A Refinery Perspective

CALIFORNIA'S PETROLEUM ECONOMY: The Current Market and the Future Fuels Transition Plan

DR. SKIP YORK, CHIEF ENERGY STRATEGIST, TURNER, MASON & COMPANY

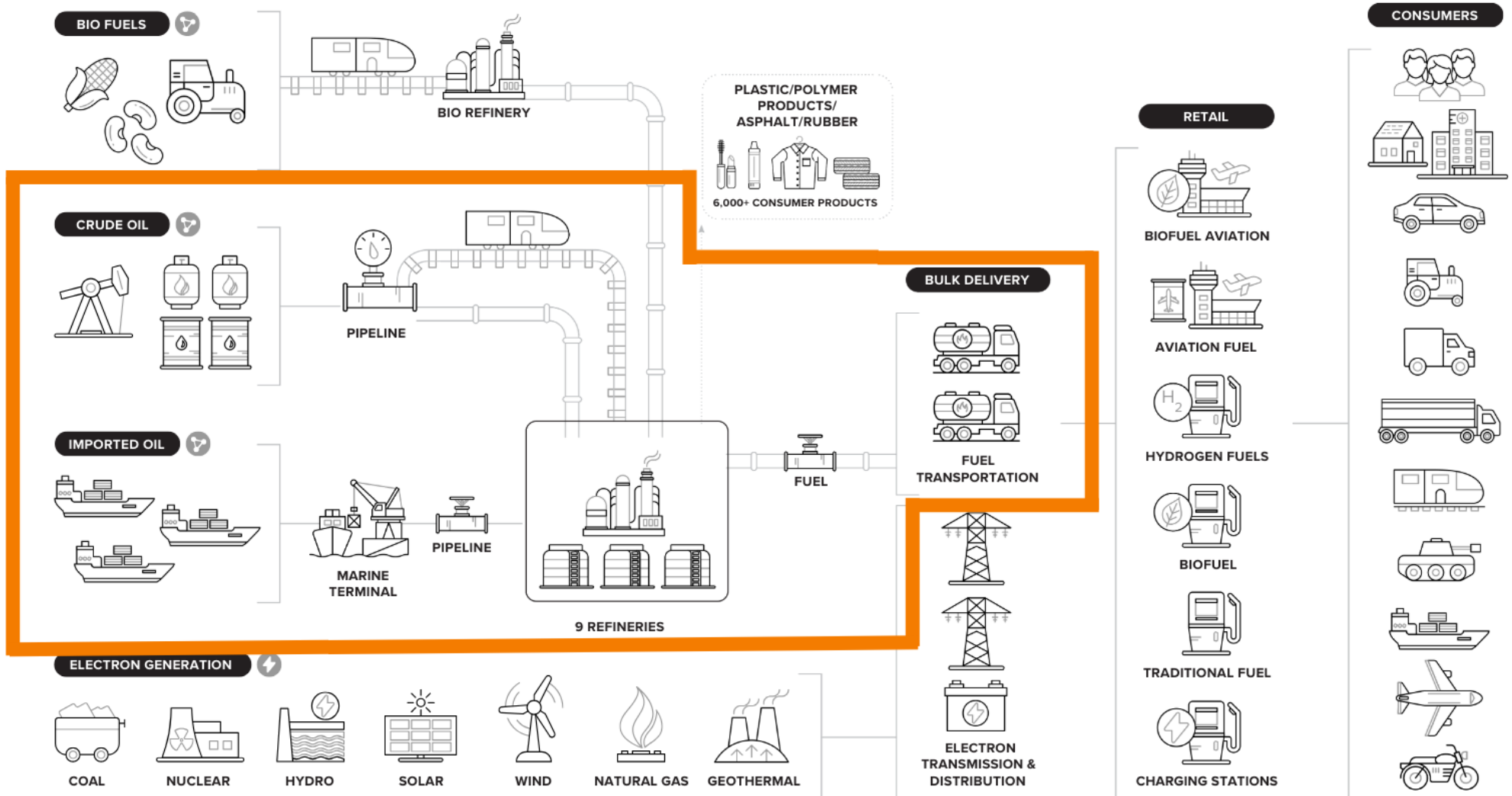
September 18, 2024

TRANSPORTATION ENERGY SYSTEM

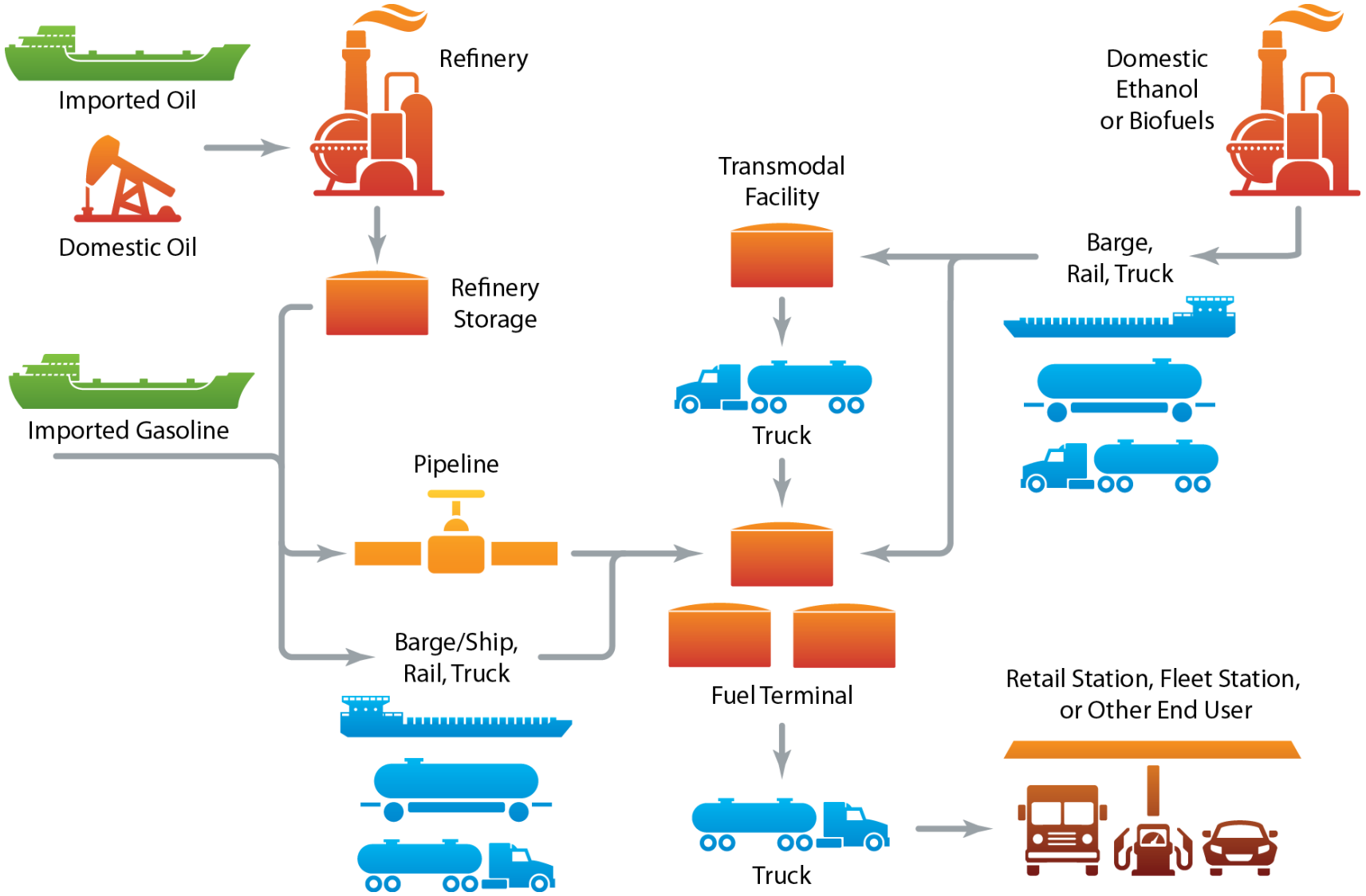
MOLECULE ELECTRON

SUPPLY

DEMAND



Learn more at **wspa.org**



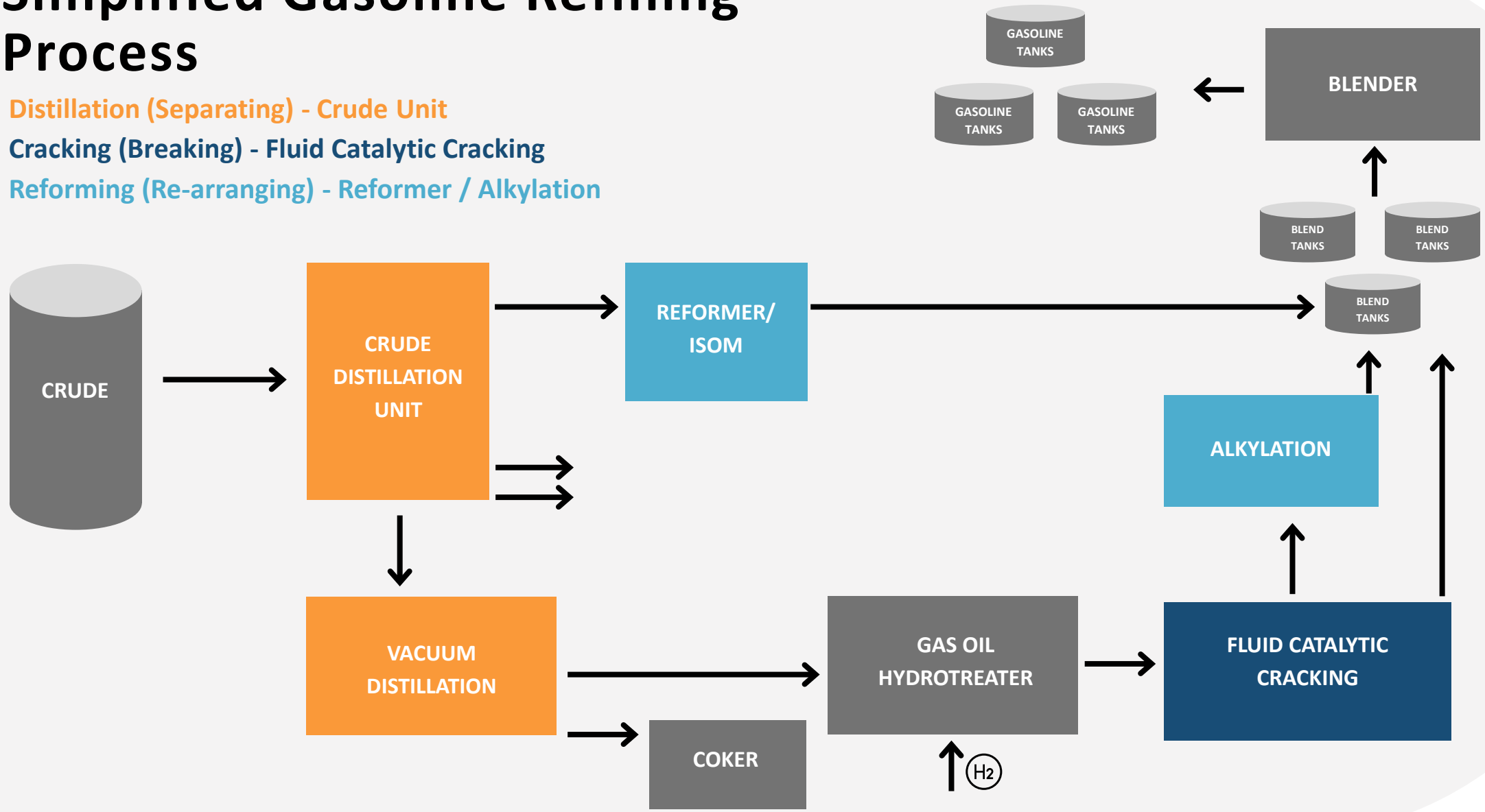
Source: National Renewable Energy Laboratory

Simplified Gasoline Refining Process

Distillation (Separating) - Crude Unit

Cracking (Breaking) - Fluid Catalytic Cracking

Reforming (Re-arranging) - Reformer / Alkylation



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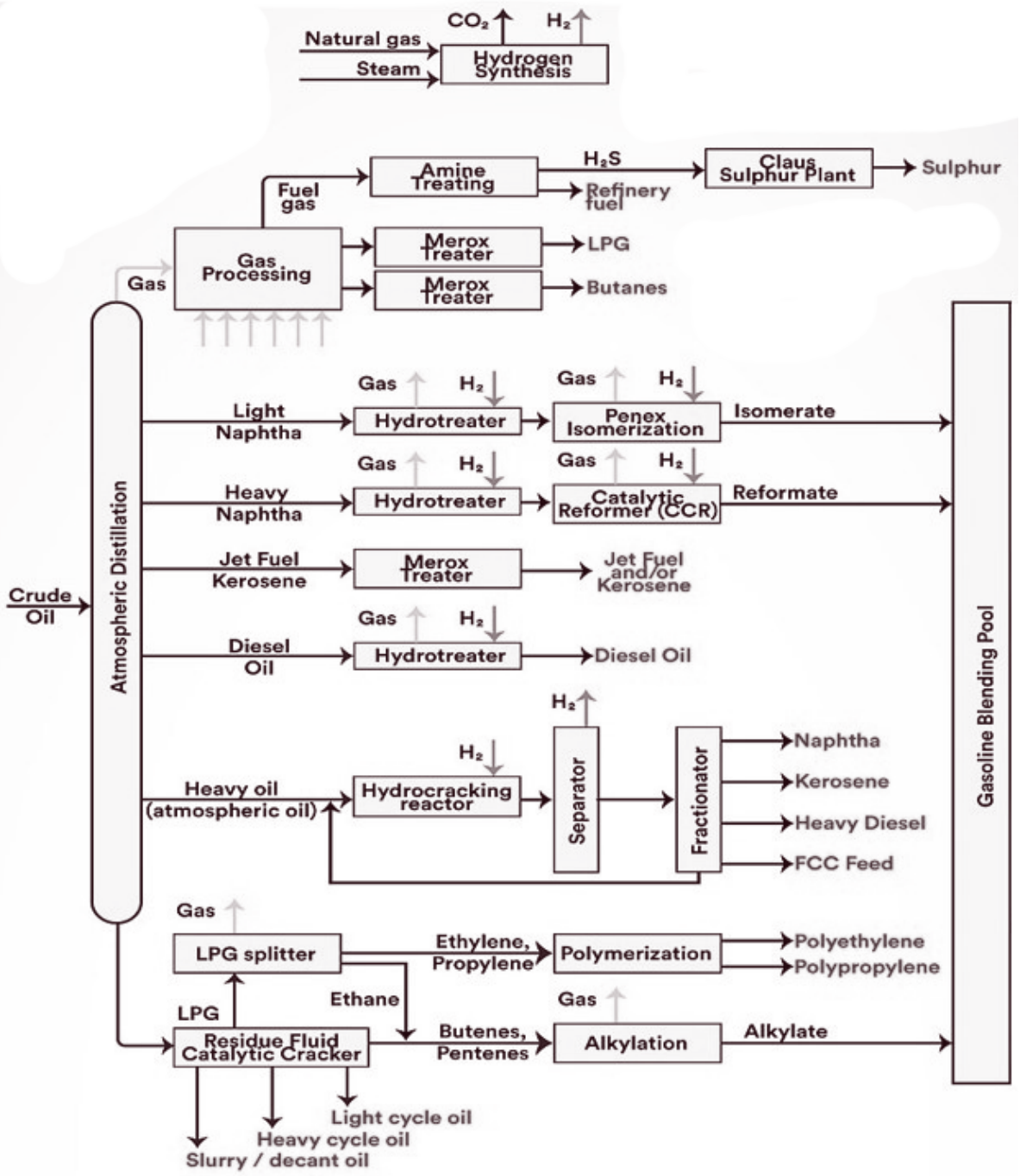
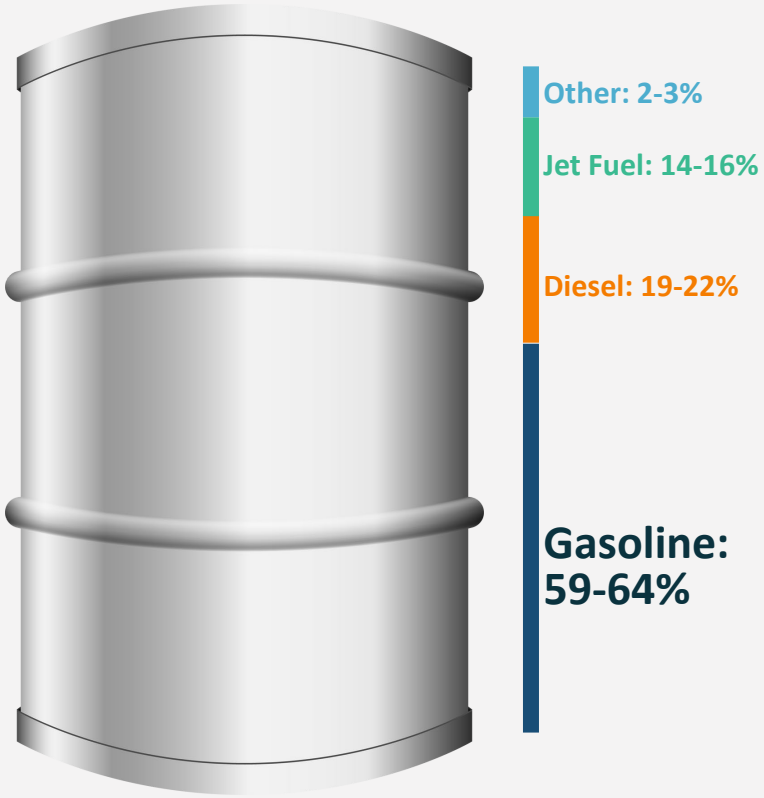
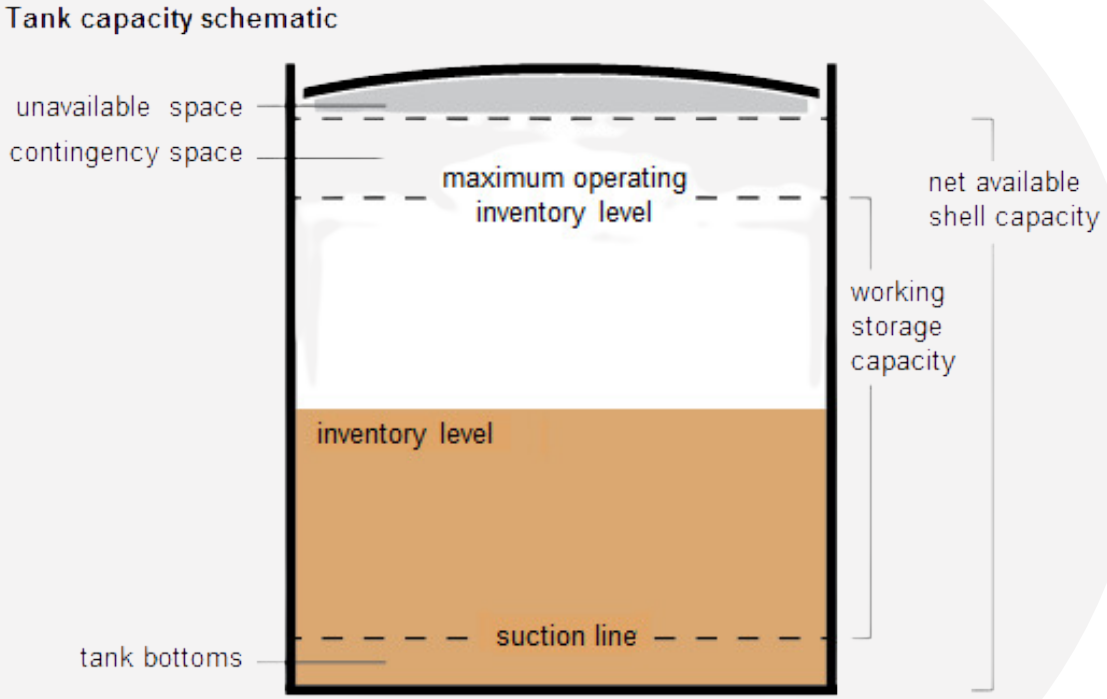


Source: Frank Severijn van Eck, https://www.greencarcongress.com/2023/12/20231209-dangote.html. Last accessed 9/17/2024.

ONLY 5% GASOLINE YIELD FLEX

- Each refinery's product output depends on its equipment and crude oil blend to maximize profit within the facility's limitations.
- Refining operations have limited flexibility to adjust production between jet fuel, diesel, and gasoline as demand changes.
- Uncertain future demand makes it difficult to decide on investments in new equipment for changing product needs.
- Refiners may need to import or export products to balance supply and meet demand.
- **Exports will compete for the same marine facilities as imports.**

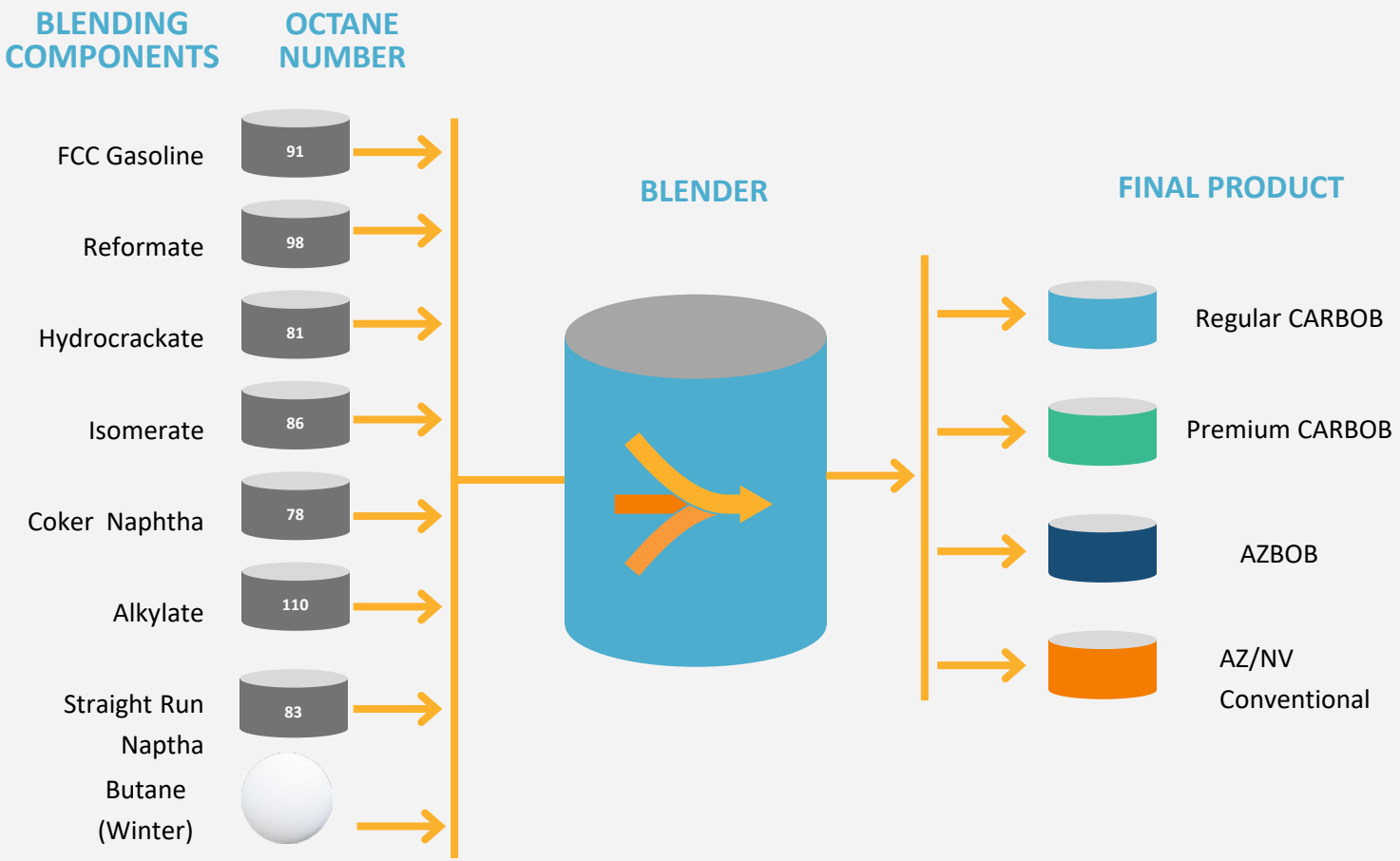




TANKAGE 101

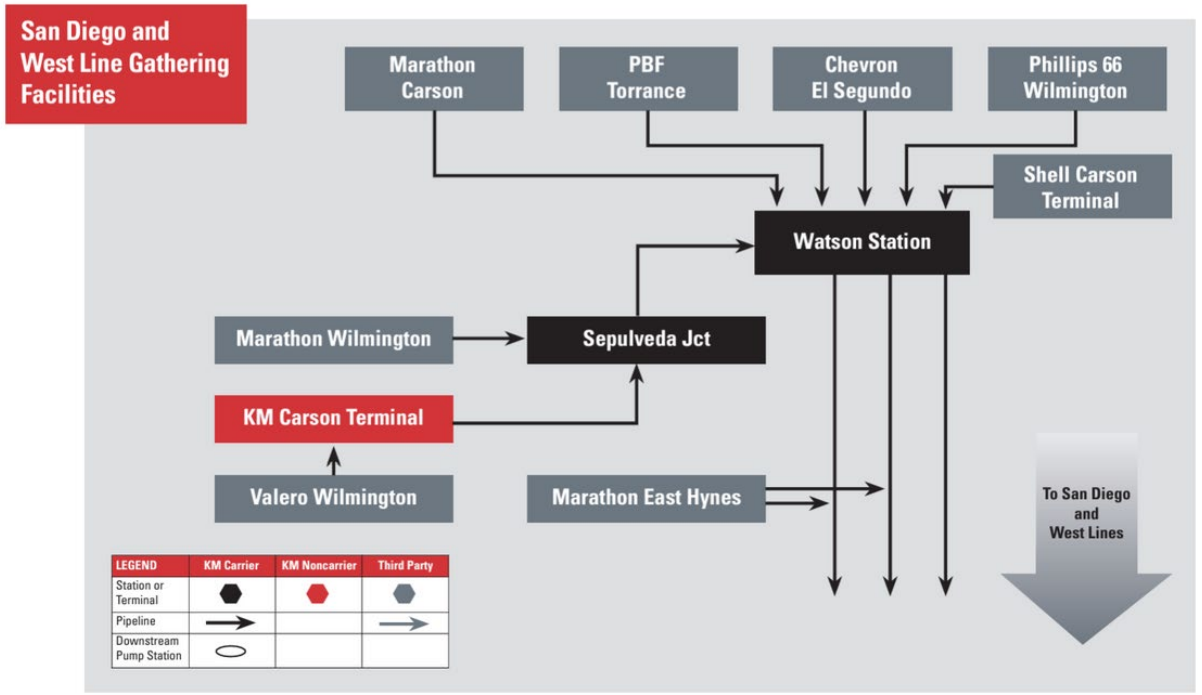
- The “working storage capacity” is smaller than the “shell capacity” – don’t count shell capacity as inventory.
- The “heel” is the minimum amount left in the bottom. A “Minimum Inventory” could raise the heel, reducing working storage capacity.
- Working Storage Capacity typically varies in volume and duration. It is just one of thousands of components in a fuel system.
- Refinery and storage tanks are continually in motion – inter-tank movements, blending, certification and pipeline receipts.
- Because of this, utilization rate ranges from **51% to 57%** for terminal and refineries gasoline tankage, respectively.*

• U.S. Energy Information Administration (EIA).Working Storage Capacity by PAD District as of March 31, 2024



GASOLINE BLENDING TANKAGE

- Gasoline is blended from "rundown" tanks that are blending components from multiple refinery units.
- 4-8 components with different properties are blended to make various gasoline recipes.
- An online blender mixes exact proportions for each recipe.
- "Final" tanks must be certified before shipping out on pipeline.



PIPELINE OPERATIONS

- Common carrier or proprietary
- Multiple shippers on single line
- Routine schedule– moves in batches (gas/diesel/jet)
- Bulk terminals along pipeline

SOURCE: Kinder Morgan. Pacific Operations Overview (March 2019). Accessed September 18, 2024. www.kindermorgan.com/WWWKM/media/Documents/2019-March-Pacific-Ops-brochure.pdf

BULK TERMINAL TENANTS

- "Tenants" include CA refiners, refiners with production outside of CA, wholesalers and traders.
- Leased tankage space – can be dedicated or community tankage.
- Sent from bulk tankage to load rack where it is loaded on truck for delivery to customer.
- Additive and 10% ethanol are blended with CARBOB at load rack as gasoline is dispensed into tanker truck.

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PRICING PANEL

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GLOBAL CRUDE OIL PRICES

Benchmark Name	API (Specific Gravity)	Sulphur (Sweet vs Sour) % by weight	Sept 17, 2024 Price per bbl
Brent (North Sea)	38.3	0.4	73.70
WTI (West Texas Intermediate)	40.8	0.3	71.19
ANS (Alaskan North Slope)	32.0	1.1	73.99
SJV (San Joaquin Valley)	13.0	1.6	60.17

NOTE: Heavier and higher sulphur crude oils tend to be more expensive to process

Source: OPIS

Imported vs. California Crude

- While crude oil is a global commodity, importing it incurs higher costs.
- California refineries can source comparable crude from other regions to substitute San Joaquin Valley (SJV) crude.
- Although crude prices may be similar across regions, transportation logistics costs vary significantly:

SJV Crude*

~$1 / bbl

*transported via pipeline & lowest risk

Brazil

~$4-5 / bbl

Alaska

~$5 / bbl

Middle East

~$5-6 / bbl

SOURCE: Solomon Associates, 2023

CRUDES MIXED ON “THE ENVELOPE”

Refineries are typically built for specific crude "types"/properties

Multiple crudes are often blended to meet required properties

The yield (amt of gasoline/diesel/jet) is optimized for refinery configuration and product mix

Balance Rule: Complex linear programing is used to optimize refinery production to meet demand.

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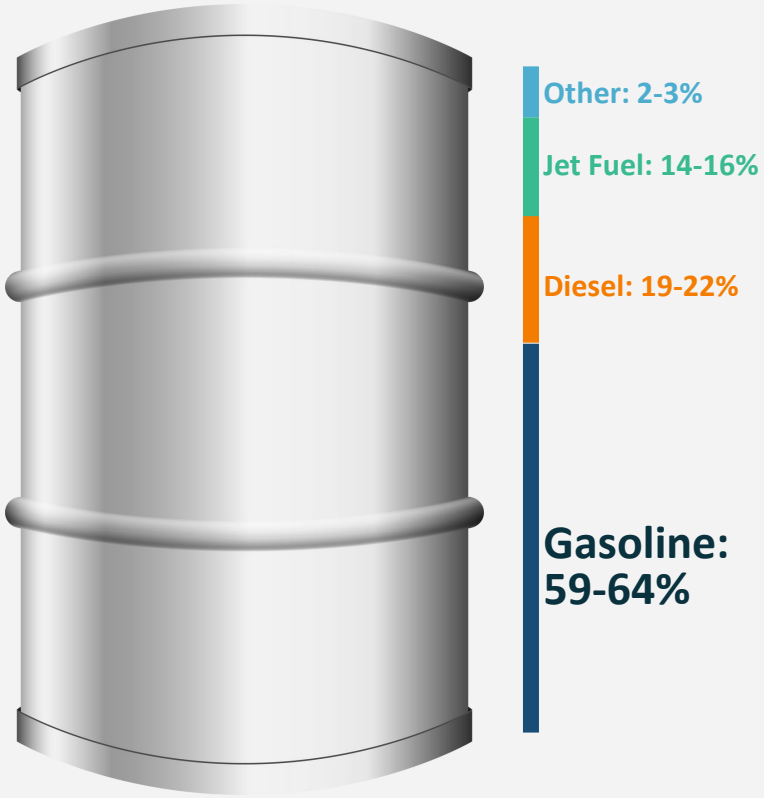

CONTRACTED VS DISCRETIONARY SALES

A refiners' first obligation is to meet contractual obligations. **This is where most of their volume goes**.

Discretionary sales generally take two forms

Bulk Sales

Sales to wholesalers (e.g., Costco, Safeway, unbranded distributors)

Spot Market

A one-time sale that tends to be a smaller transaction than bulk

- Higher risk
- Volumes are a small fraction of the market