

FEDERAL RESERVE BANK *of* CHICAGO

**Biofuels in the Midwest: Today and Tomorrow**

**November 30, 2021**

John Campbell  
Managing Director  
Ocean Park

# Ethanol Industry Investments

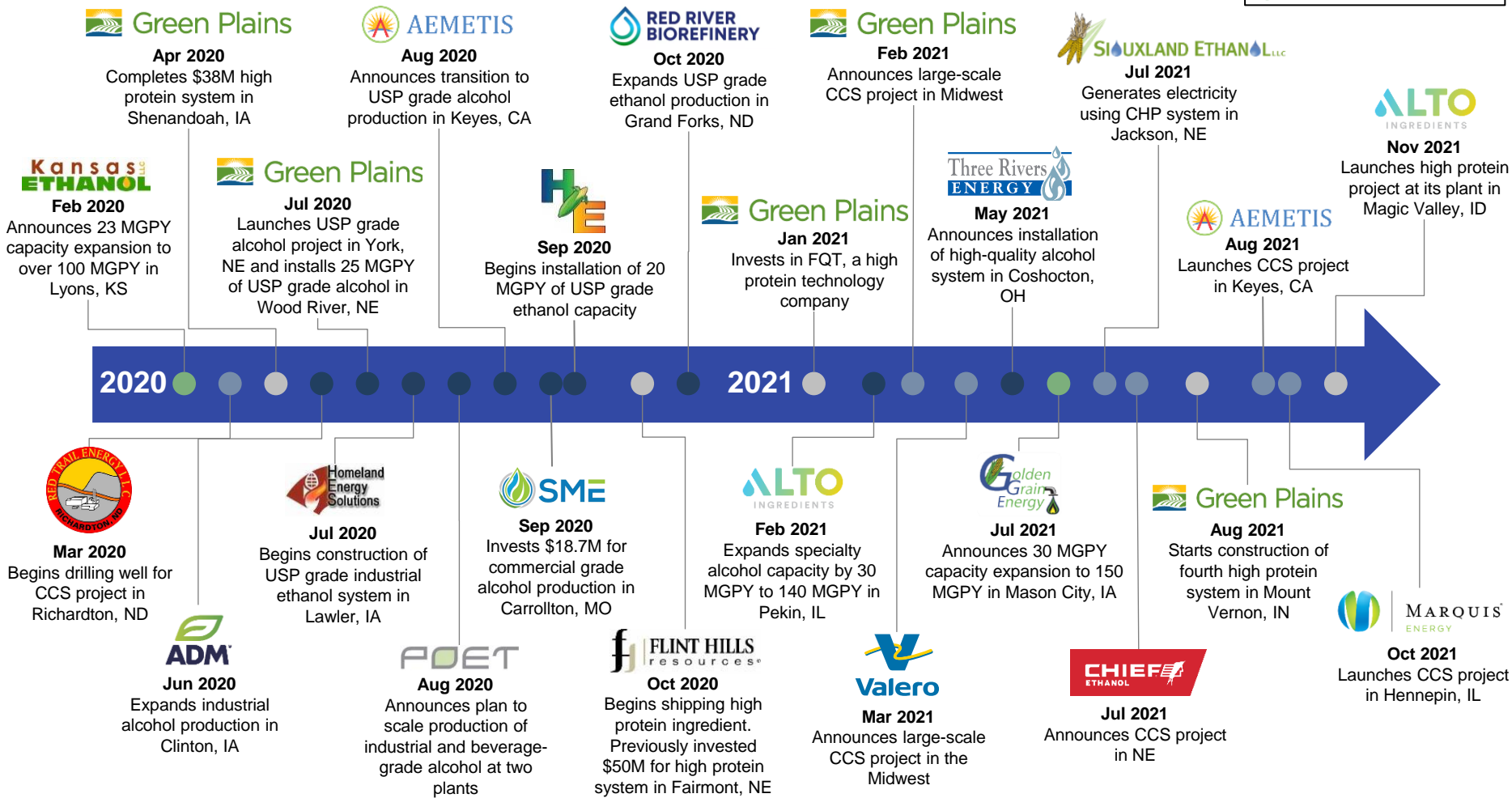
The combination of COVID-19, volatile margins, and uncertain policy has created a catalyst for change within the fuel ethanol industry. Traditional ethanol producers are investing or announcing projects in four key areas in pursuit of growth.

- **High-Quality Alcohol.** The onset of COVID-19 resulted in an undersupplied market for high-quality alcohol blended in hand sanitizers. Large spot market premiums inspired many traditional fuel ethanol players to shift towards high-quality alcohol.
- **High-Protein Coproducts.** Technology optimization in ethanol production has enabled the transition towards high-value protein coproducts from DDGS and yeast.
- **Low-Carbon Initiatives.** Growing momentum towards projects aimed at lowering the carbon intensity score of fuel driven by financial incentives including California's LCFS and federal 45Q tax credit.
  - Combined heat and power (CHP)
  - Carbon capture and sequestration / storage (CCS)
    - Direct injection into geologic formation onsite
    - Pipeline project for permanent storage or enhanced oil recovery
- **Capacity Expansion.** A few producers are moving forward with low-cost, incremental production expansion projects mainly through additional fermentation capacity.



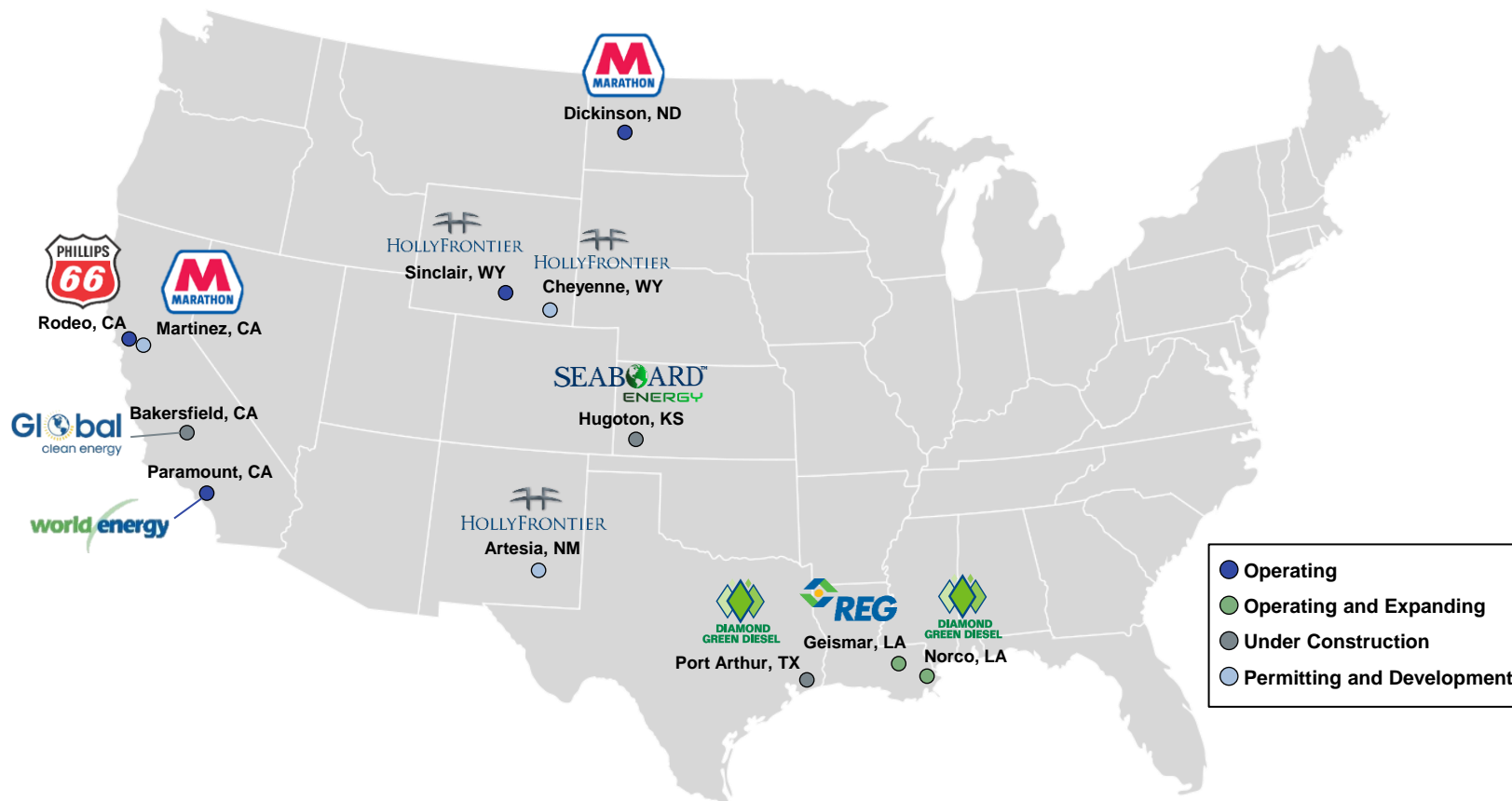
# Ethanol Industry Investments (cont'd)

- High-Quality Alcohol
- High-Protein Coproducts
- Low-Carbon Initiatives
- Capacity Expansion



# Renewable Diesel (RD) Plants

Twelve plants are operating or making rapid progress.



By 2024, these 12 plants will have 3.9 BGPY of production capacity.

Source: Company filings and press releases, OP research and analysis.

## Other Potential RD Projects

Additional announced RD projects total 3.3 BGPY. The status of these projects is uncertain from public information.



(100 MGPY)  
Wynnewood, OK;  
Coffeyville, KS<sup>(1)</sup>



(920 MGPY)  
Baton Rouge, LA



(600 MGPY)  
Clatskanie, OR



(336 MGPY)  
Baton Rouge, LA



(307 MGPY)  
Chalmette, LA



(260 MGPY)  
Paramount, CA



(153 MGPY)  
Mobile, AL



(140 MGPY)  
Great Falls, MT



(100 MGPY)  
Las Vegas, NV



(100 MGPY)  
Douglas, WY



(90 MGPY)  
Newton, IL



(80 MGPY)  
Hastings, NE



(34 MGPY)  
Hull, IA



(32 MGPY)  
Columbia, LA

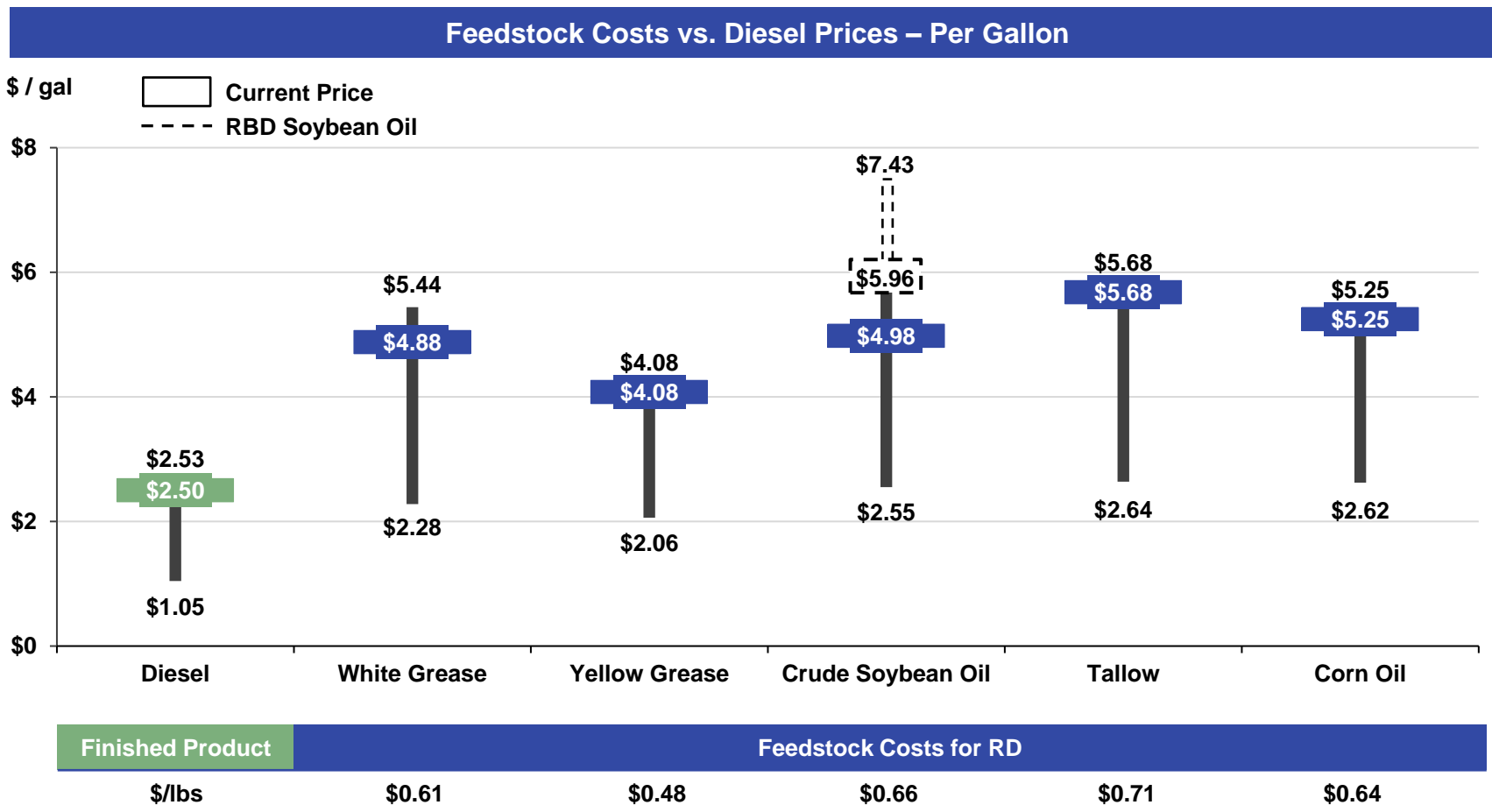
To the extent any of these projects are successfully completed, it will only amplify market forces.

Source: Company filings and press releases, OP research and analysis.

(1) Potential capacity has not been disclosed.

# RD Economics – Feedstock Costs

RD (and BD) feedstocks are expensive – costing twice as much as diesel.



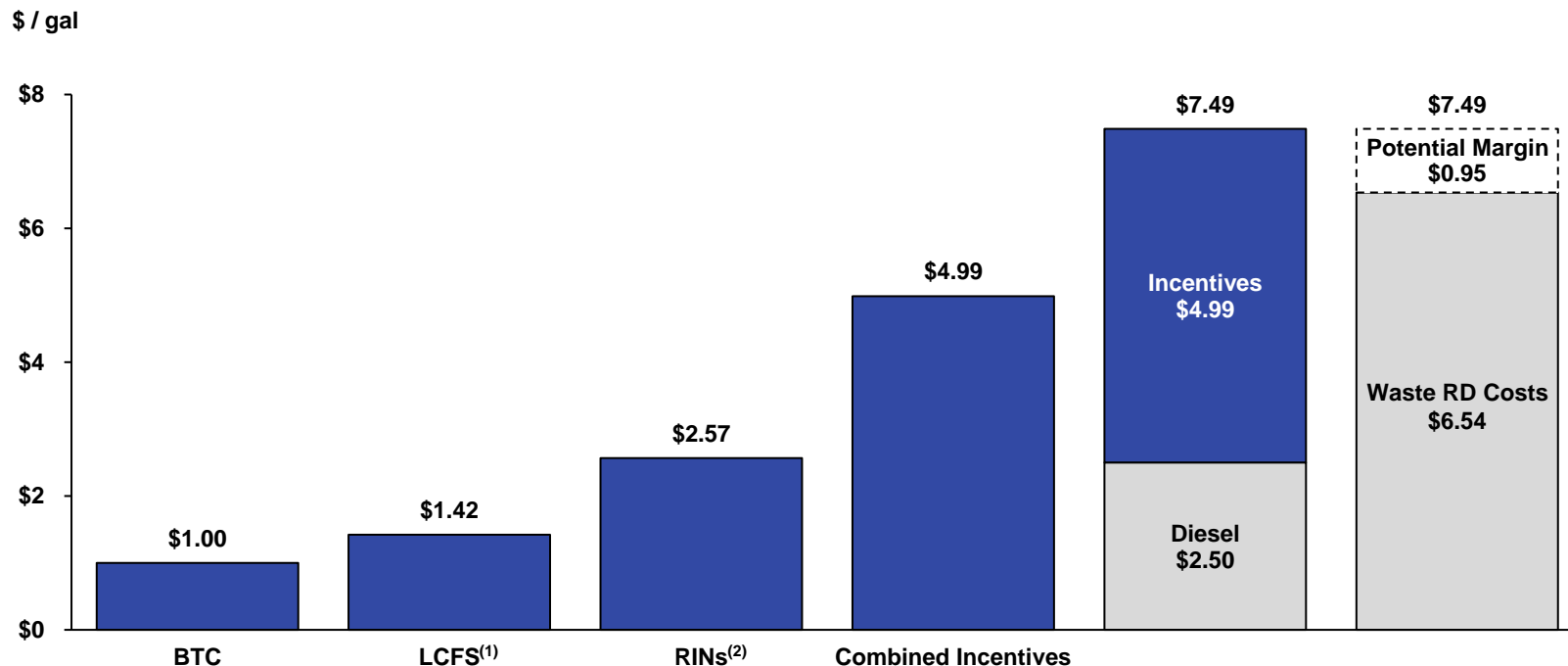
Source: The Jacobsen, Nasdaq, EIA, OP research and analysis.

Note: Current prices shown are as of Oct 27, 2021. Based on conversion of 8.5 lbs/gal for YG, 7.5 lbs/gal for SBO, 8.0 lbs/gal for WG/Tallow and 8.2 lbs/gal for Corn Oil.

# RD Economics – Policy Incentives Bridge the Gap

Cumulative policy incentives provide the economics for RD and BD production.

## Value of Policy Incentives



How long will the market pay this premium?

Source: The Jacobsen, CARB and OP research and analysis. Prices as of Oct 27, 2021.

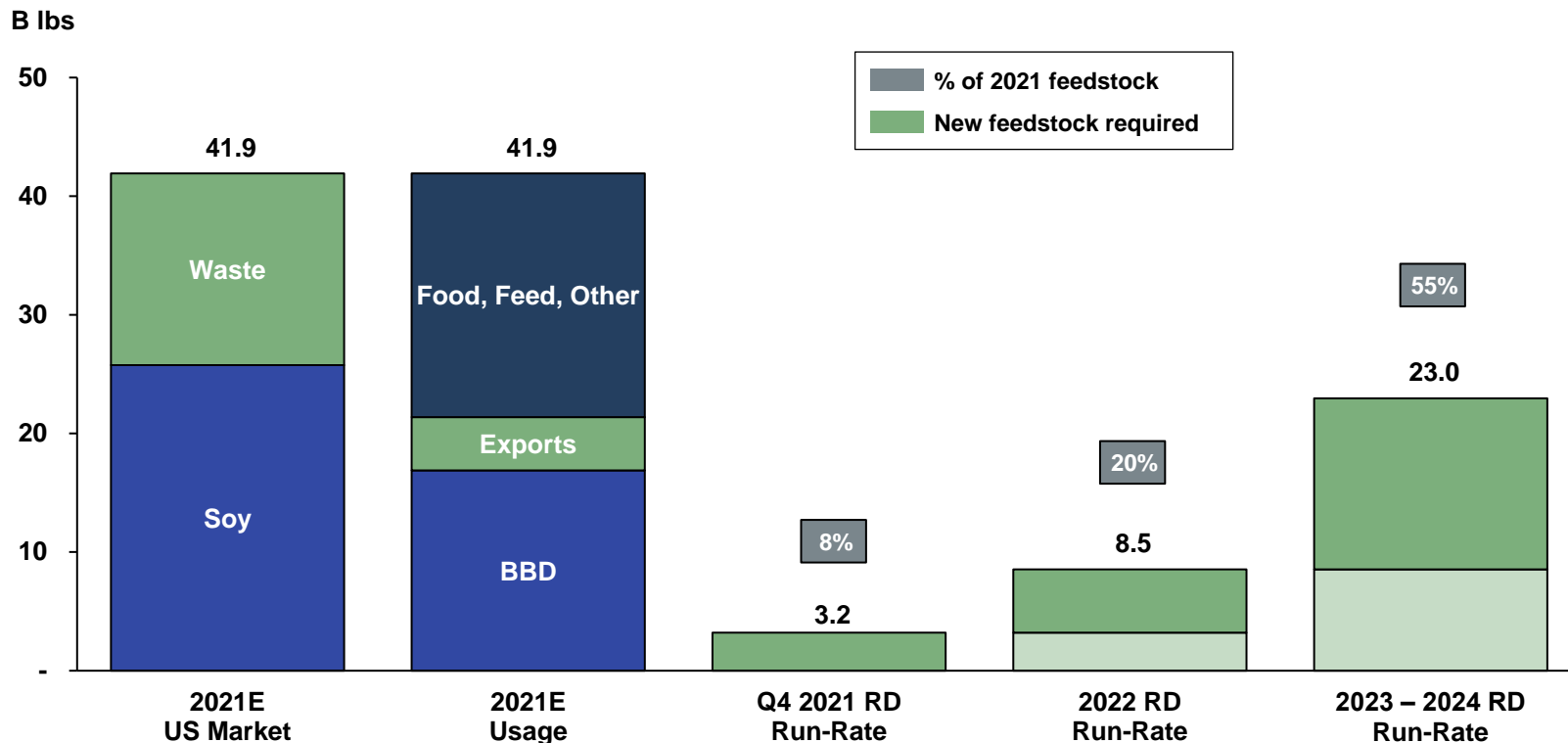
(1) Based on credit price of \$167/MT and average CI Score of 26.3. RD conversion CI scores range from 20 to 32.

(2) Based on D4 RINs value of \$2.57/gal for RD (\$1.51 x 1.7 factor.)

# Feedstocks – New RD Demand

Fuels are projected use 40% of feedstocks in 2021. By 2024, they would consume 95%.

## 2021 – 2024 Feedstock Usage



If all US feedstock were used for RD/BD, it would only produce 5.4B gallons of fuel.

Source: Render Magazine, USDA, EIA, National Agricultural Statistics Service (NASS), OP research and analysis.



# Wrap-Up

- It is all about feedstock for nature-based climate solutions.
- Additional corn starch is available, but the vehicle market is currently stuck at around 10% blend – alternative jet fuel, biochemicals and exports are future markets.
- Soy and waste feedstocks are effectively gone for renewable diesel.
- The next investment frontier is biomass to liquid (not alcohols).