# Renewable Propane: Regulatory & Refiner Perspectives

Prepared for the Renewable Propane Summit

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# Fueling the future of transportation energy with trusted industry experience

1. Stillwater Associates leverage decades of experience to help clients navigate transportation fuels market challenges. **We see things others miss.**
2. **Our clients:** government agencies, petroleum and renewable fuels companies, trade associations, technology developers, private equity firms, and law firms.
3. Leading experts on renewable fuels markets and the regulations that drive them.
4. Stillwater's **LCFS and C&T Newsletters** offer producers, importers, traders, and investors the right information to make smart credit market decisions.
5. Our library of **Carbon Market Outlooks** provides a unique, in-depth perspective on the future of carbon markets and the availability of low carbon fuels.
6. **Questions about renewable fuels markets?** Our team of experts is available to provide specific analysis and tailored strategy for your needs.

# Agenda

1. Regulatory environment: Incentivizing carbon reduction
   a. $CO_2$ reduction regulations for transport
   b. A couple of related transport fuel notes
   c. $CO_2$ reduction regulations for heating

2. Refiners' view: How renewable propane stacks up against the competition

# $CO_2$ reduction regulations for transport

Driving forces behind renewable fuel supply & demand

# LCFS

- Administered by CARB
- Reduces the CI (gCO2e/MJ or g/MJ) of the transportation fuel pool by setting an annual carbon reduction standard
- Current reduction target is 20% by 2030. *That will probably change.
- Fuels with a CI above the standard (currently gasoline & diesel) generate deficits. Fuels with a CI below the standard (renewable fuels, electricity) generate credits.
- Deficit generators must purchase or generate credits to be in annual compliance with the standard
- Compliance mechanism = LCFS credit

# CFP

- Administered by DEQ
- Modeled after the CA program with some slight differences
- Current reduction target is 37% by 2035
- Compliance mechanism = CFP credit

# CFS

- Administered by Ecology
- Modeled after the CA & OR programs with some slight differences
- Current reduction target is 20% by 2034
- Compliance mechanism = CFS credit

# C&T

- West Coast state carbon Cap & Trade Programs
- Administered by CARB, Ecology, and DEQ
- Places a declining cap on major sources of emissions
- CA & WA programs establish an auction for carbon allowances which covered entities may purchase to offset emissions. Proceeds from auctions are used for in-state climate investment.
- CA program includes Cap-at-the-Rack fee for petroleum fuels at the wholesale level.
- CA & WA compliance mechanisms = allowances & offsets

# CPP

- OR CPP provides compliance instruments to covered entities for free. They are not sold by the state but can be traded between entities. Covered entities may also purchase Community Climate Investment (CCI) credits to offset emissions.

# RFS

- Administered by the EPA
- Mandates specific volumes of renewable fuel, identified by separate categories, be blended into petroleum fuel
- Compliance mechanism = RIN
- *Can be political

# BTC

- Administered by the IRS
- Provides $1 per gallon tax credit for RD/BD/SAF blended with petroleum fuel
- Expires at the end of 2024
- *easy peasy

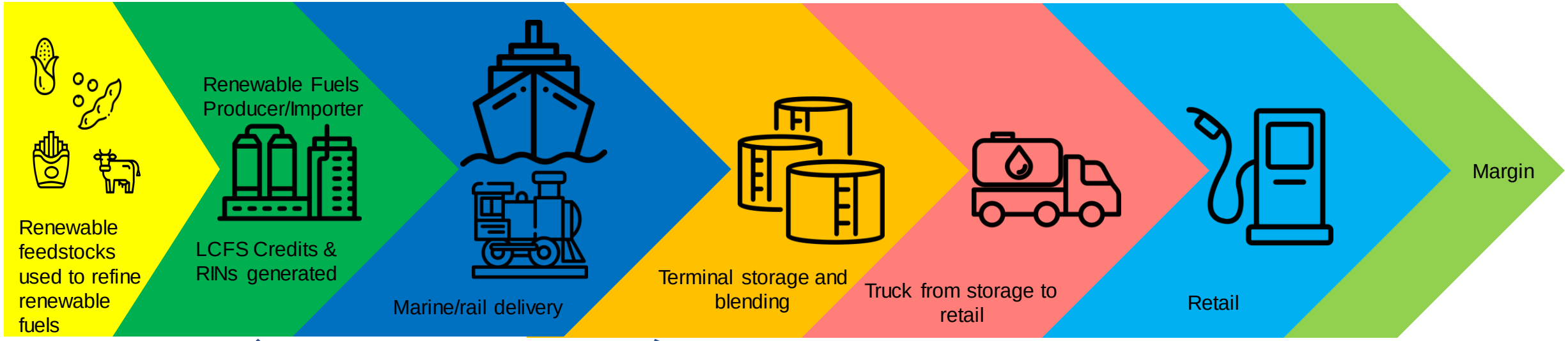
# AFTC

- Administered by the IRS
- Provides $0.50 per gge tax credit for propane, natural gas, hydrogen, etc. (= ~ $0.37 per propane gallon)
- Re-instated in 2022. Expires at the end of 2024.

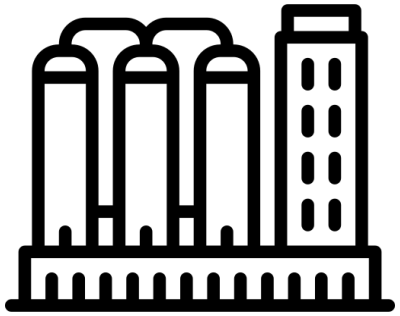
# CFPC (45Z)

- Part of the IRA - starts in 2025.
- Available to any transportation fuel produced in the U.S. (not just RD/BD/SAF)
- Per gallon credit is calculated from the emissions rate of the fuel. IRS will publish an annual table of emission rates for each applicable fuel.
- Base rate for non-aviation fuels is $1 per gallon for fuels with an emissions rate less than 50 kgCO2e/mmBTU.
- Value of CFPC will probably be lower than the BTC for most producers.
- *will be more complicated than the BTC or AFTC

# The renewable fuels value chain relies on environmental credits and tax incentives.

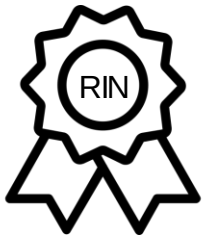



LCFS Credits sold to petroleum refiners and importers



SAF gets IRA SAF Tax Credit through 2024. Starting in 2025, U.S. Renewable fuels producers will collect 45Z Tax Credit.

RINs are separated and sold to refiners and importers




If RD/BD producers sell R99/B99, they can separate the RINs and collect the BTC. Propane sellers can collect the AFTC. BTC and AFTC end in 2024.

In California, C&T Cap-at-the-Rack fee is levied on CARBOB/ULSD/LPG position holder at the terminal.

Credits & incentives offset the high cost of renewable fuel production with the goal of bringing the consumer cost of renewable fuels to parity with petroleum fuels.

# Renewable fuels producers benefit from stacking the value of credits and incentives.

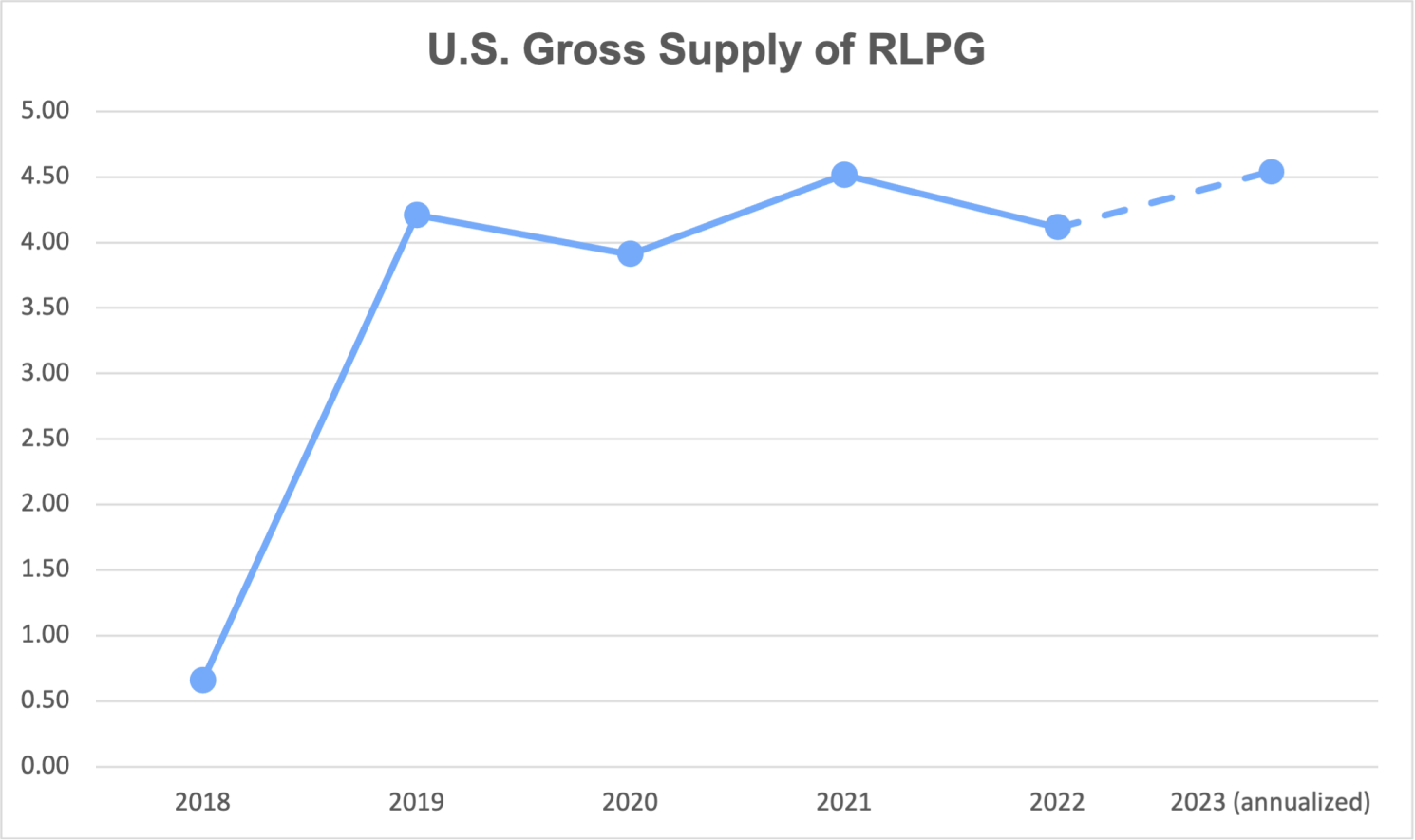
Incentive Value for 32 CI RP in California vs. non-LCF/C&T jurisdiction ($/gal)

| RP 32 CI | CA | Non-LCF |
|---|---|---|
| Cap-at-the-Rack | 0.21 | --- |
| LCFS Credit Value $79/MT | 0.43 | --- |
| RINs Value $1.44 | 1.58 | 1.58 |
| AFTC | 0.37 | 0.37 |
| **Total RP Incentive Value** | **2.59** | **1.95** |

Based on 2023 LCFS benchmark values for renewable propane and market prices reported on August 10, 2023
Source: OPIS, CARB, AFDC

The high value of the full incentive stack drives renewable fuel supply to LCF regulated jurisdictions.

# LCF & RFS regulations have incentivized the creation and growth of the renewable diesel (RD) market and subsequently the renewable propane (RP) market.

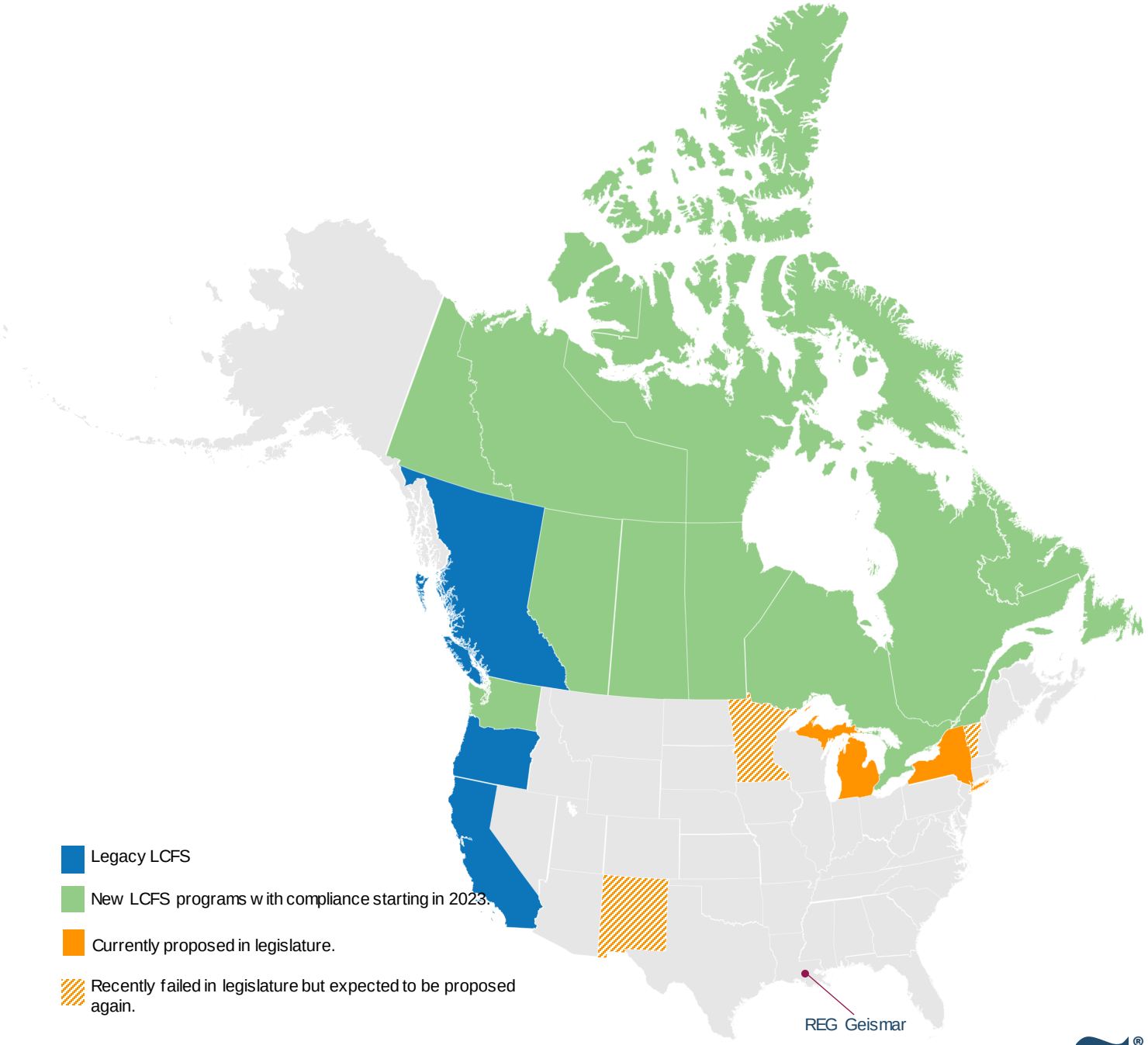



Source: EPA EMTS

1. Total volume reported to the EPA grew from 0.66 million gallons (mg) in 2018 to a high of 4.5 mg in 2021.
2. At 2.3 mg in 1H2023, this year is on track to meet or beat 2021 performance.
3. Most of this volume is directed at California, with smaller volumes supplied to Oregon.

# Outlook for LCF Regulations

1. In the near term, Stillwater does not anticipate the passage of a national LCF program
2. We expect more states to adopt LCF programs



# Outlook for federal incentives: 45Z will replace AFTC

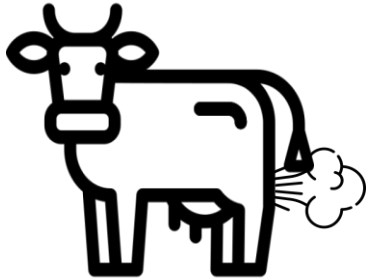
**CFPC (45Z)**

1. The IRA creates a new per-gallon tax credit based on carbon reduction standards starting in 2025.
2. RP with an **emissions rate (ER)** below 50 kgCO2e/mmBTU will qualify for an up to $1 per gallon tax credit. The IRS will publish a table of ERs for similar types and categories of fuels.
3. 45Z tax credit calculated based on a calculated **emissions factor (EF)** multiplied by the $1 per gallon base rate: ***45Z* = *(50-ER)/50* x $1**
4. Sample 45Z tax credit for RP: ***(50-35)/50* x $1 = *$0.30***

# A couple of related transport fuel notes

# A note about renewable natural gas (RNG)…

RP



RNG

| | RP | RNG |
|---|---|---|
| **Average CI** | **32** | **-5** |
| **RINs Value** | D5 x 1.1 /gal | D5 or D3 x 1 /77,000 BTU |
| **Accounting provisions** | Physical delivery | Book & Claim accounting |
| **AFTC credit value per gasoline gallon equivalent (gge)** | $0.37 | $0.50 |
| **Petroleum alternative subject to Cap-at-the-Rack?** | Yes | No |

RNG's very low CI provides significant advantages over RP and other renewable fuels.

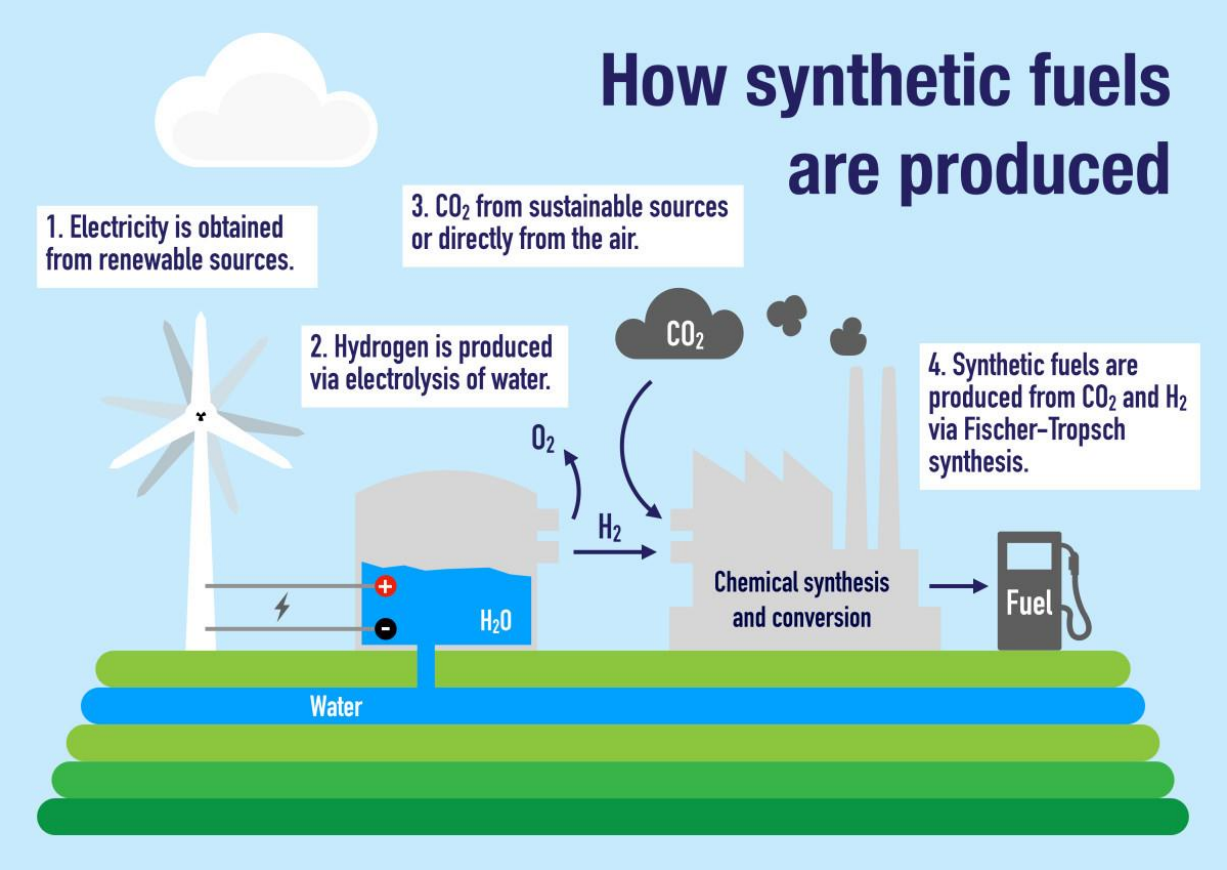
# RFS & LCFS incentives add significantly more value to RNG

Incentive Value for RP vs. RNG in California ($/gal)

| Incentive | RP 32 CI | RNG -5 CI |
|---|---|---|
| Cap-at-the-Rack | 0.21 | --- |
| LCFS Credit Value $79/MT | 0.43 | 0.86 |
| RINs Value* | 1.58 | 2.78 |
| AFTC | 0.37 | 0.50 |
| **Total Incentive Value** | **2.59** | **4.14** |

*RP qualifies for D5 RINs. D5 price was $1.44 on 8/10/23. Most RNG qualifies for D3 RINs. D3 price was $2.78 on 8/10/23.
Based on 2023 LCFS benchmark values and market prices reported on August 10, 2023
Source: OPIS, CARB, AFDC

# A note about e-Fuels…




Source: Fleet Europe

1. In very early demonstration phase.
2. Generates drop-in fuel that can be used in conventional engines.
3. $CO_2$ captured in production process is equal to $CO_2$ emitted by vehicle.

Expensive and energy intensive process without much upside

# $CO_2$ reduction regulations for heating

Source: FuelSnap

# IRA Implications for RP in heating

Clean Energy & Efficiency Incentives for Individuals (25c)

1. Starting January 1, 2023 through December 31, 2032
2. Residential energy property that meets the Consortium for Energy Efficiency (CEE) highest efficiency tier.
3. Credit up to $600 per item (max $3,200). Costs may include labor for installation.
4. Qualified property includes new:
   a. Central air conditioners
   b. Natural gas, propane, or oil water heaters
   c. Natural gas, propane, or furnaces and hot water boilers

# State incentives for RP: The Vermont Clean Heat Standard (CHS)

Vermont's Global Warming Solutions Act of 2020 requires increasing GHG emissions reduction targets by 2050. The 2023 Affordable Heat Act creates a clean heat performance standard for the heating fuel sector to help meet these goals.

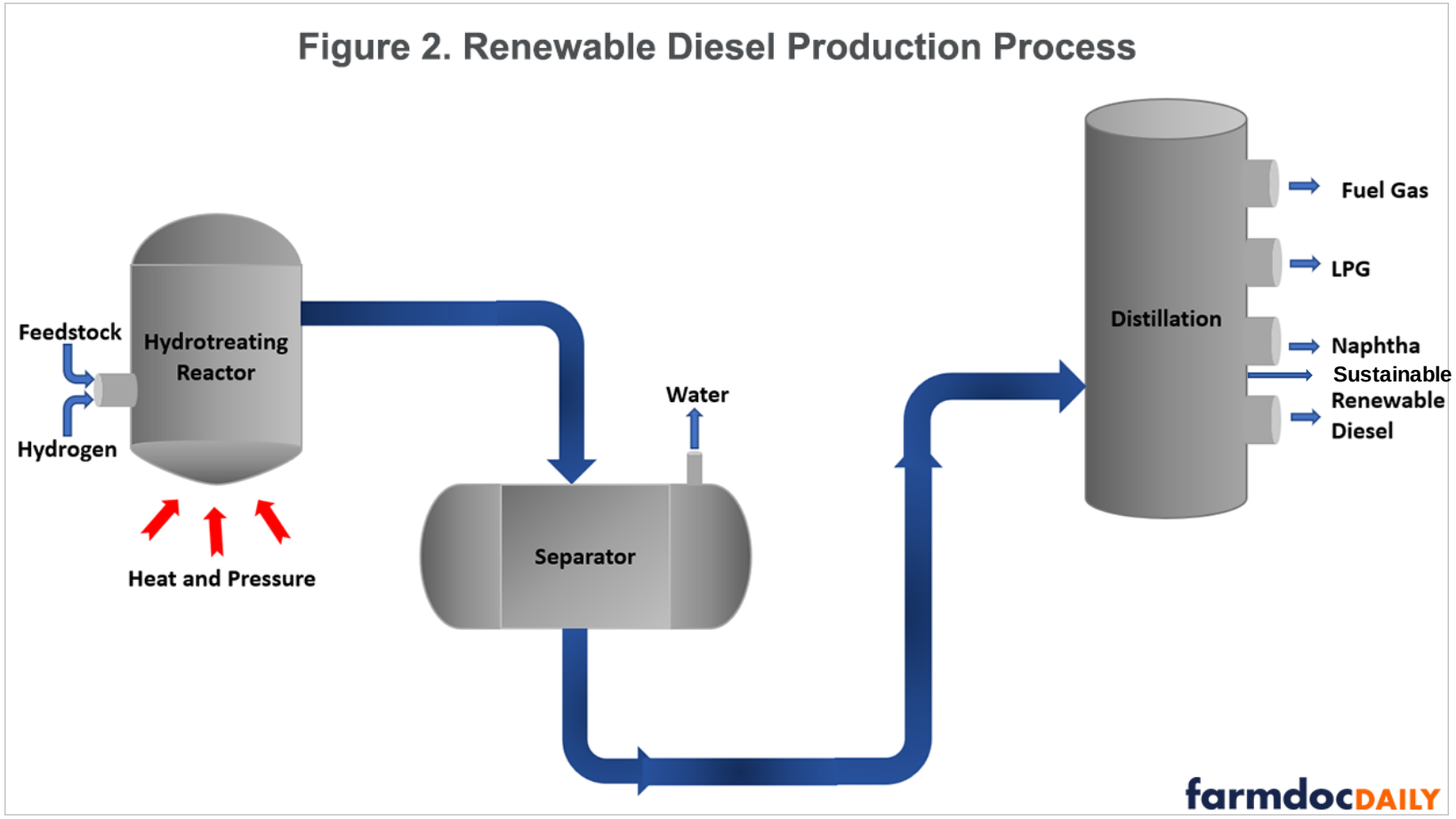
1. Will incentivize companies that make or import fuel (Obligated Parties) within the state to reduce pollution over time, consistent with the state's emission reduction goals.
2. The state's public utility commission (PUC) is responsible for designing and establishing a marketplace.
3. Obligated Parties must annually purchase or generate a certain number of **clean heat credits** equivalent to the amount of fossil fuels they delivered in the previous year.
4. Clean heat credit represents the total reduction of GHGs from specific **clean heat measures** delivered to end-use customers, such as the installation of heat pumps or home weatherization improvements.
5. Must be designed to allow all Vermonters an **equitable opportunity** to participate in and benefit from clean heat measures.
6. By 2025 the PUC must produce a report estimating the economic impact of the program on customers. Then the legislature must pass a 2nd law to enact the full CHS.
7. Any clean heat measure taken on 1/1/23 or later can count toward the new credit system. But the marketplace for credits won't be up and running until after lawmakers approve the 2nd law and the rules take effect.

# Refiners' View

## Opportunities and barriers for RP


REG Geismar, LA Renewable Diesel Refinery
Source: BIZ New Orleans

# LPG (RP) is a product of the renewable diesel production process




Refiners have a lot of choices for the propane they produce:

1. Burn it for fuel
2. Use it for hydrogen feed
3. Segregate and sell on the market

Using RP for hydrogen feed eliminates the need for natural gas and lowers the overall CI of products with higher incentive value and demand – RD and SAF.

# What is the value of RP to refiners?

1. RP must compete with products with higher yield, incentive value, and demand: RD and SAF.
2. CA refiners may be able to sell RP locally for a premium.
3. Refiners far from LCF markets need to bear the costs for segregated storage and rail transport.

California Incentive Value Comparison ($/gal)

| Incentive | RP 32 CI | RD 32 CI | SAF 32 CI |
|---|---|---|---|
| Cap-at-the-Rack | 0.21 | 0.37 | --- |
| LCFS Credit Value $79/MT | 0.43 | 0.53 | 0.52 |
| RINs Value* | 1.58 | 2.38 | 2.10 |
| AFTC | 0.37 | --- | --- |
| BTC | | 1.00 | |
| SAF Tax Credit | | | 1.39 |
| **Total Incentive Value** | **2.59** | **4.28** | **4.01** |

*RP and RD qualifies for D5 RINs. D5 price was $1.44 on 8/10/23. RD qualifies for D4 RINS. SAF in this instance also qualifies for D4 RINs. D4 price was $1.40 on 8/10/23.
Based on 2023 LCFS benchmark values and market prices reported on August 10, 2023
Source: OPIS, CARB, AFDC

# Refiners' attitude to RP: Barriers and Opportunities

1. The RP for transport market is small: Propane accounts for about 2% of total energy used in the U.S. Of that, only about 3% of propane is used for transport.
2. New greenfield or smaller converted RD facilities with limited storage capacity will be most likely to value RP for hydrogen feed over investment in segregation and storage.
3. Large converted brownfield refineries that have a history of propane segregation and storage will be more likely to produce RP for sale.
4. RP is more likely to be produced for sale rather than for hydrogen feed if it's produced in or near LCF-markets.

# Outlook for the incentive stack

2025 California Incentive Value Comparison ($/gal)

| Incentive | RP 32 CI | RD 32 CI | SAF 32 CI | RNG -5 CI |
|---|---|---|---|---|
| **Cap-at-the-Rack*** | 0.22 | 0.40 | --- | --- |
| **LCFS**** | 0.46 | 0.55 | 0.55 | 0.96 |
| **RINs***** | 2.15 | 3.30 | 2.91 | 3.23 |
| **45Z** | 0.30 | 0.30 | 0.53 | 1.00 |
| **Total Incentive Value** | **3.13** | **4.55** | **3.99** | **5.19** |

*WAG
**Stillwater 2025 LCFS Credit Price Outlook = $96/MT
**Stillwater 2025 RINs Outlook: D3 = $3.23, D4 = $1.94, D5 = $1.95
Source: Stillwater LCFS Credit Price Outlook and RFS RINs Price Outlook

# Conclusion

1. The RP incentive stack is less valuable than for alternate products.
2. Refiners may not choose to sell RP if storage is limited and production is far from LCF jurisdictions.
3. Establishment of LCF programs for heating markets, particularly in states closer to production centers, could be a significant game-changer.

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*...experience runs deep*

# Thank you.

Questions?