Renewable Diesel (RD) Market Overview

Prepared For:

Susquehanna International Group

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PLG Consulting

Experience // Expertise // Excellence

Today's Presenter

DEAN PIACENTE, Senior Consultant

- Dean brings over 30 years of sales, marketing and financial planning experience to his teams, and was previously responsible for CSX's largest industrial products segment worth $4.5B. Dean implemented innovative marketing strategies, delivering over $100MM in growth by expanding export of new products and improving market share.
- He is a respected leader in the rail and intermodal transportation industries and is experienced in strategies to help companies reduce costs, mitigate risk, improve service and gain competitiveness. Dean helped CSX grow through business expansion, channel expansion and, most proudly, personnel talent development initiatives.

EXPERIENCE

- CSX Corporation
  - VP Sales & Marketing, Industrial Products
  - Vice President, Intermodal
  - VP Sales & Marketing, Chemicals, Petroleum & Fertilizers
  - Vice President, Financial Planning & Analysis
  - President & GM, CSX TRANSFLO

EXPERTISE

- Rail Transportation
- Logistics Procurement
- Business Strategy
- Market Analysis
- Chemicals
- Bulk Commodities
- Financial Planning & Analysis

About PLG

PLG TEAM

- Real-world, industry veterans
- Over 50 logistics and supply chain strategists, operations experts, analysts and project managers
- Delivering value to over 200 clients since 2001

CORE EXPERTISE

- Surface transportation and logistics
  - Rail
  - Truck
  - Marine
  - Pipeline
  - Terminals & Warehousing
- Renewables
- Chemicals
- Oil and gas
- Bulk commodities
- Manufacturing
- Mining and minerals

SERVICES INCLUDE

- Assessment and optimization
- Due diligence
- Operations
- Logistics procurement
- Marketing analysis
- Engineering
- Business strategy
- Site selection
- Technology
- Supply chain design

Representative Clients / / Partial List

ORION ENERGY PARTNERS

eia

EASTMAN

ExxonMobil

lyondellbasell

NESTE

Resources

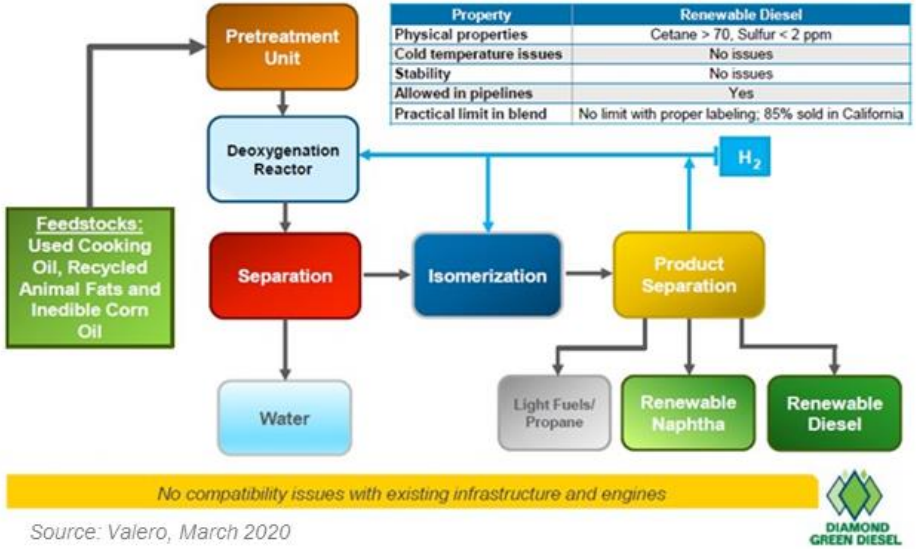
www.plgconsulting.com

White Papers, Presentations & Featured Insights:
https://plgconsulting.com/resources/

Today's Presentation

1. Renewable diesel background
2. Renewable diesel market consumption dynamics
3. Production capacity and expansion
4. Rail opportunity on feedstock and finished product

Renewable Diesel Process and Properties



Property	Renewable Diesel
Physical properties	Cetane > 70, Sulfur < 2 ppm
Cold temperature issues	No issues
Stability	No issues
Allowed in pipelines	Yes
Practical limit in blend	No limit with proper labeling; 85% sold in California

Renewable diesel background

- Advanced biofuel that reduces greenhouse gas emissions while meeting the same ASTM D975 specification as petroleum diesel (“drop-in biofuel”)
- No changes in engine, can be blended, and can be used in existing pipelines
- Can be produced by triglyceride feedstocks
  - Plant oils and animal fats (virgin or recycled), used cooking oils
  - Process consumes hydrogen and liberates water
  - Propane is also made during the process
- Cost of the triglyceride feedstock is the largest contributor to the cost of production

Renewable Diesel is Different Than Biodiesel

Biodiesel

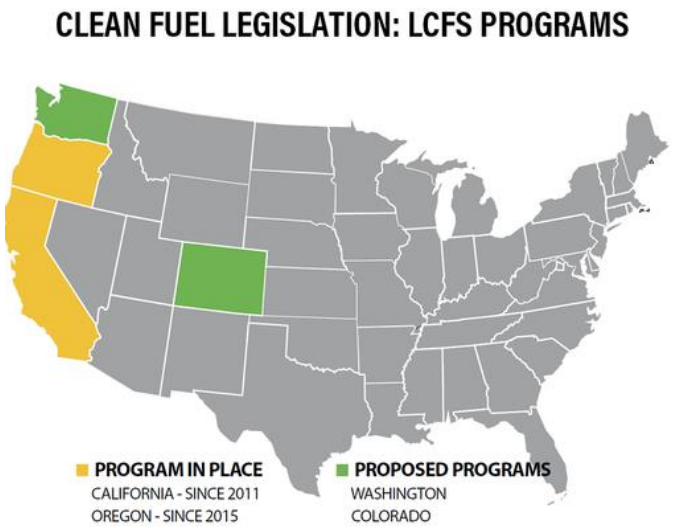
- Refined from fats, seed oil, and waste cooking oil
- Biodiesel is a mixture of chemical compounds named alkyl ester
- Transesterification turns feedstock into fatty acid methyl esters (FAME)
- Introduces oxygen into the fuel causing issues in cold temperatures, separation during storage, algae growth, and higher emissions
- Low cold flow properties lead to plugging or restricted flows in vehicle fuel systems and thus must be blended at a lower percentage
- Must be blended with petroleum diesel at different levels, usually at 5% to 20% level
- 55 cetane rating

Renewable Diesel

- Also refined from fats, seed oil, and waste cooking oil
- Hydrotreating process and doesn't introduce oxygen, thus no negative characteristics
- Composed of hydrocarbon, which is chemically similar to petroleum diesel and thus can be blended into petroleum diesel at higher blend levels without any blending limitations
- Can be transported in existing petroleum pipe systems
- Lower carbon intensity thus generates RINs at a higher rate (D5 level = 1.6 – 1.7) vs. biodiesel at 1.5) due to its lower carbon intensity
- 75 – 90 cetane rating

Consumption Driven by Government Policies

Renewable diesel (RD) is more costly to produce than petroleum diesel. California and Canada have programs based on carbon intensity which gives additional value to renewable diesel. 66 countries have mandates or goals to reduce emissions.

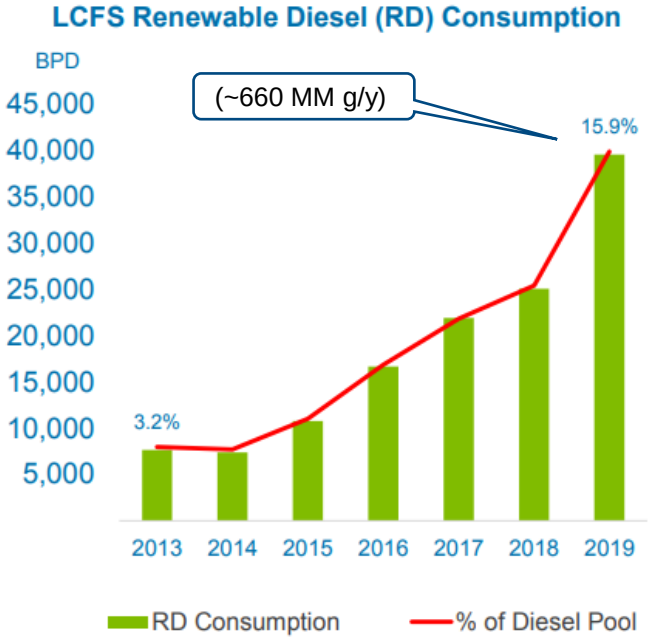


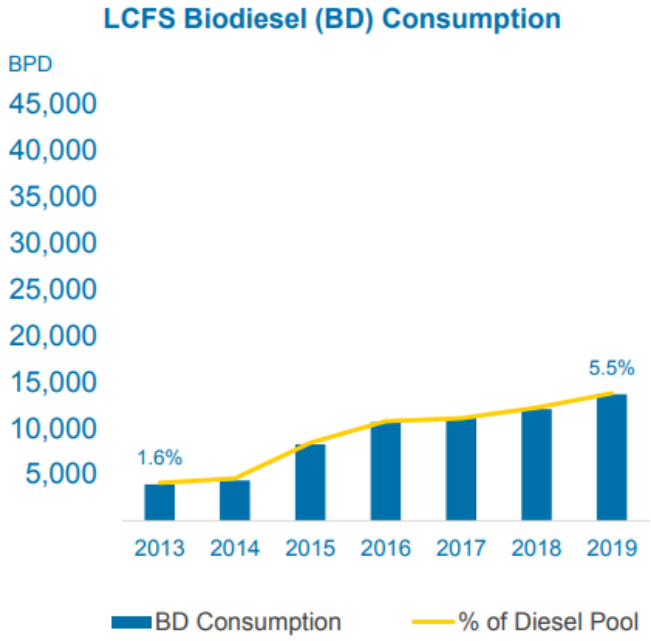
Source: Government-Fleet.Com 1/8/2020

- Low-carbon fuel standard (LCFS) mandate use of low-carbon fuels such as renewable diesel that burn cleaner than fossil fuels
- Goal to decrease CO_2 emissions
- Carbon intensity (CI) is measured in CO_2 equivalent emissions per unit of energy over the life-cycle of the fuel*
- With the California LCFS credit and the federal renewable fuel standard (RFS) credits make renewable diesel competitive with petroleum diesel
  - The EPA 2020 RFS is for 20.09B gallons
  - RD generate D5 level RIN credits or 1.6 to 1.7 plus a California Blenders Tax Credit that gives RD a subsidized value of $3.32/gal using tallow based feedstock

*Source: Valero, March 2020

RD Consumption and Blending Outpacing Biodiesel





Source: Diamond Green Diesel, California Air Resources Board

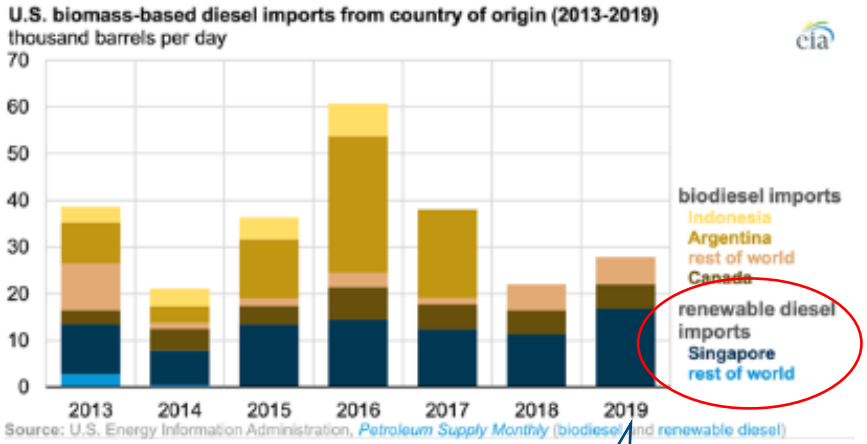
U.S. Capacity ~400 MM Gal and Imports ~300 MM Gal

Existing U.S. Capacity

Location	Company	Capacity (Thousands barrels per day)
Norco, LA	Diamond Green Diesel	17.9
Geismar, LA	Renewable Energy Group	4.9
Paramont, CA	World Energy	2.6
Garnett, KS	East Kansas Agri-Energy	0.3
Oklahoma City, OK	Envia Energy	0.2
TOTAL		25.9
		(~400 MM gallons/year)

Source: ADI-analytics, February 2020

Imports of Biomass



~17,000 b/d (~260 MM g/y) imported from Singapore into California

***Dimensionalized for Rail**:*

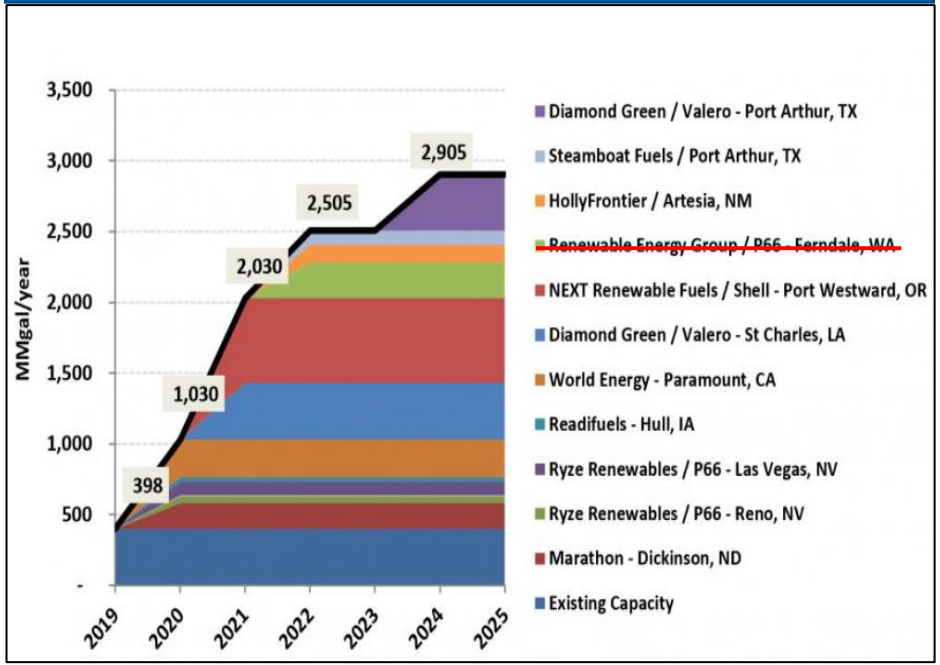
1 bbl. = 42 gallons

29k – 31k gallon tank car can hold 690 – 738 bbl.

100 MM gal/yr. plant is ~3,340 avg. rail carloads equivalent

RD Growth 2.4 MM Gal Nearly 8x Existing Capacity

Potential U.S. Renewable Diesel Production



Source: Baker & O'Brien, December 2019

Recent Announcements

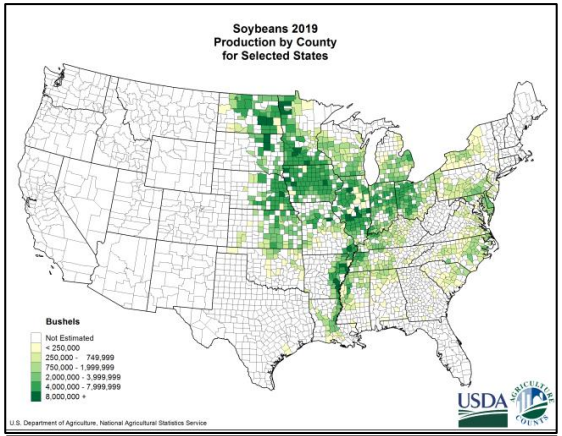
- **Diamond Green Diesel**
  - JV - Valero (refiner) and Darling (feedstock supplier)
  - Expanding capacity 400 MM gal/yr. at St. Charles, '21
  - Considering 2nd 400 MM gal/yr. facility in Port Arthur, '24
- **Renewable Energy Group and P66**
  - Announced in January 2020 they are discontinuing their plans for a WA plant due to permit issues
- **HollyFrontier**
  - Plans to convert Cheyenne, WY refinery to produce 90 MM gal/yr. of renewable diesel
  - Plans for a new 125 MM gal/yr. unit at Artesia, NM refinery

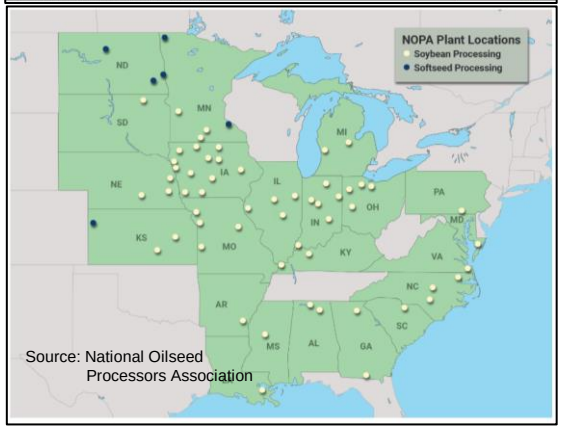
Large Rail Opportunity for Feedstock Moves

- Nearly a 1:1 inbound to outbound opportunity
- Predominately mid-west sources of feedstock
  - Animal renderings, distillers corn oil, soybean oil, used cooking oil
- Proximity to refiner and type of feedstock preferred will determine mode
  - Midwest refineries could chose a mix of truck and rail

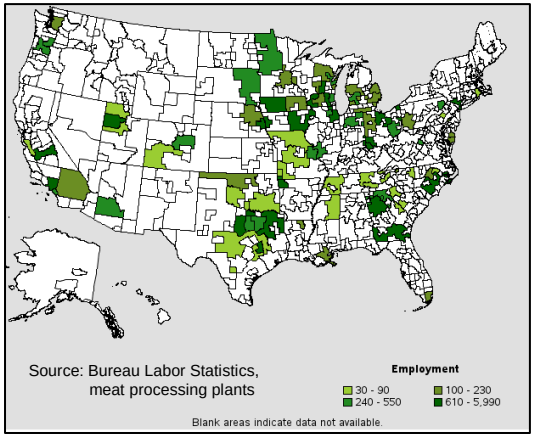
- Rail car type is a standard DOT-111
  - ~29,000 gal coil insulated, plentiful supply
- Manifest rail service (single cars)
- Non-hazardous product
- A 200 MM gal/year plant could consume ~7,000 rail carloads/year of feedstock

Feedstock Predominately Midwest Sourced





Source: National Oilseed Processors Association



Source: Bureau Labor Statistics, meat processing plants

Seed oils predominately in the Midwest

Animal processing plants heaviest in the mid-west

Mode of shipments dependent on proximity to feedstock

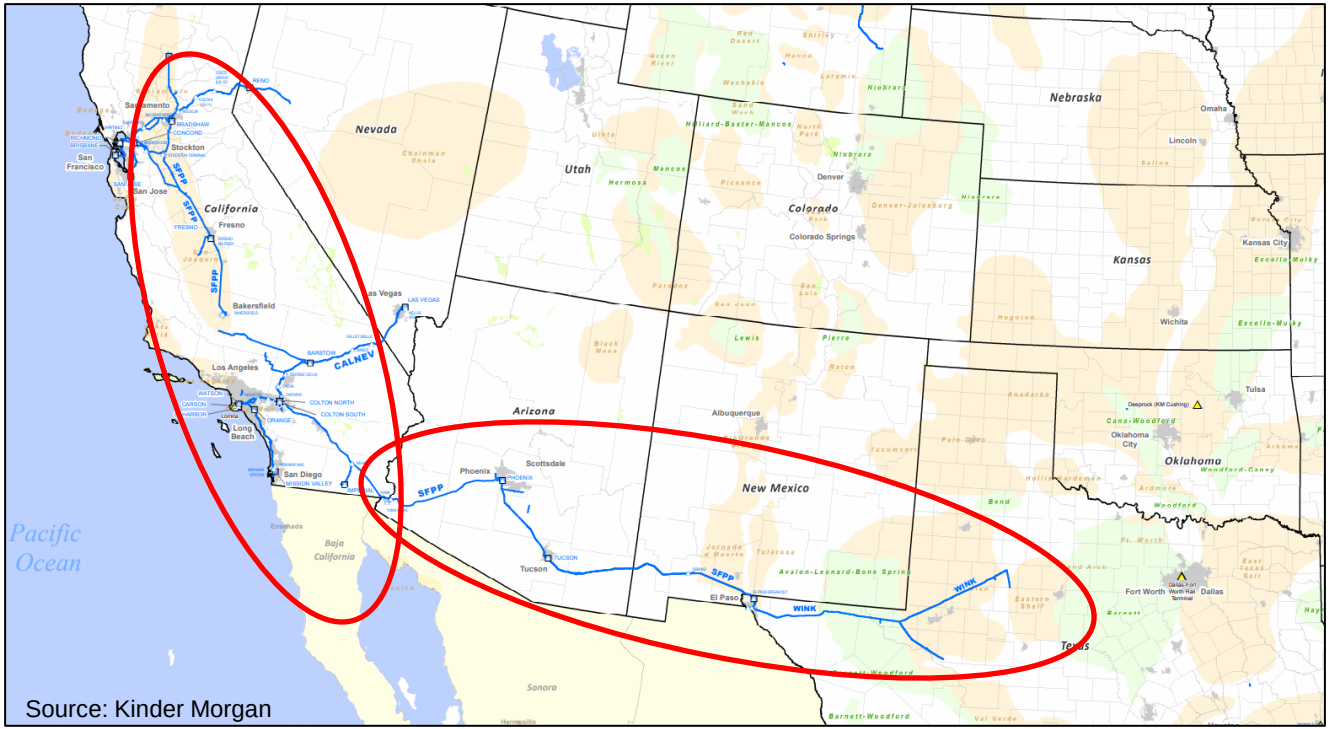
Refiners setting up to handle in and outbound rail

Large Rail Opportunity for Finished RD Moves

- Demand almost exclusively California with some to other West Coast states
- Transportation from refiners outside of California, Oregon, Washington most likely via rail
- Jones-Act vessels from Gulf Coast economically challenged
- CA instate refiners most likely ship pipe and truck

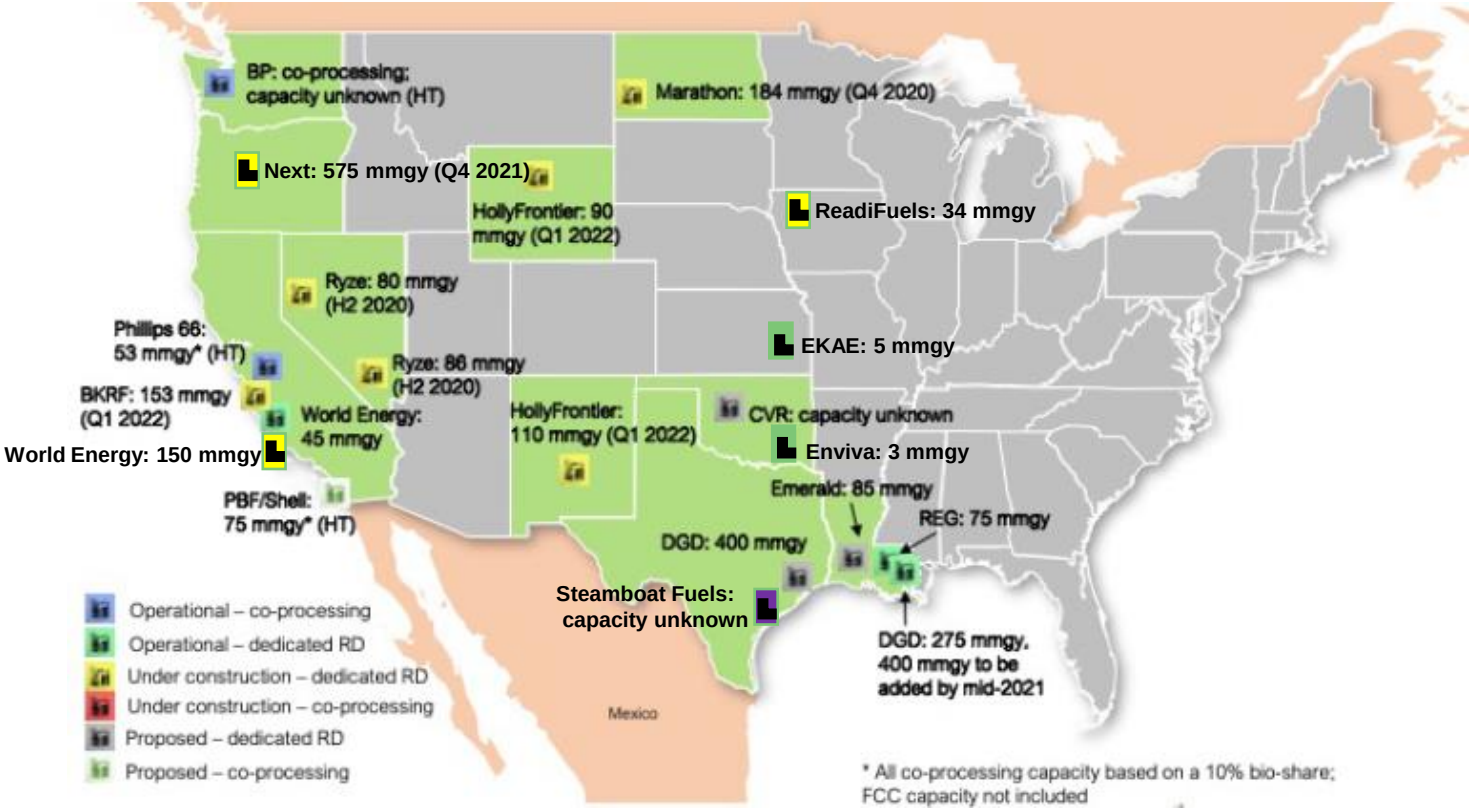
- DOT-117J preferred
  - ~30,000 gallons
- Manifest rail service (single cars)
- Hazardous flammable liquid
- A 200 MM gal/year plant could ship ~6,700 rail carloads/year

Pipe Competition Minimal



Source: Kinder Morgan

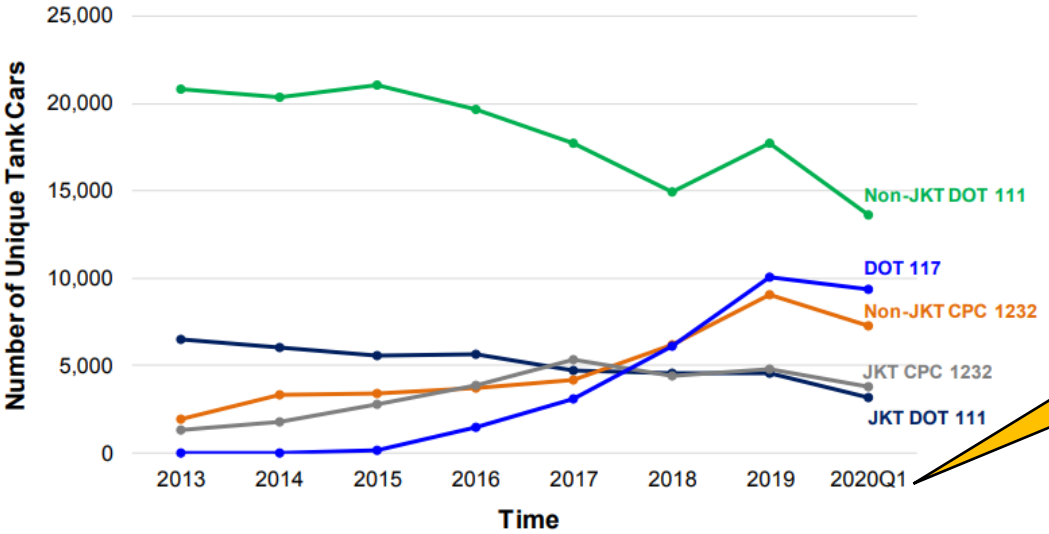
Large Inbound and Outbound Opportunity for Rail



Source: StratusAdvisors.com 6/11/2020; PLG Consulting

RD is Packing Group III, Transition to DOT-117J or R by 5/1/2029

There Has Been Over a 38% Reduction in the Number of DOT-111 Tank Cars Making at Least One Shipment Of Other Flammable Liquids from 2013 – 1st Quarter of 2020



25,077 tank cars in "other flammable liquid" Movements most are not DOT-117J or R

Source: American Association of Railroads
JKT = Jacketed

Questions and Comments