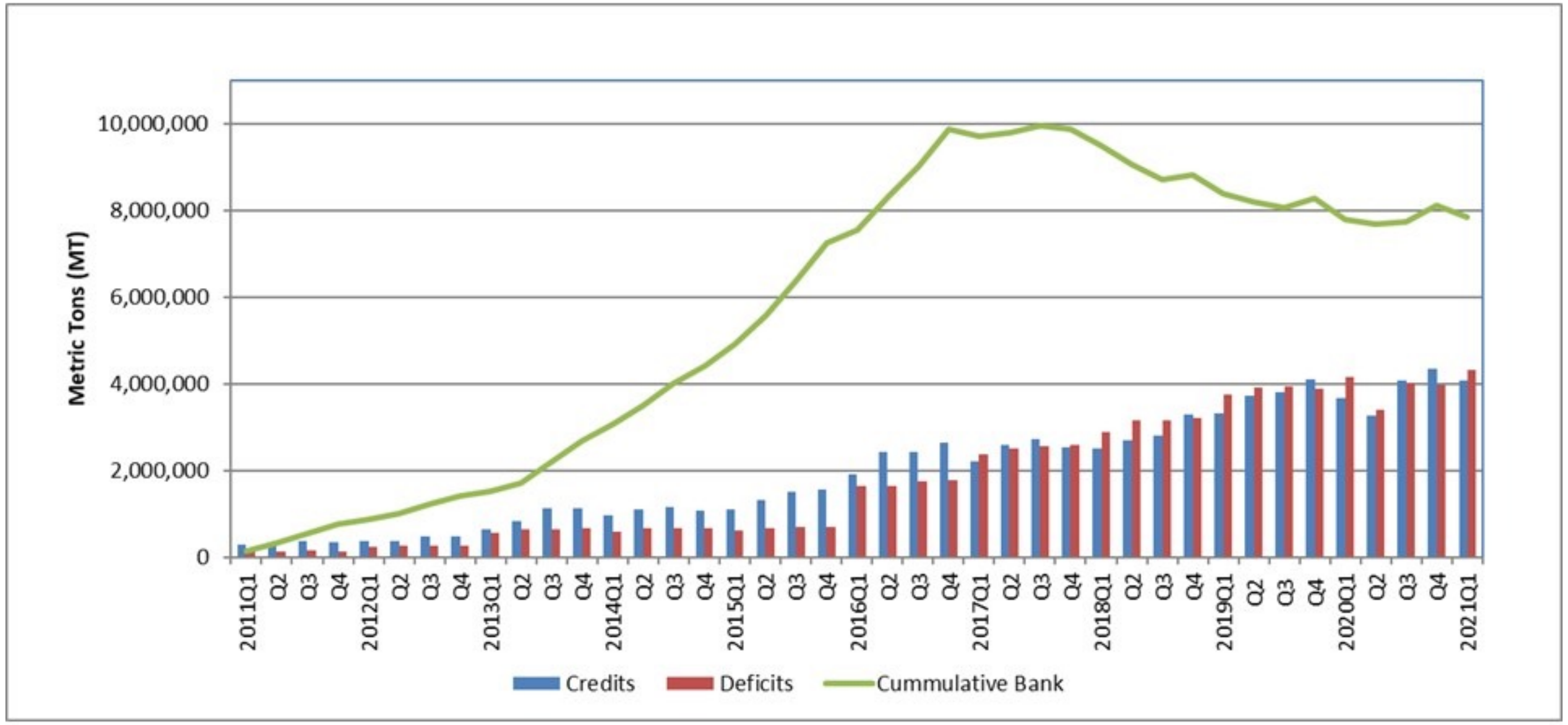
Over 7,000 people

Headquartered outside Washington, D.C. with **70+ offices worldwide**

Publicly traded with **$1.51B** in annual revenue

40 years in lenders advisory business

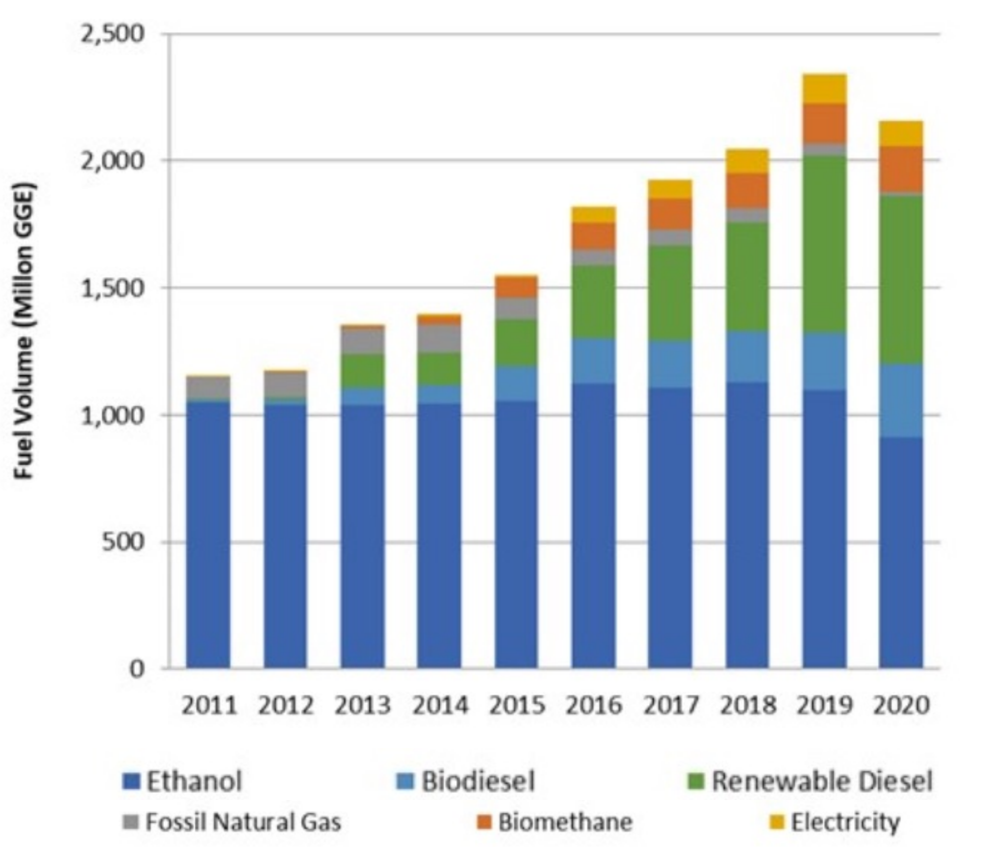
Total Credits and Deficits for All Fuels Reported and Cumulative Credit Bank
Q1 2011 – Q1 2021



Last Updated 07/30/21

Source: CARB LCFS Data Dashboard - https://www.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm

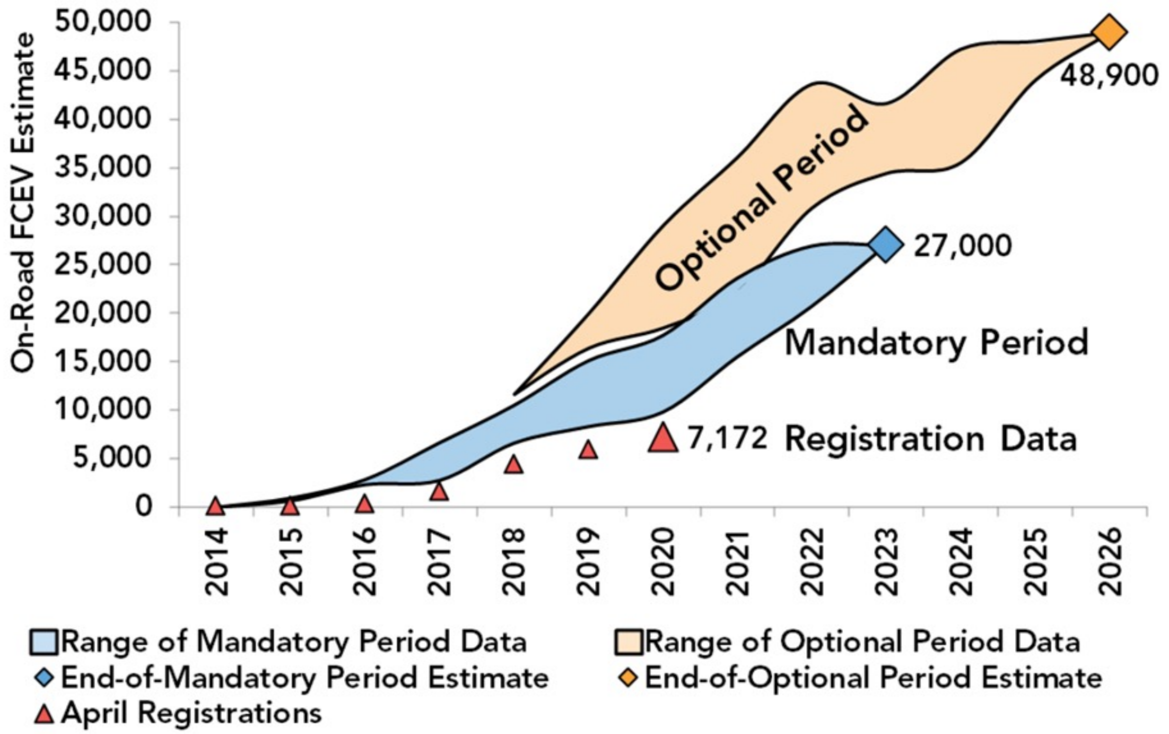
VOLUMES



Last Updated 04/30/2021

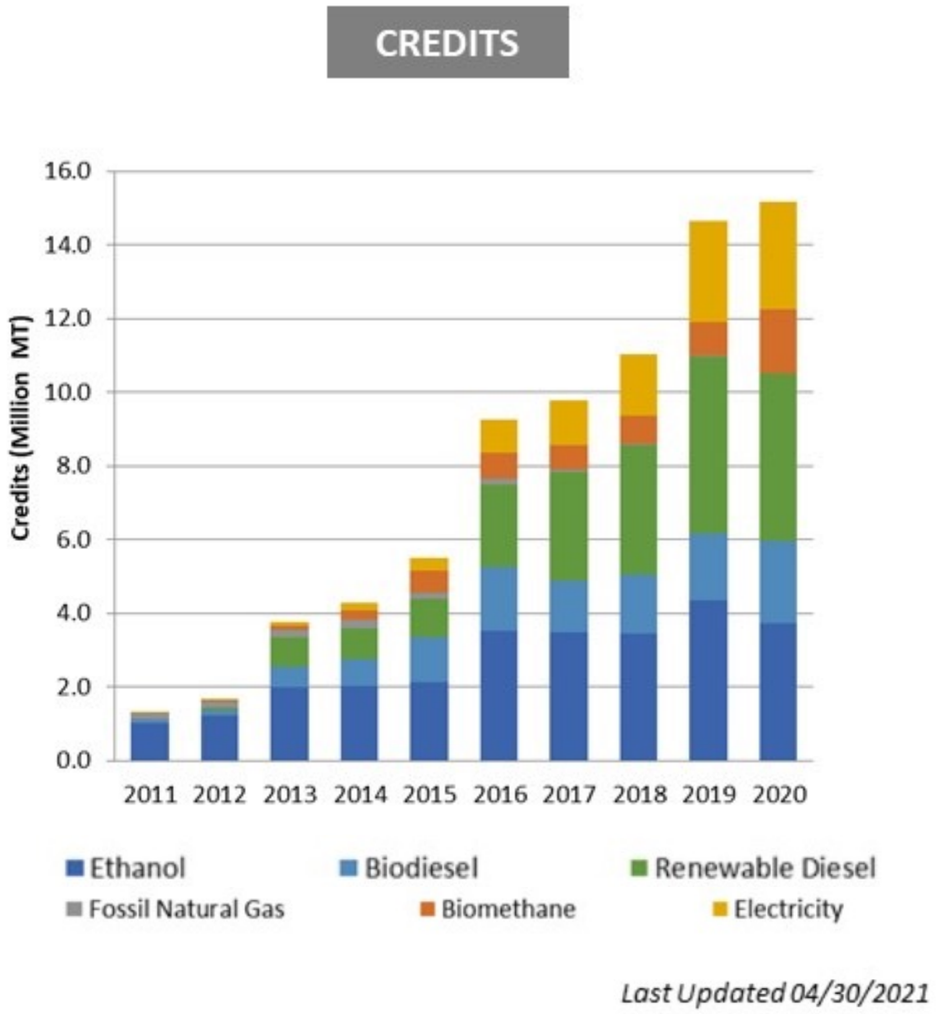
Credit Bank & Credit Generation

- **Ethanol**
  - CCS reducing CI by 20-25 gCO2e/MJ (Most ethanol 65 gCO2e/MJ)
  - E15 on pause following Reid Vapor Pressure Waiver decision by U.S. Circuit Court of Appeals for the District of Columbia
- **Electricity**
  - Approximately 10% of ***new*** car sales in 2020
  - Average age of fleet approaching 12 years
- **Hydrogen (Light Duty Vehicles)**
  - Approximately 10,000 Hydrogen FCEV's
  - Lack of fueling infrastructure, supply interruptions, and Covid delaying rollout
  - CARB estimates of units sold approximately ½ of 2017 estimates



Source: via CARB's Annual Evaluation of Fuel Cell Electric Vehicle Deployment and Hydrogen Fuel Station Network Development

→ Limited Credit Generating Opportunities in Gasoline Pool (15 BGal)

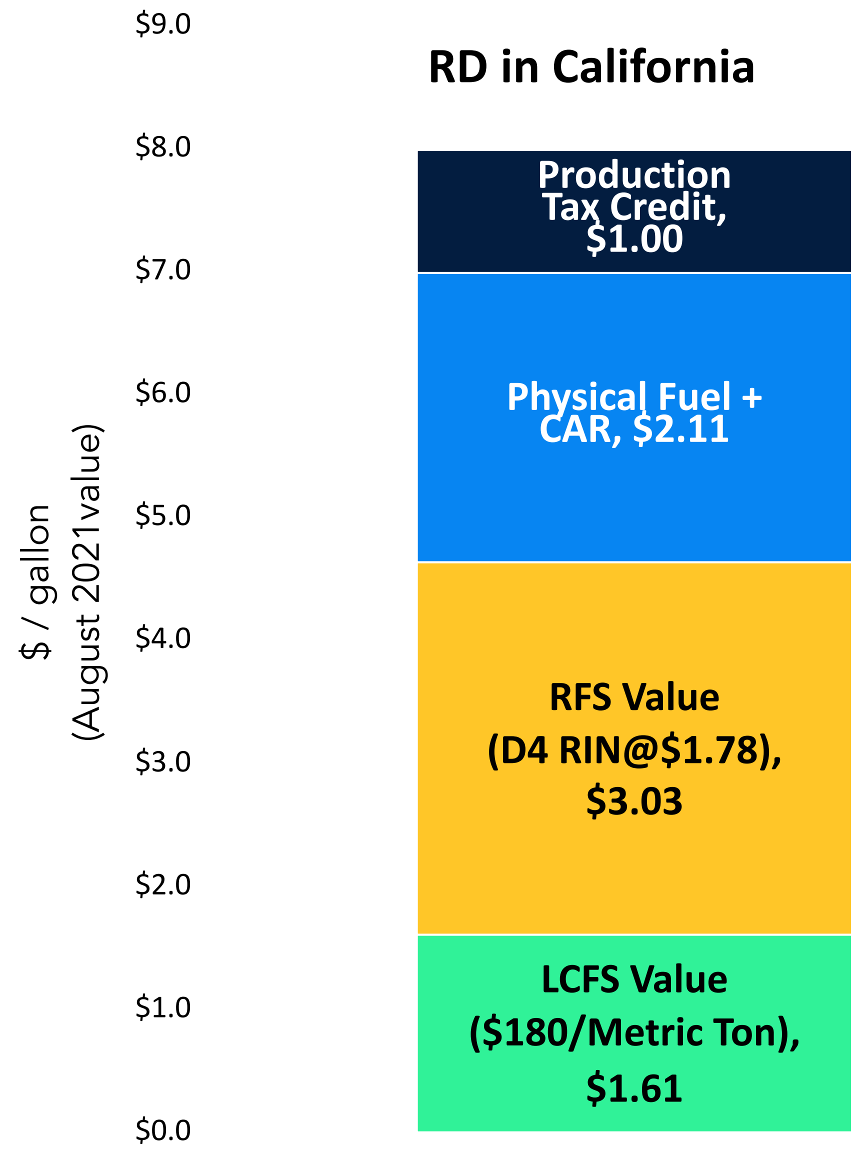


- Renewable Natural Gas
  - Slow steady growth ~5%, mostly in private fleets
  - Some pickup in credits due to shift from landfill gas to manure
- Renewable Diesel
  - Biggest credit generating opportunity, but high marginal cost fuel
  - Questions of ultimate penetration via four distribution channels
    - Retail, Fleets, High Volume Retail, and Miscellaneous Aggregators
- Biomass Renewable Diesel
  - High Capital Cost and Low Output per Facility limit credit generation
- Biodiesel
  - Limited to 5% blend due to NOx concerns
- Hydrogen (Medium/Heavy Duty Vehicles)
  - Advanced Clean Truck Rule – 55% FCEV/BEV by 2035
  - Most promising ZEV technology for heavy duty trucks, limited availability at present

Credit Generating Opportunities in Diesel Pool (4 Billion Gal)

The “value stack” for renewable diesel

RD in California



Value Component

Tax value
(U.S. biomass production tax credit)

Physical fuel value
(ULSD + Cap at the Rack “CAR”)

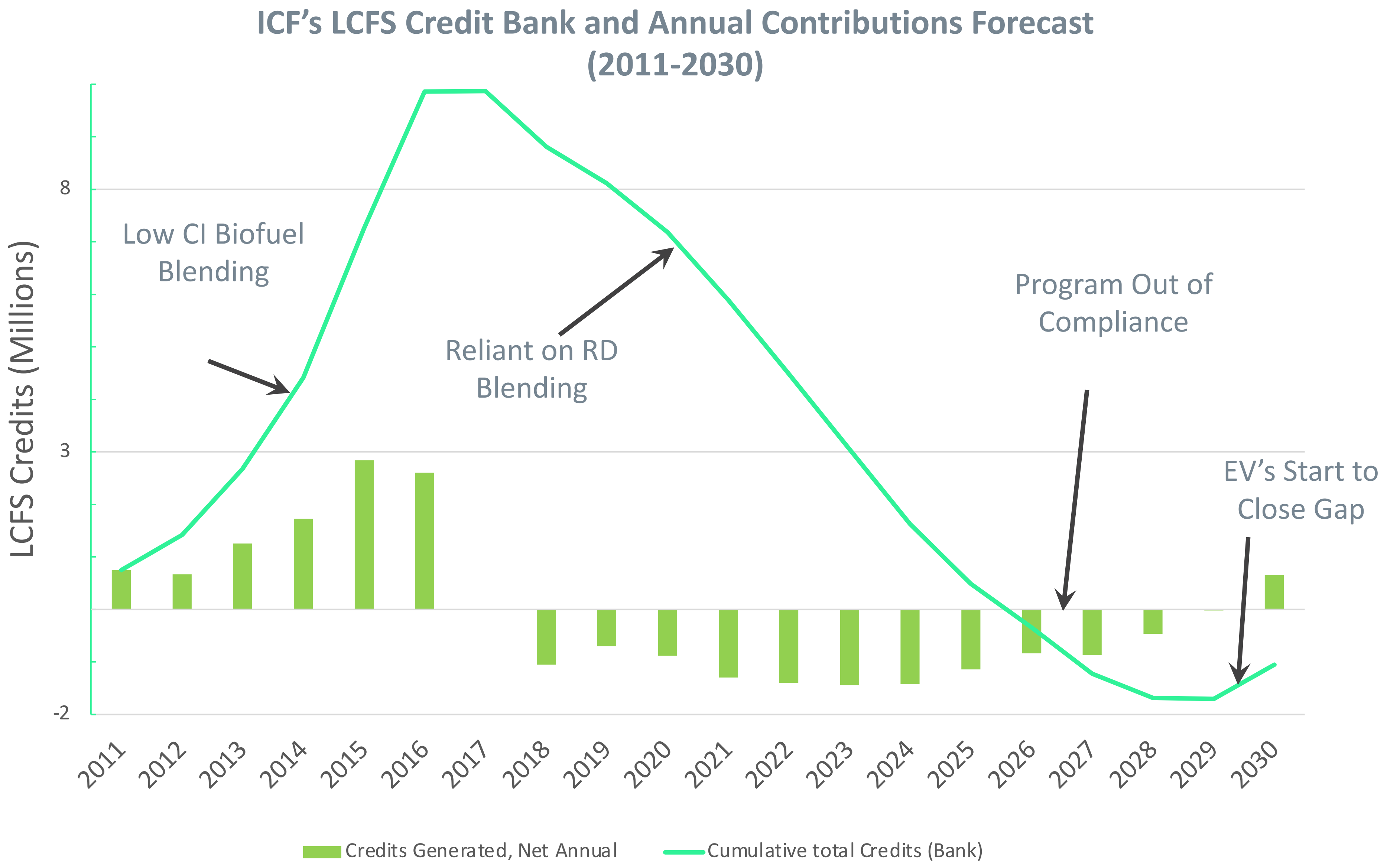
Blend mandate value
(US RFS, D4 RIN)

CO_2 offset value
(California LCFS at
Carbon Intensity (CI)=25g CO_2/MJ)

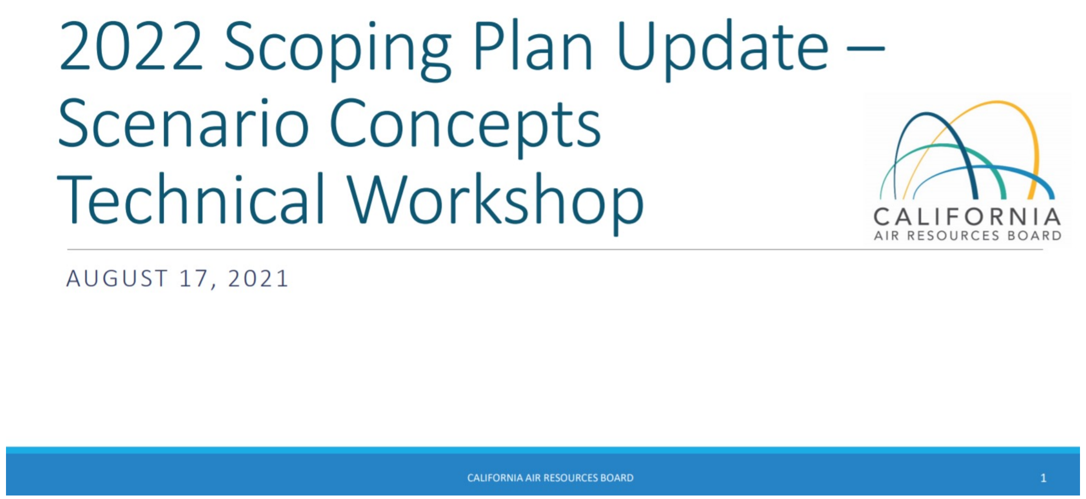
UCO RD in California has $8.00 per gallon in value to be divvied up between the parties

With increased penetration, ICF expects some margin compression for RD, most likely in physical fuel and CAR

- Credit prices going up as market moves from surplus to deficits
- ICF sees credit prices remaining near $200 ($2020) for the near and medium term, with slight reductions in the 2030's due to electrification of the fleet
- CARB looking at credit QE in late 2020's



ICF's View on Credit Bank



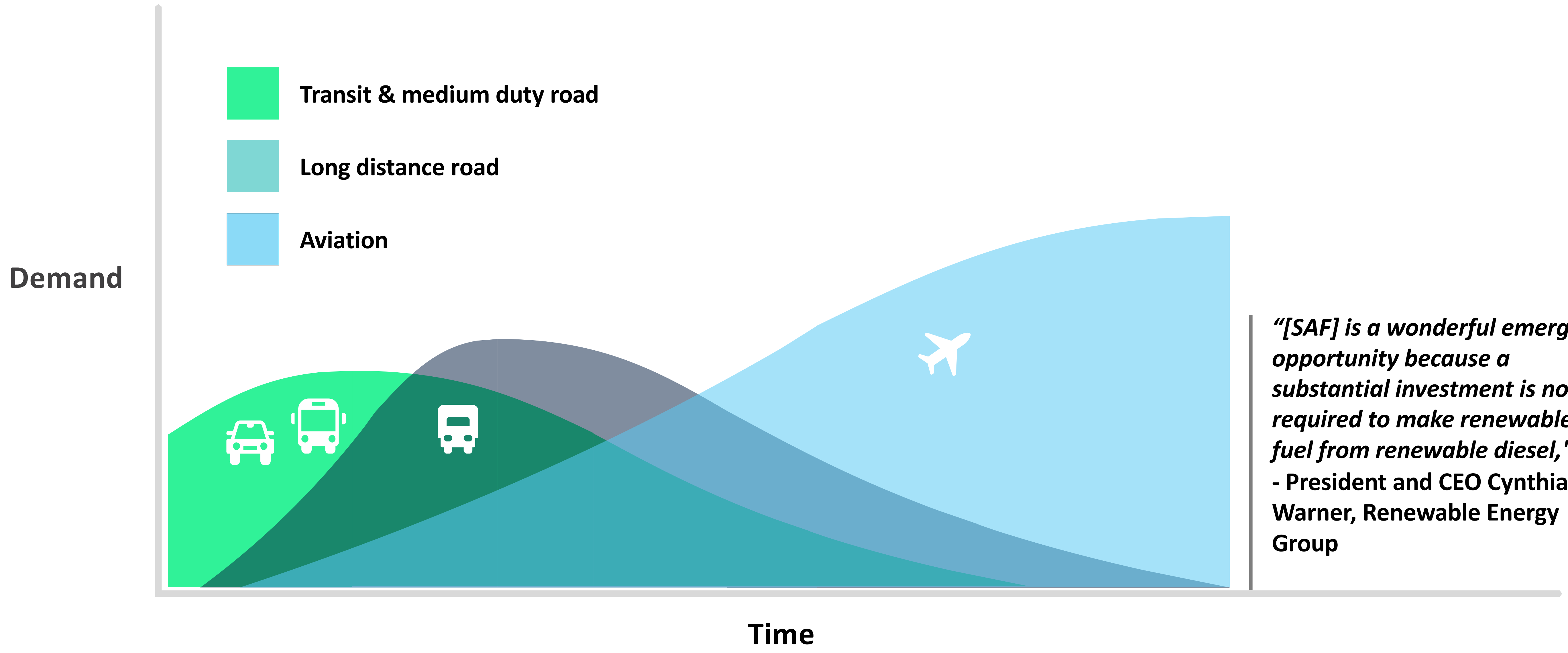
SB32 =>40% GHG Reduction by 2030

80% GHG Reduction by 2050

Carbon Neutral by 2045

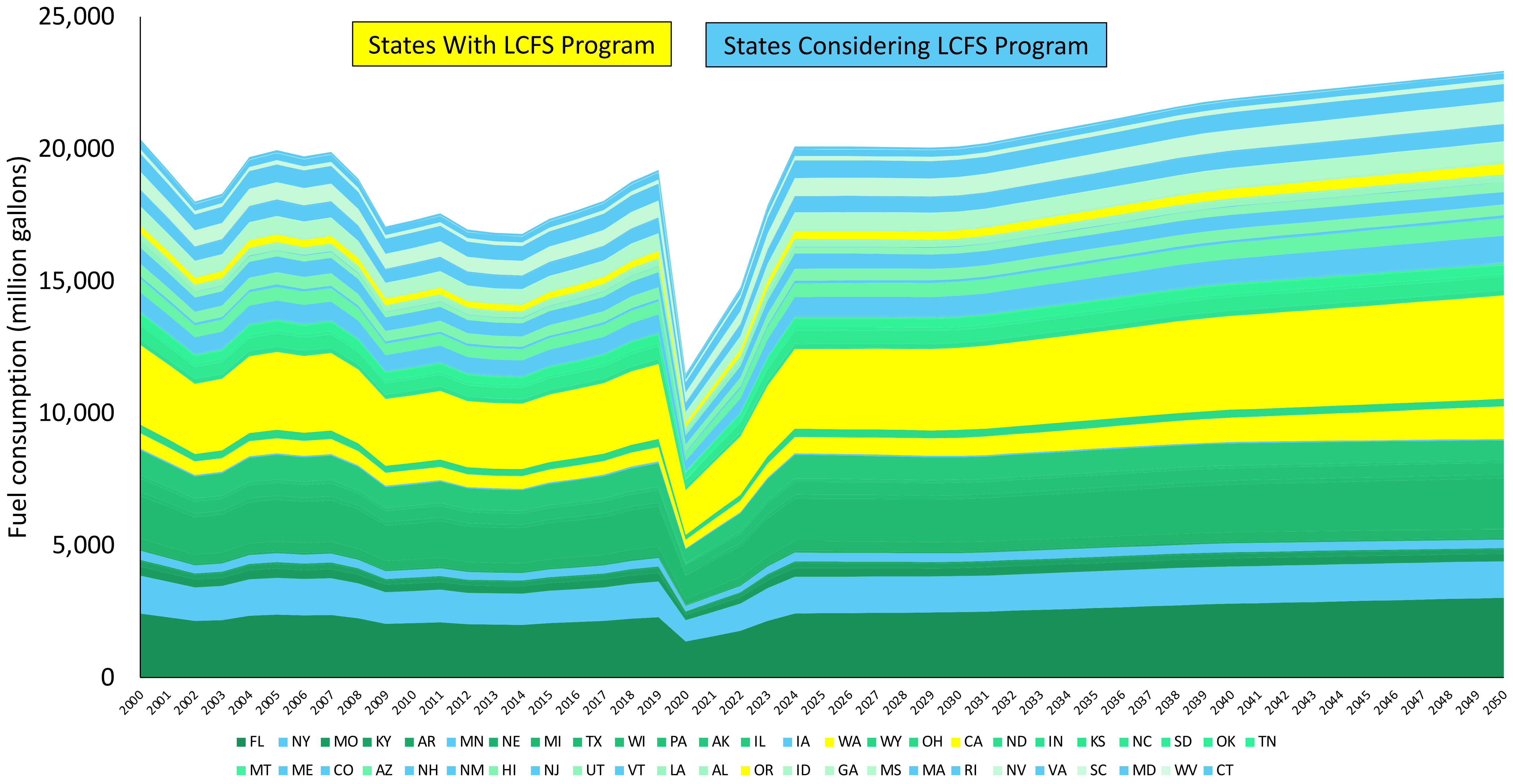
A tightening LCFS Program? And Expanding Markets……

Renewable diesel can be made into SAF via isomerization



"[SAF] is a wonderful emerging opportunity because a substantial investment is not required to make renewable jet fuel from renewable diesel,"
- President and CEO Cynthia Warner, Renewable Energy Group

Going forward – RD capacity moves to harder to decarbonize markets such as aviation



SAF - It’s a 20+ billion-gallon potential market in the U.S.

Conclusions

- Limited credit generation opportunities keeps credit prices high through the 2030's
- Margin compression may occur on physical fuel and CAR before LCFS
- RD capacity moves to SAF market in high hydrogen and electricity penetration scenarios

ICF

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About ICF

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