OIL & GASOLINE 101

Overview of the Retail Petroleum Industry

Presented by Nick De Palma
NJ Gasoline-Convenience-Automotive Association

02 TODAY'S AGENDA

- Petroleum Basics
- Elementary Overview of Different Individual Segments of the Industry, including:
  - Exploration & Crude Transportation
  - Refining & Transporting Refined Products
  - Final Distribution & Gasoline Retail Operations
- New Jersey Petroleum Landscape
- Distribution to Retailers
- Gasoline Retailer Ownership Structures
- Retailer Environment & Challenges

03 WHAT IS NJGCA?

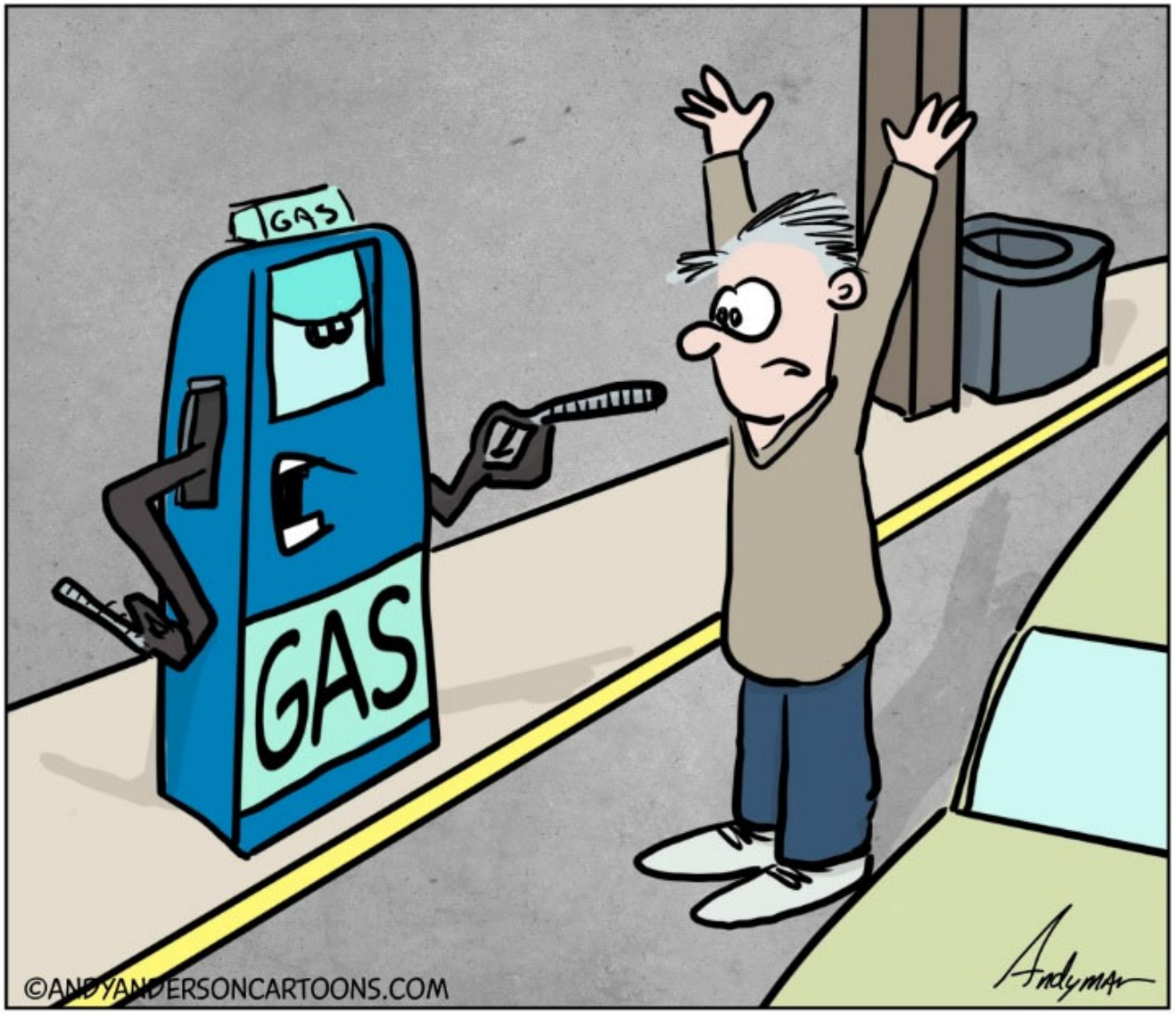
- Founded in 1937 as the **New Jersey Gasoline Retailers Association & Allied Trades, Inc. ("NJGRA"),** our mission is to represent the independent small business owners in the Petroleum Retail, Convenience Store, and Automotive Repair industries of New Jersey.

- In 2007, our organization was reshaped and rebranded as the **New Jersey Gasoline-C-Store-Automotive Association ("NJGCA")** to reflect the changing landscape of the industry to encompass a greater number of small business owners serving the motoring public.

What do we do?

Advocacy. Lobbying. Member Services. Education & Training. Member Benefits.

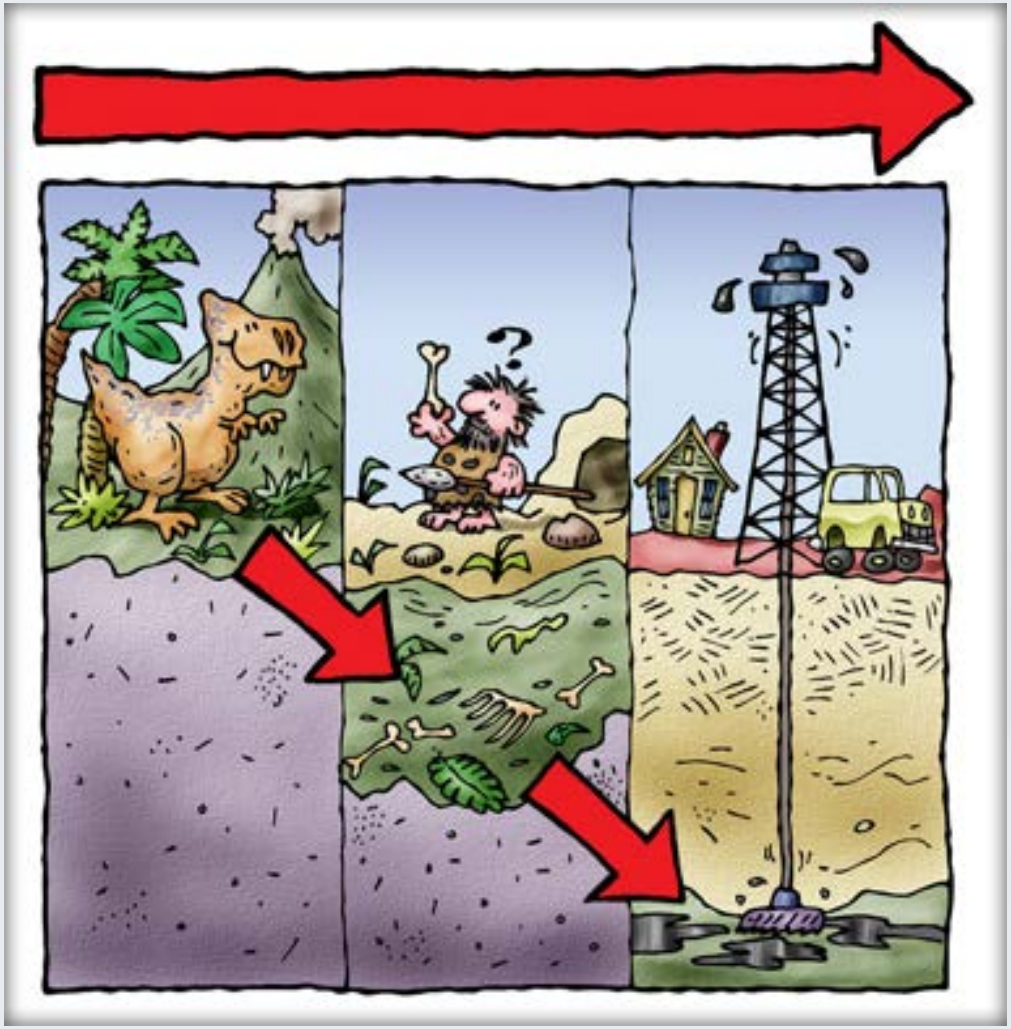
04 WHY IS GAS SO EXPENSIVE?



GIVE ME ALL YOUR MONEY!

05 WHERE DOES OIL COME FROM?

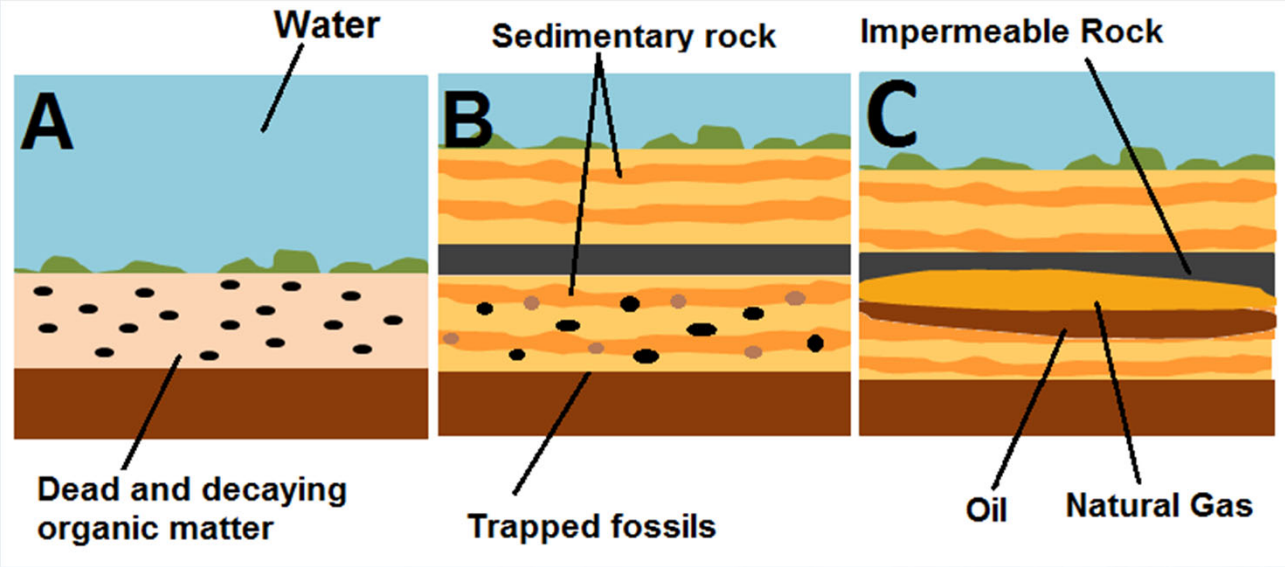
- Theories of where crude oil comes from are generally split into two schools of thought, the **Biogenic Theory** (Traditional View) and the **Abiogenic Theory** (Alternative View).



NOT DINOSAURS!

06 WHERE DOES OIL COME FROM?

Biogenic Theory (Traditional View)

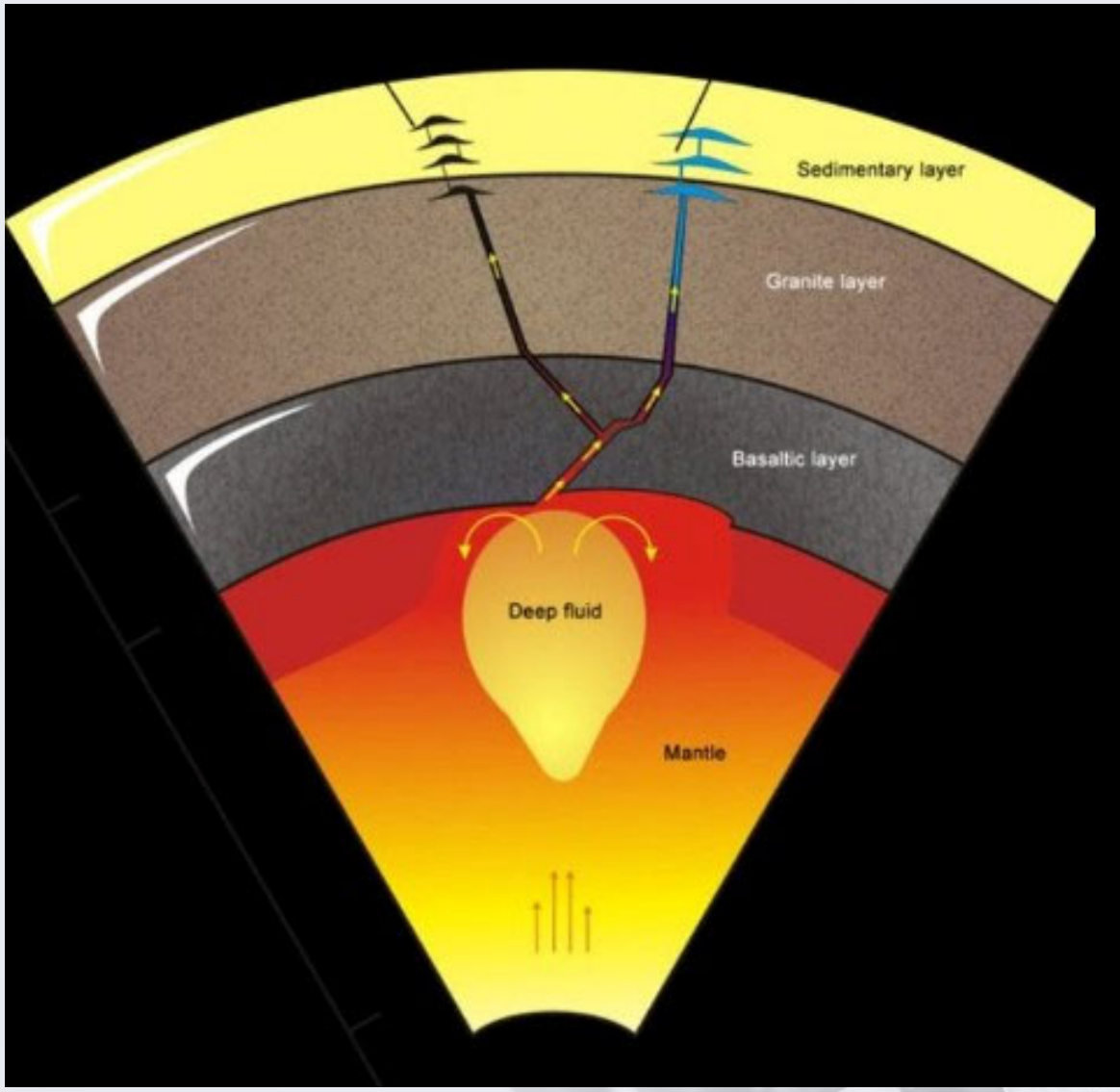


- Theory advances that crude oil is believed to have been formed primarily from organic remains of ancient marine organisms. e.g. plankton, algae, bacteria and zooplankton.
- This organic material lived in shallow seas and lakes, were buried under layers of sediment, then subjected to high heat and pressure over millions of years.
- This process transforms the organic matter into hydrocarbons, including crude oil (as well as natural gas and coal).
- The pressure and heat from inside the earth transformed the organic matter into *kerogen* (which is a waxy, solid hydrocarbon), eventually breaking down into liquid oil and natural gas.
- The resulting liquid oil and natural gas migrates through porous and permeable rock layers, and accumulates in underground reservoirs.

07 WHERE DOES OIL COME FROM?

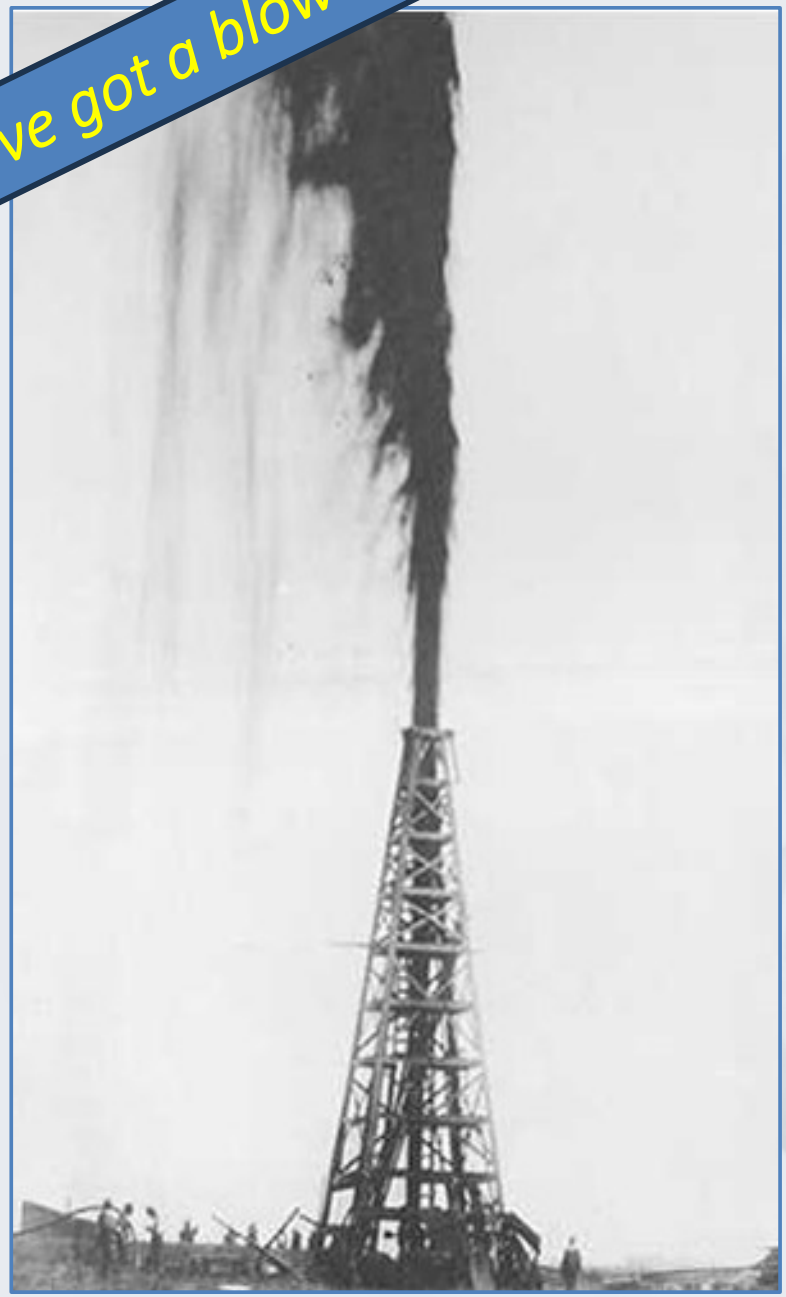
Abiogenic Theory (Alternative View):

- Theory advances that crude oil does not come from organic material, but from deep inside the earth, potentially from primordial hydrocarbons or from reactions involving simple gases and minerals.
- These hydrocarbons originated from the Earth's mantle and seeped up through fractures in the crust.
- The fact that some oil wells are located very deep, far below any fossil-bearing layers, supports the abiogenic hypothesis.



08 HOW DO WE FIND OIL?

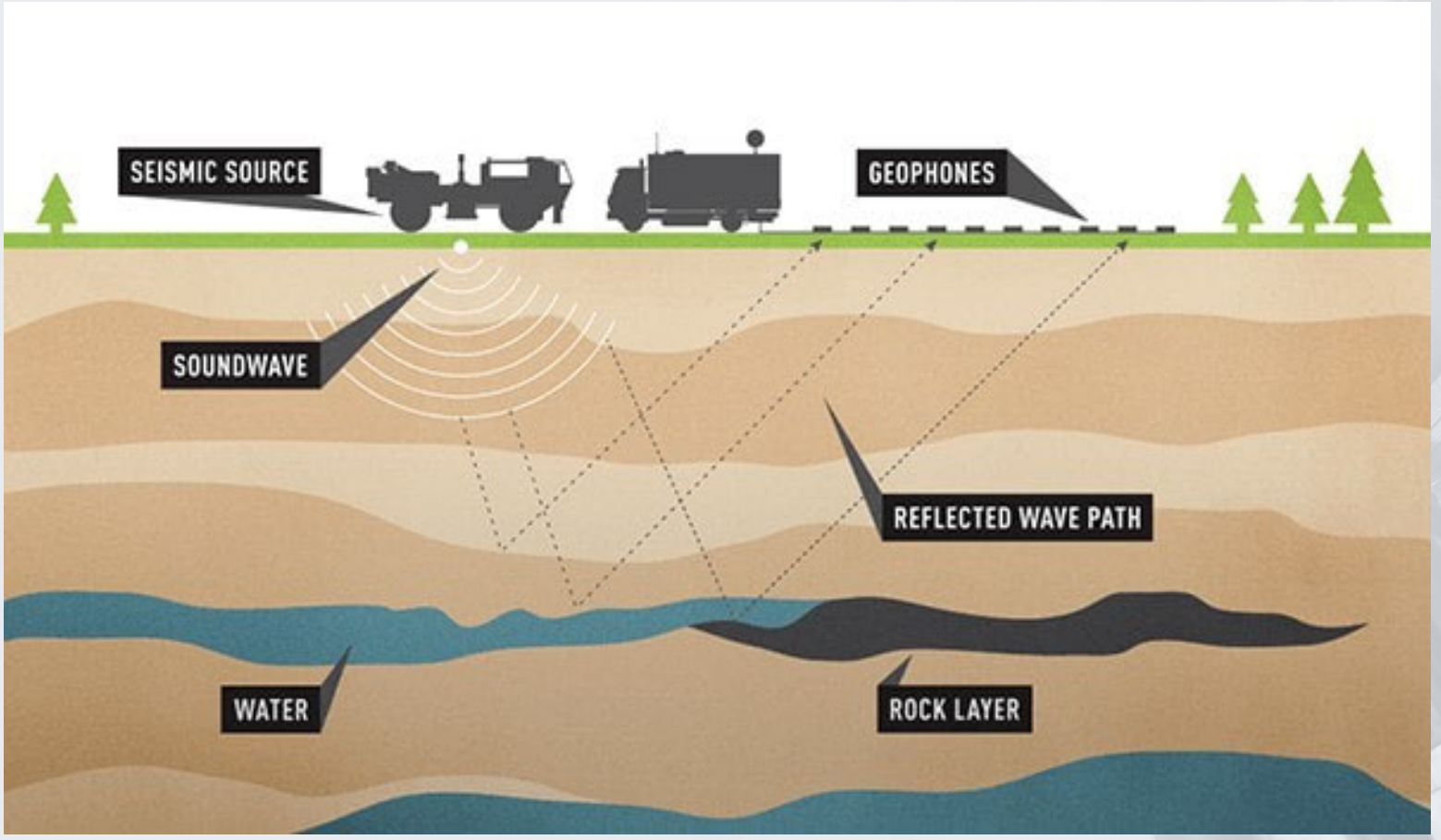
We've got a blowout!



09 HOW DO WE FIND OIL?

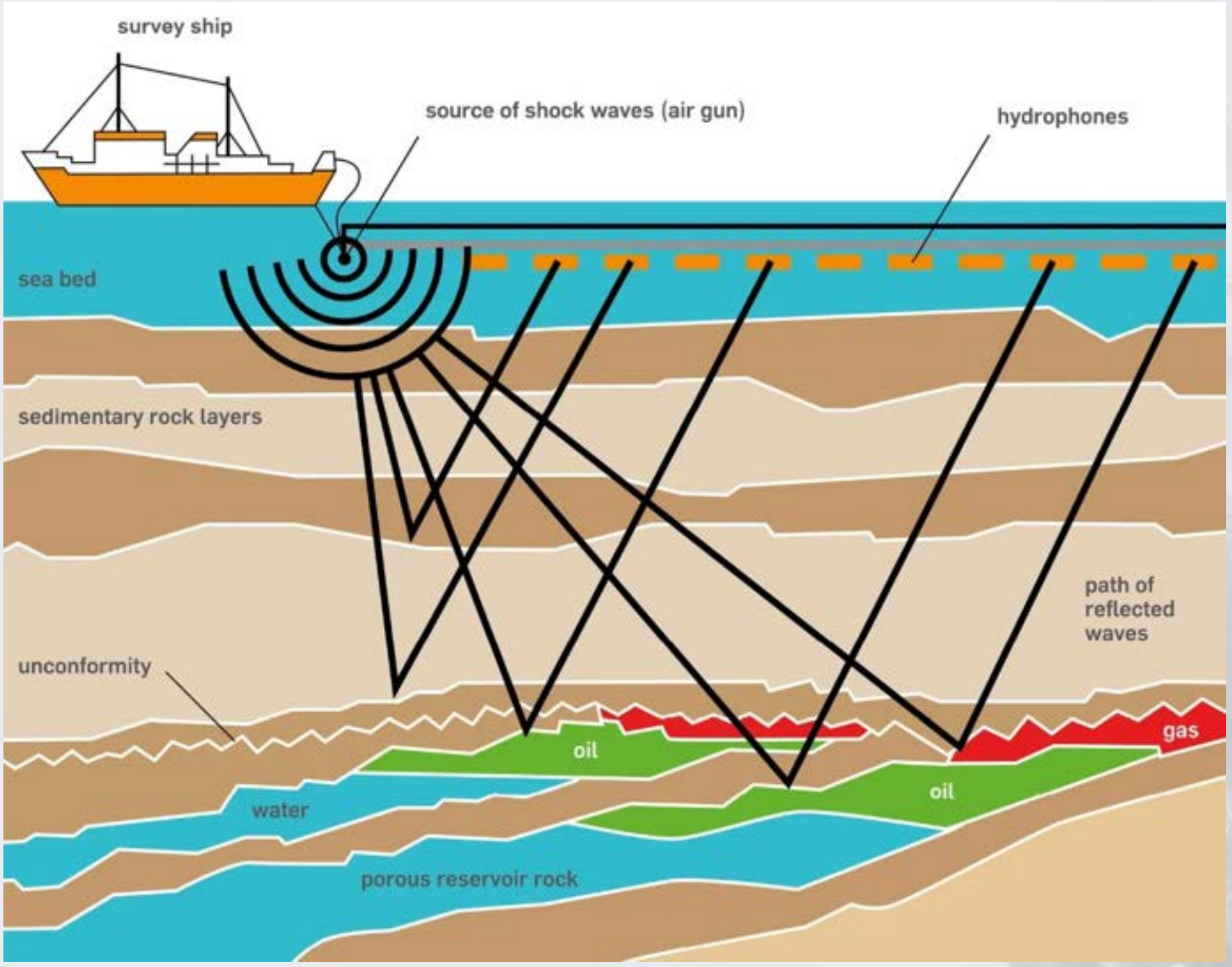
1 – Geological Analysis & Surveys

- Geologists hunt for potential “oil traps” through seismic surveys (soundwaves penetrating the ground), which let’s them know about what could be beneath the surface.
- They look for structures like folds and faults, which can trap oil in porous and permeable rock formations called reservoirs.



010 HOW DO WE FIND OIL?

Geological Analysis & Surveys can also be done on land – or water



11 HOW DO WE FIND OIL?

2 – Exploratory Drilling:

- Once a potential oil field is identified, exploratory wells are drilled to confirm the presence and quantity of oil.
- Well drilling provides data on the type and quality of the rock, as well as the presence and flow characteristics of oil.
    - e.g. “Light, Sweet Crude”, “Heavy, Sour Crude”, “Shale Oil”, etc.

12 HOW DO WE FIND OIL?

Types of Crude:

Light, Sweet Crude:

- More desirable than heavy, sour crude due to its lower sulfur content (below 0.5%).
- Easier to refine into products like gasoline and diesel.
- Has a lower viscosity ("runnier" so flows easier) and "*Higher API Gravity*" (meaning it has lower density, making it lighter and easier to transport).
- More expensive on the open market (since it is more desirable).

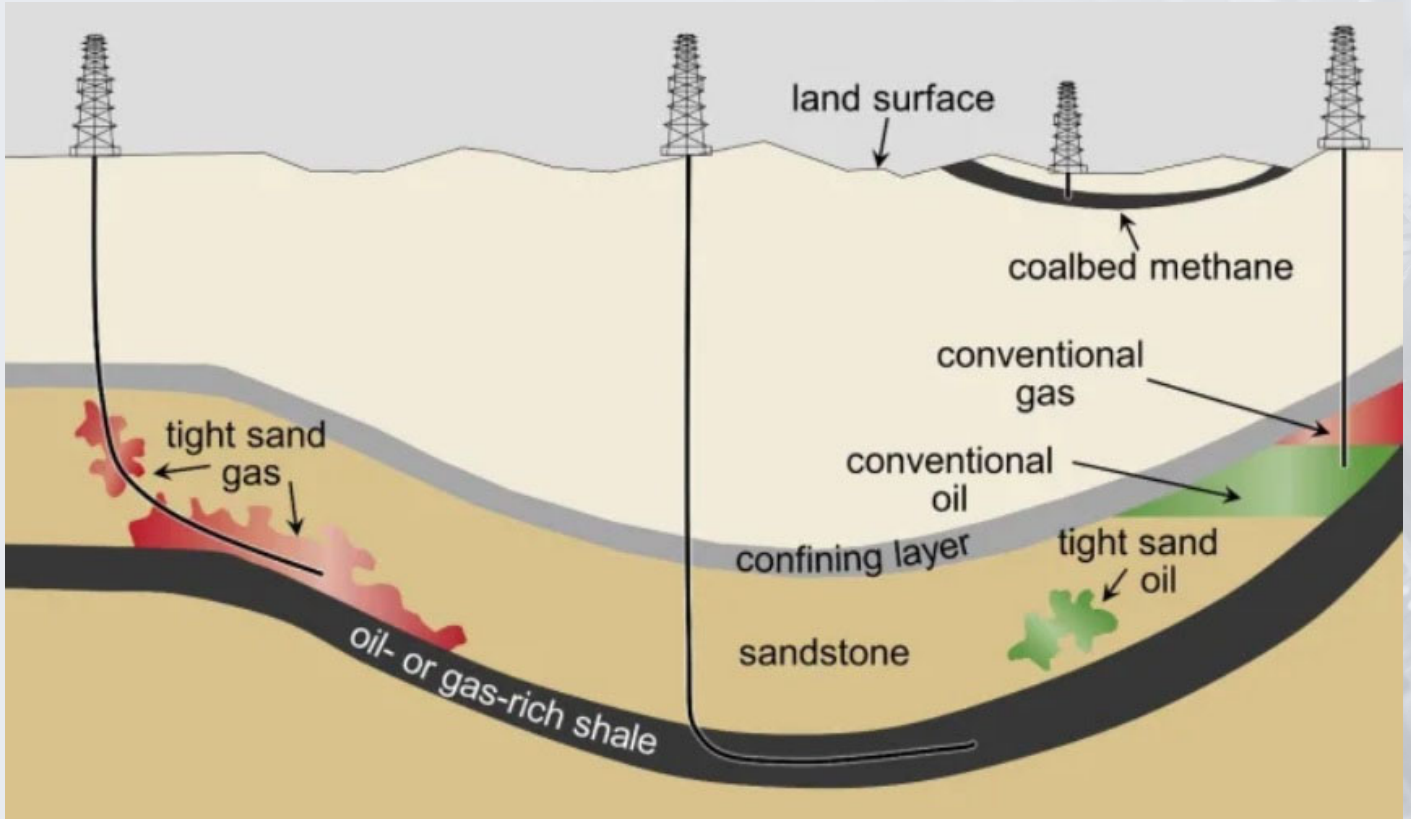
Heavy, Sour Crude:

- Less desirable than light, sweet crude because it has a sulfur content above 0.5%
- Has a higher viscosity ("thicker" so it flows slower/harder to handle), and "Lower *API Gravity*" (meaning it has a higher density, making it heavier and harder to transport).
- More costly refining processes, which drives up refining costs to remove impurities.
- Less expensive on the open market than light, sweet crude (since it is less desirable and processing it costs more money).

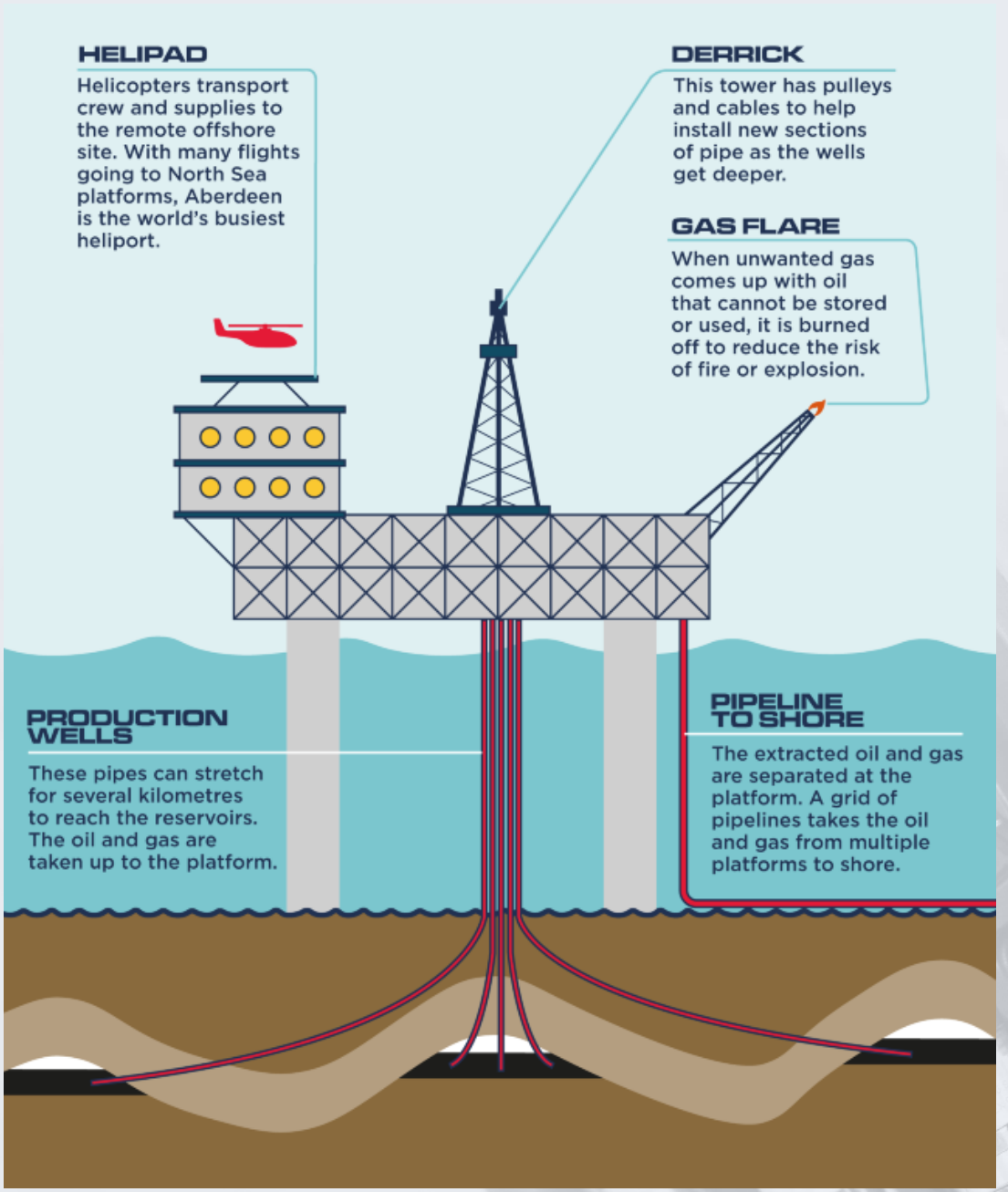
13 EXTRACTION

3 – Development & Extraction:

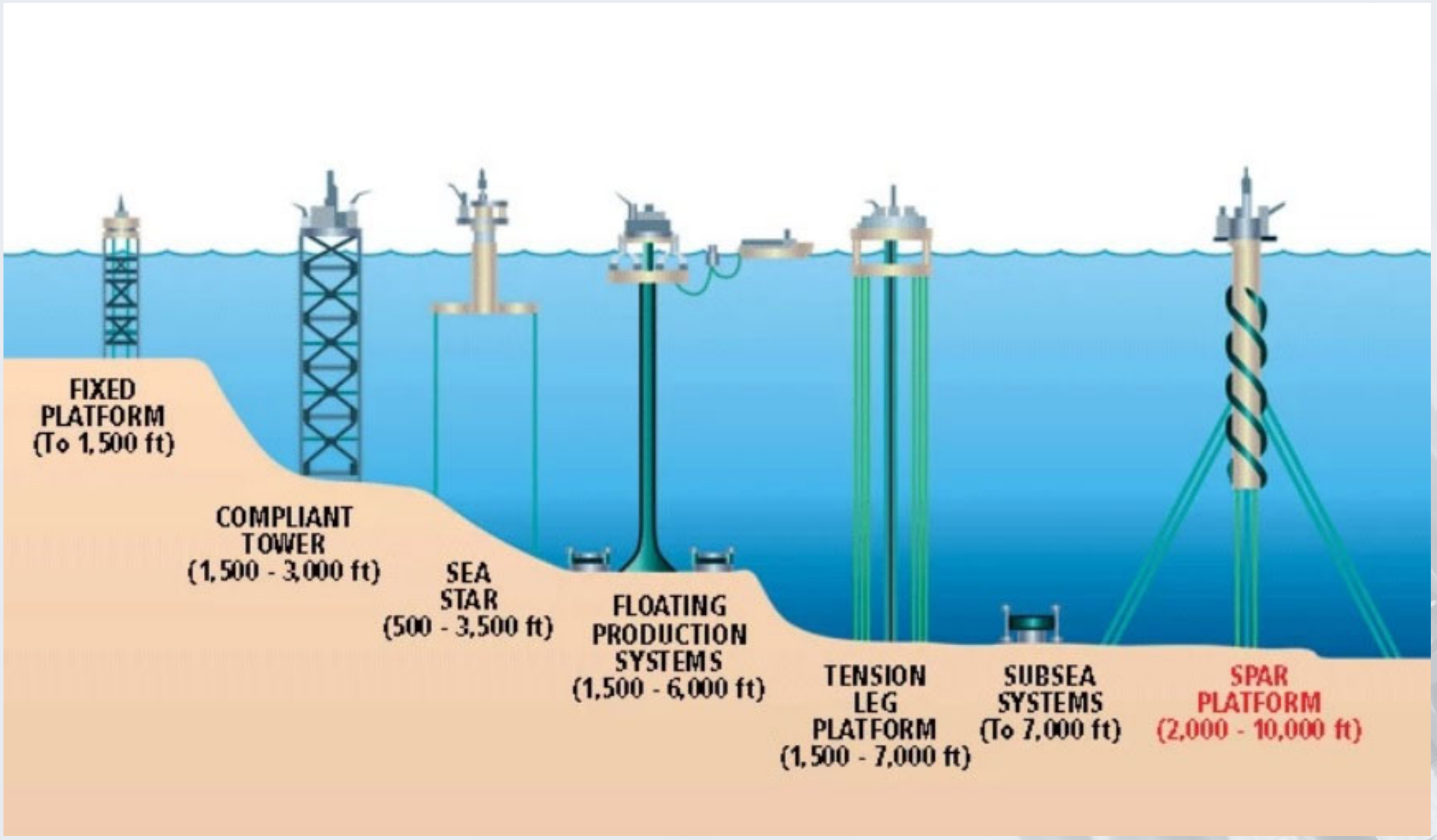
- If exploratory wells confirm a viable oil field, development wells are drilled to extract the oil.
- Hydraulic fracturing, or "fracking," may be used to increase the flow of oil from tight formations.
- Shale oil (sometimes referred to as tight oil) is crude oil trapped within shale rock formations. Typically, the crude is extracted using drilling and fracturing techniques, and horizontal drilling.



14 EXTRACTION

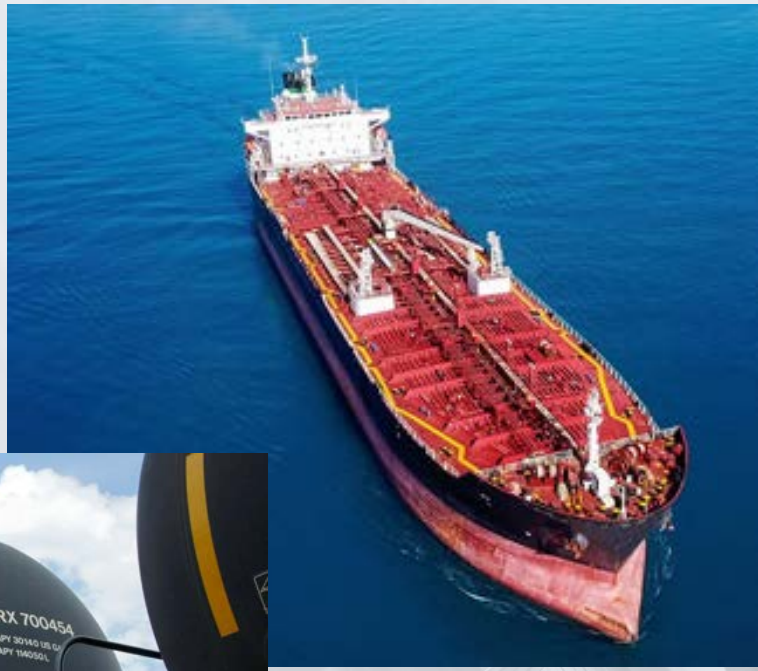


15 EXTRACTION



16 PRODUCTION & CRUDE TRANSPORTATION

- After crude oil is extracted, it is typically pumped via pipeline to holding facilities or directly routed through pipelines to refineries.
- Crude oil can also be transported through ships, railcars, and trucks, depending on the original source location.

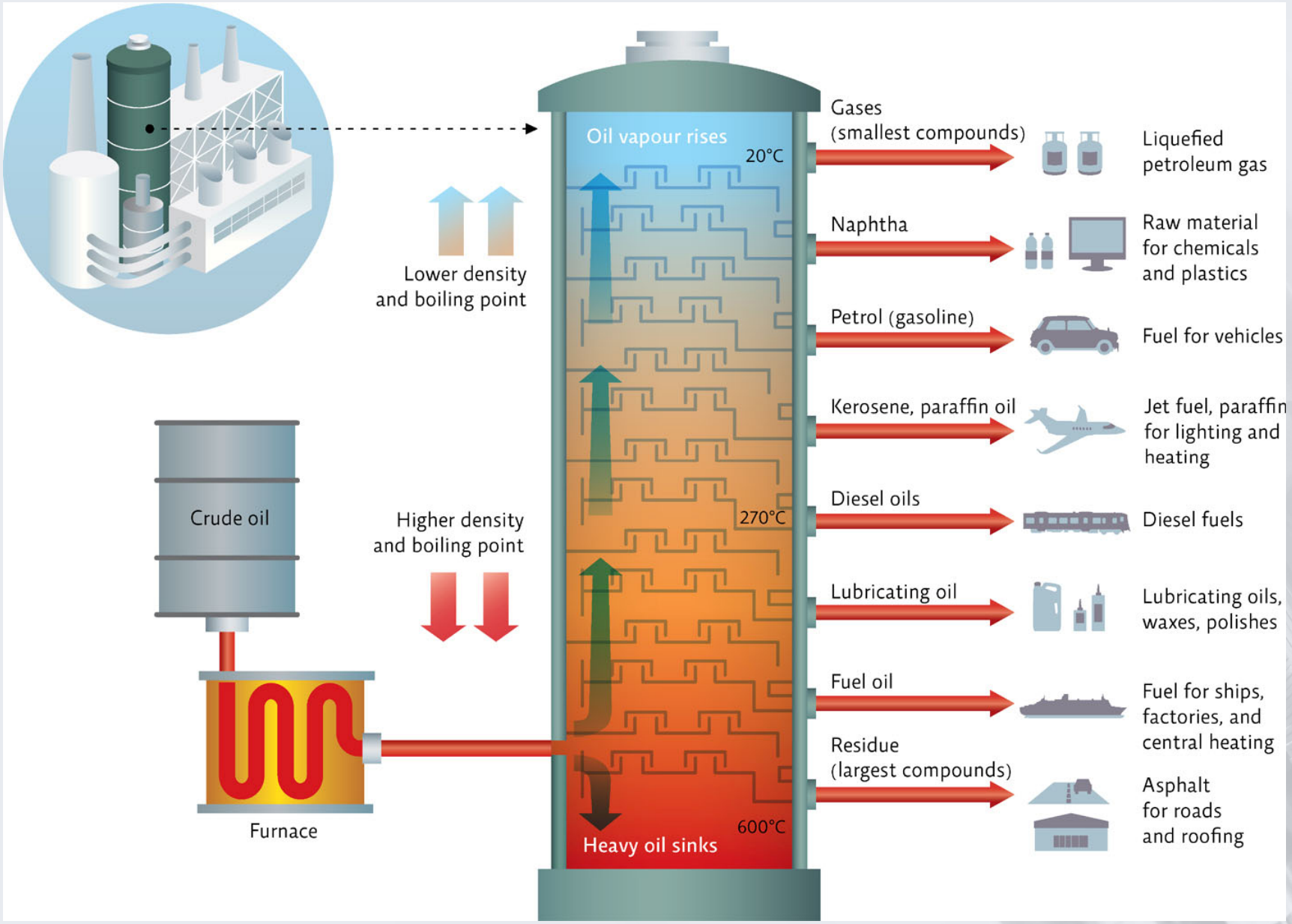


17 REFINING CRUDE OIL

- Once crude oil arrives at a refinery, it is processed to create different petroleum products.
- Processes are typically:
  - **Fractional Distillation:** Used for separating a mixture of substances with narrow differences in boiling points, and is the most critical step in the refining process.
  - **Chemical Processing:** Breaks longer chains into shorter ones (cracking). Or by combining smaller pieces to make larger ones (unification).

18 REFINING CRUDE OIL

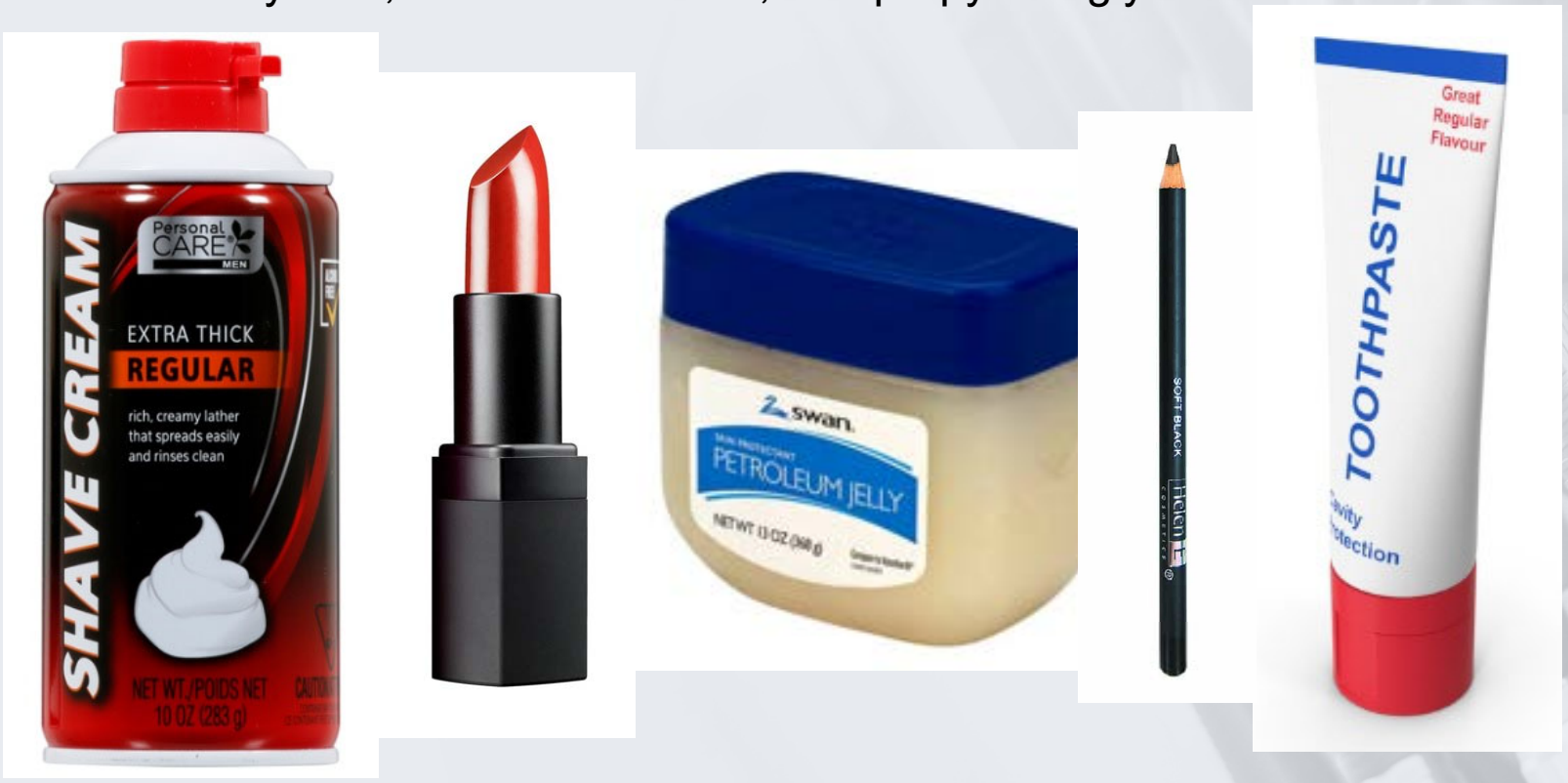
What petroleum products are created in the refining process?



19 SURPRISING PRODUCTS CREATED FROM OIL?

Many everyday items are made from or utilize petroleum, sometimes in surprising ways.

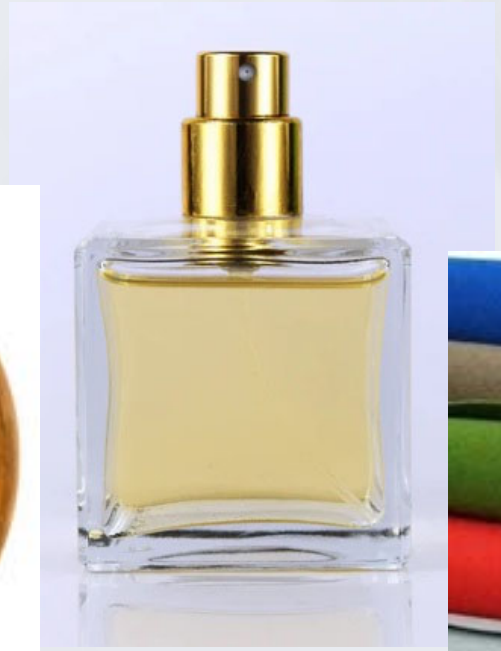
- Petroleum Jelly: A classic lubricant and skin moisturizer.
- Toothpaste: Poloxamer 407, a common petroleum derivative, helps dissolve oil-based ingredients in water.
- Shaving Cream: Isopentane, derived from crude oil, helps break down sebum and cause hair to stand up for easier shaving.
- Cosmetics: Many lipsticks, eye liners, and other cosmetics use petroleum products or byproducts like crylates, coal tar colorants, and propylene glycol.



20 SURPRISING PRODUCTS CREATED FROM OIL?

Many everyday items are made from or utilize petroleum, sometimes in surprising ways.

- Perfume: Certain perfume components and solvents are derived from petroleum.
- Paints: Paints often contain petroleum-based resins and solvents.
- Chocolate Coatings: Some chocolate coatings may contain paraffin wax, a petroleum product.
- Chewing Gum: The base of chewing gum is made with petroleum wax.
- Clothing: Polyester, a common synthetic fabric, is derived from petroleum.



21 SURPRISING PRODUCTS CREATED FROM OIL?

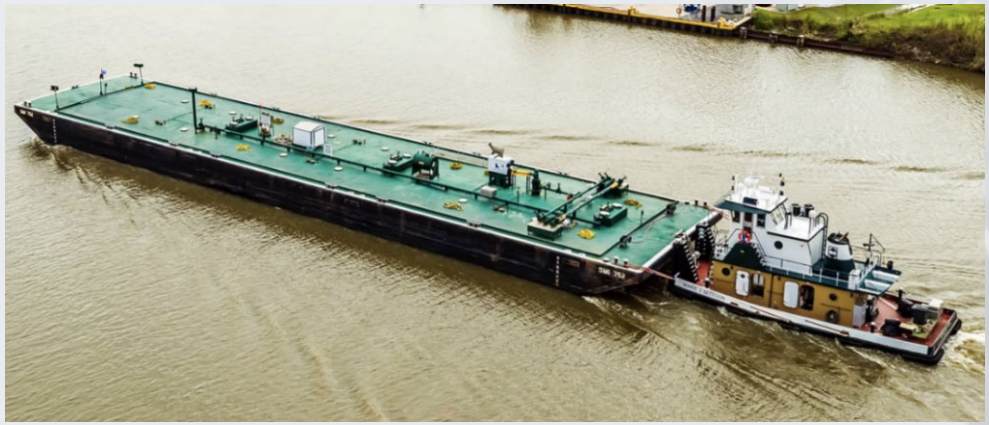
Many everyday items are made from or utilize petroleum, sometimes in surprising ways.

- Dentures: Acrylic resin, a hydrocarbon petroleum product, is used in making dentures.
- Rugs: Synthetic rugs often use petroleum-based nylon or olefin fibers.
- Aspirin: Contains benzene, a hydrocarbon typically derived from petroleum.
- Soap: Some soap ingredients are derived from petroleum waste by-products.
- Vitamins and Amino Acids: Some essential vitamins and amino acids are also produced from petroleum waste by-products.
- Fertilizer: Petroleum waste by-products are used in the production of fertilizers.

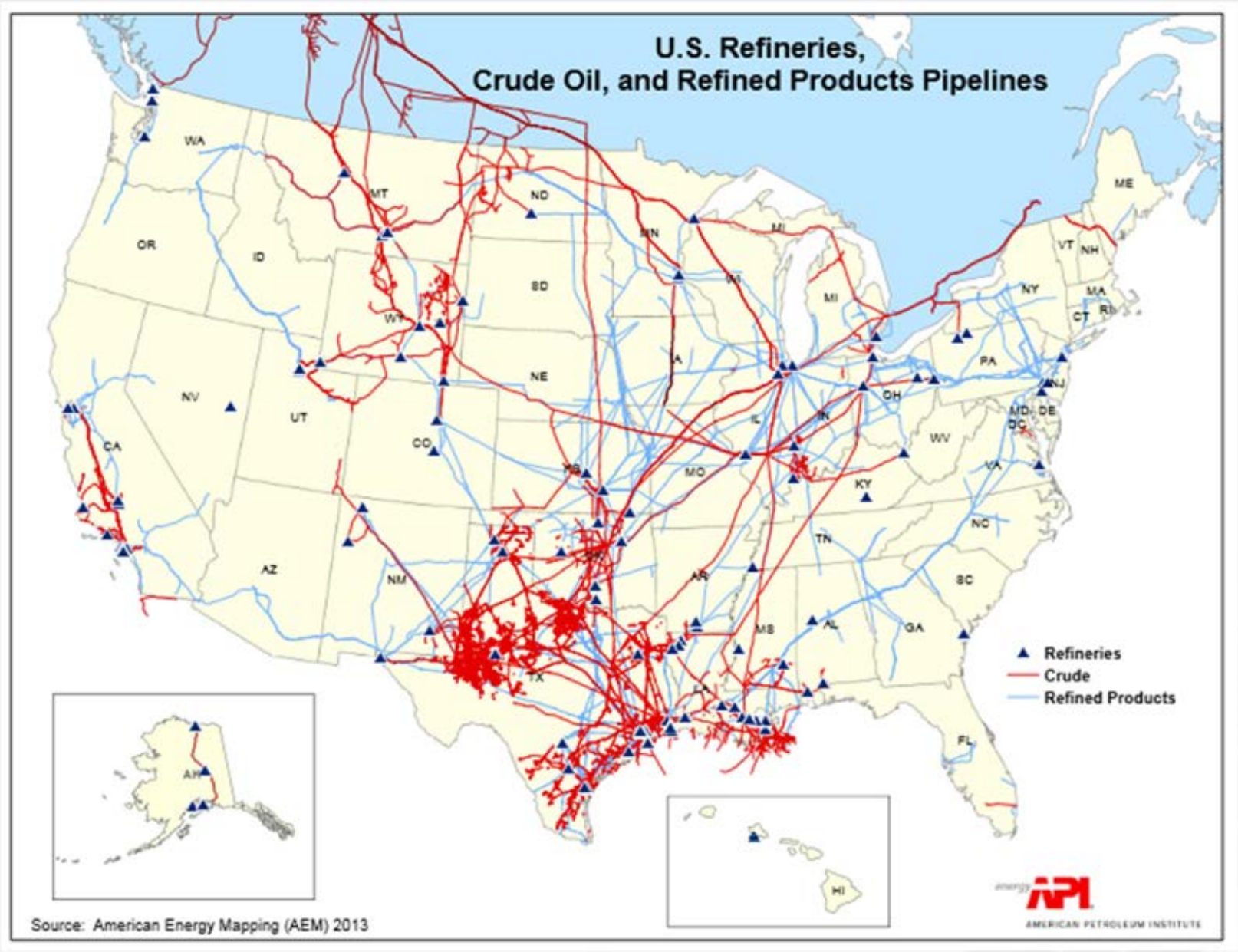
22 TRANSPORTING REFINED PRODUCTS

How do refined products created at refineries get transported?

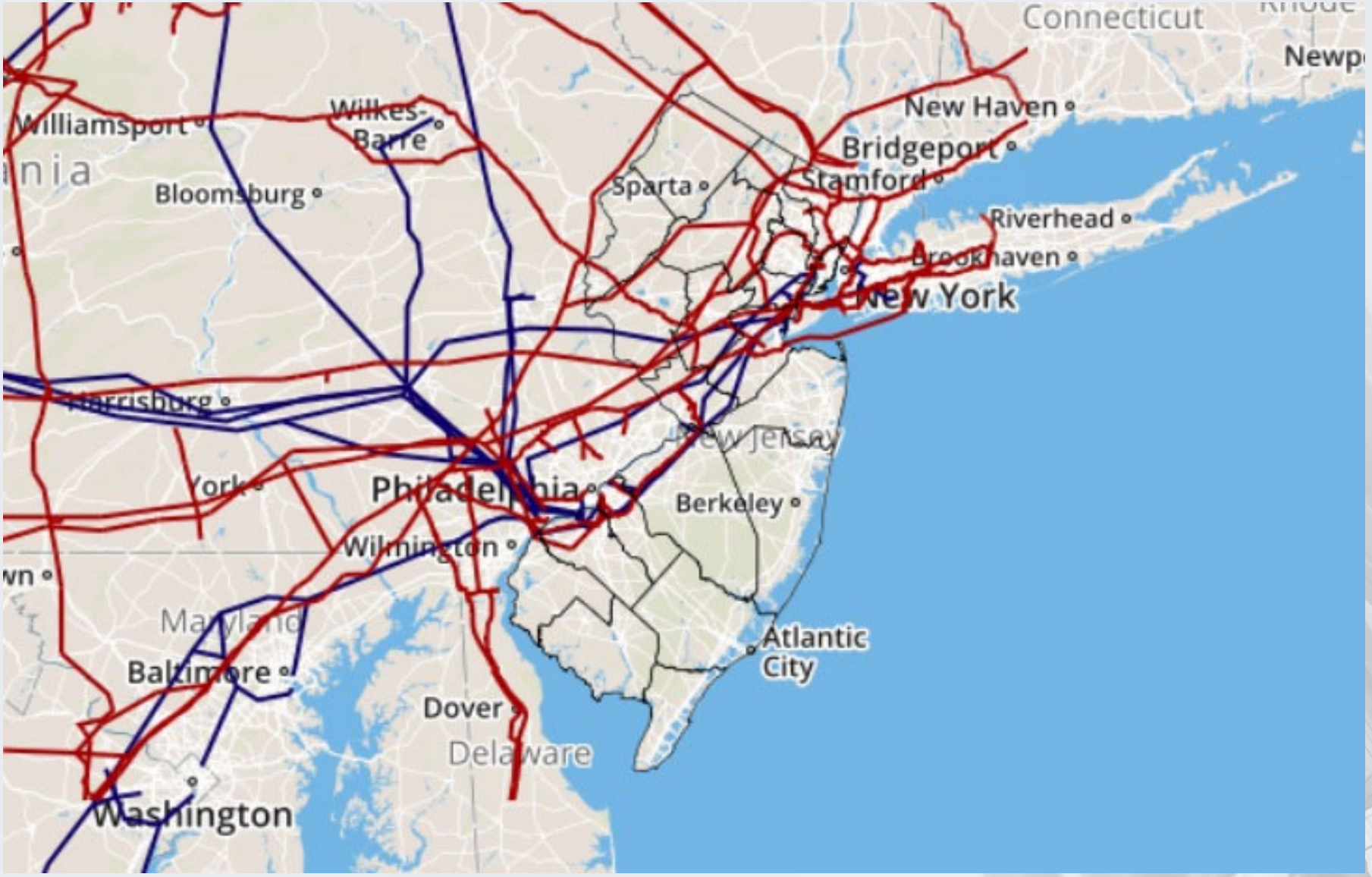
- **Pipelines**: The primary method for transporting refined petroleum products, particularly over long distances. Efficient, cost-effective, and have a low environmental impact. Pipelines can be both above and below ground.
- **Rail Cars**: Railroad tank cars are used to transport large quantities, mostly to distribution terminals and storage facilities.
- **Trucks**: Tanker trucks are used for the final leg of the transportation process, delivering refined products to retail gas stations and other end-users.
- **Ships**: Specific “product tankers" are used to transport refined products by sea, especially to locations that don't have access to pipelines or rail. Product tankers are smaller than crude oil tankers.
- **Barges**: Used for transporting refined products along waterways.



23 TRANSPORTING REFINED PRODUCTS



24 TRANSPORTING REFINED PRODUCTS



25 FUEL FORMULATIONS – ETHANOL & THE BOBS

When fuel leaves the refinery, it is not a finished product. In the technical language of the industry, it is a blending component, or a blendstock.

Ethanol:
"Ethanol" and "ethyl alcohol" are essentially the same thing. Both terms refer to the alcohol found in solvents, disinfectants, fuel additives, and alcoholic beverages.

- **The Good**: Ethanol is renewable, acts as an oxygenate (aiding in the burning of fuel) and reducing emissions.
- **The Bad**: Ethanol is "hygroscopic" in nature (it absorbs water). In fuel blends (like E10), if too much water is absorbed it will lead to phase separation in blended fuels. This can lead to fuel degradation and engine damage.

Main ethanol blends – Meet the BOBs:
These base gasoline blendstocks mixed with ethanol at the terminal racks and serve different purposes.

- **Conventional Blendstock for Oxygenate Blending (CBOB):** Used for "ordinary" gasoline, that typically includes ethanol (E10 blended stock) and is the "standard" gasoline blend for most of the country.
- **Reformulated Blendstock for Oxygenate Blending (RBOB):** Formulated to reduce smog, especially in high density areas. Fuel burns more cleanly and reduces pollutants compared to conventional gasoline. When RBOB is blended with ethanol, it becomes a **"Reformulated Gasoline" (RFG)**. RBOB usually used in metropolitan areas during the summer months to reduce smog and meet air quality standards.
- **California Reformulated Gasoline Blendstock for Oxygenate Blending (CARBOB):** An extra-special RBOB formula mandated by California. RBOB is more expensive to refine—more energy and more effort are required to pull some of the additional hydrocarbons out of the fuel. This is the main reason why California gasoline prices are typically higher than anywhere else in the country.

26 NEW JERSEY PETROLEUM OPERATIONS

Do we refine crude oil in New Jersey?

Bayway Refinery
Located in Linden and Elizabeth
Owned by Phillips 66

- The Bayway Refinery distills crude, naphtha reforming, fluid catalytic cracking, solvent de-asphalting, hydrodesulfurization, and has a polypropylene plant.
- Overall high percentage of transportation fuels, as well as petrochemical feedstocks, residual fuel oil and home heating oil.
- Refined petroleum products are distributed to East Coast customers by pipeline, barge, railcar and truck.

27 NEW JERSEY PETROLEUM OPERATIONS

Do we refine crude oil in New Jersey?

PBF Energy
Located in Paulsboro

- The Paulsboro refinery specifically manufactures Group I lubricant base oils and is the largest producer of Asphalt on the East Coast.
- Marine transfer terminal right on the Delaware River.
- Former ExxonMobil facility, then owned by Valero Energy before being sold to PBF Energy.

28 NEW JERSEY PETROLEUM OPERATIONS

Shuttered Refinery Locations:

- Sunoco Eagle Point Refinery in Deptford/Westville, closed in February 2010.
- Chevron/Buckeye Refinery in Perth Amboy, closed in July 2012 (but may be partially operational today).
- Hess Corporation Refinery in Port Reading, closed in March 2013
- Diamond Head Oil Refinery in Kearny, closed in 1980 (now a superfund site).

In many cases, the above continue to operate as a gasoline terminal rack for blending and distribution.

29 NEW JERSEY PETROLEUM OPERATIONS

Fuel Terminals (aka *the racks*):
Gasoline supply terminals are known as "***racks***" within the industry. This is the last stop before fuel is transported to a gasoline station for retailer to dispense to motorists. Terminals in Linden, Perth Amboy, Westville, Paulsboro, Newark, Carteret, and a few other locations.

A variety of additives can be added at the terminal rack, depending on the fuel type and intended use. These may include:

- **Detergents**: To help keep fuel injectors and intake valves clean.
- **Octane Boosters**: To increase the octane rating and improve performance, especially in high-performance engines.
- **Ethanol Blending / Oxygenates**: Such as ethanol, to improve combustion and reduce emissions.
- **Antioxidants**: To prevent fuel degradation and extend shelf life.
- **Corrosion Inhibitors**: To protect the fuel system from rust and corrosion.
- **Volatility Modifiers**: To adjust the fuel's volatility for easier starting and warm-up.

Why are additives added at the terminal rack?

- **Efficiency**: Adding additives at the terminal rack allows for efficient and controlled blending with the fuel as it's being loaded for delivery.
- **Flexibility**: Different grades of fuel and specific additive packages can be blended for different customers and needs.
- **Consistency**: Precise additive injection systems ensure a consistent and accurate blend, meeting quality standards.

30 NEW JERSEY PETROLEUM OPERATIONS

Fuel Terminals:

Racks in New Jersey are operated by companies you have heard of (like Sunoco), and others you may never have heard of (including Petrocom Energy Group, Buckeye Partners, Global Partners, and Kinder Morgan)

OPIS Pricing:

- For retailers, the “rack price” is a key marker to set street prices and determine profits.
  - This is also what state officials may use as a resource in investigating accusations of gouging or selling below cost.
- A trend over the last few years is for retailers negotiate “rack minus” (as opposed to “rack plus”) pricing. This is because many distributors can work directly with the fuel suppliers and arrange for discounts for themselves based on volume and prompt payment. A portion of that discount then gets passed on to potential customers.

31 NEW JERSEY PETROLEUM OPERATIONS

Typically at a fuel rack, a tanker truck will pull under the dispensing equipment and fuel will be pumped into the tanker compartments along with any additives.

Tanker trucks can be configured to have three compartments within the interior of the tank to hold different grades of gasoline, totaling 8500 gallons.

32 NEW JERSEY PETROLEUM OPERATIONS

Taxes & the Rack:

Fuel taxes are pre-collected by the supplier, before the fuel goes through the supply chain.

This means that taxes are not collected at the pump as fuel is dispensed into a patron's vehicle.

Each year the PPGRT rate (one component of the overall gasoline tax) is recalculated by the Treasurer to meet the updated Highway Fuels Revenue Target.

Gasoline Taxes

NJ State Excise Tax:	10.5¢
NJ Petroleum Gross Receipts Tax:	34.4¢
Federal Excise Tax:	18.4¢
Total NJ Gas Tax:	**44.9¢**
Total Gas Tax:	**63.3¢**

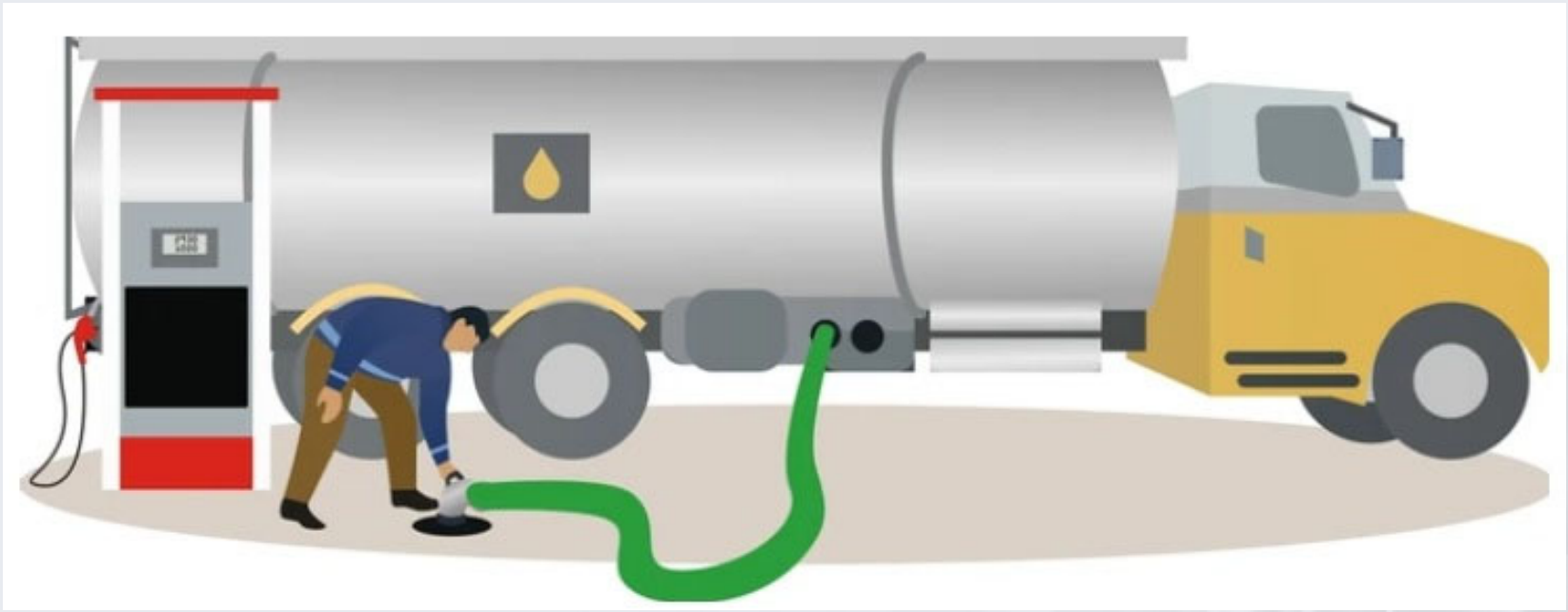
Diesel Taxes

NJ State Excise Tax:	13.5¢
NJ Petroleum Gross Receipts Tax:	38.4¢
Federal Excise Tax:	24.4¢
Total NJ Diesel Tax:	**51.9¢**
Total Diesel Tax:	**76.3¢**

NJ Spill Fund:	.0548¢ (2.3¢ per barrel)
Federal Spill Fund:	.214¢ (9.0¢ per barrel)
Federal Superfund tax (annual adj)	.391¢ (16.4¢ per barrel)
Federal Leaking UST Fund:	.1¢ (Included here in excise tax)
Total Gas Tax w. fees	64.0598¢
Total Diesel Tax w. fees	76.9598¢

Until January 1, 2025

33 NEW JERSEY PETROLEUM OPERATIONS



Once they leave the gasoline terminal rack, a distributor will deliver the fuel to a gasoline retail facility, where the fuel will be dispensed into the underground storage tank (UST) system for sale to motorists.

34 RETAIL OPERATIONS – WHO OWNS WHAT?

Who owns this gas station?

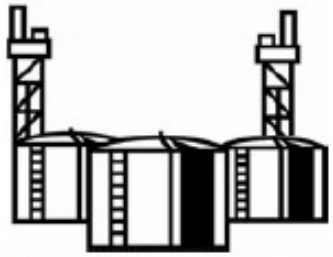
It's complicated!

Gasoline service stations may appear monolithic, but the property ownership and business operations may be entirely different.

In New Jersey, we have seen six basic gasoline retail operating structures.

35 RETAIL OPERATIONS – WHO OWNS WHAT?

GASOLINE MARKET SCENARIO #1



OIL COMPANY / OIL REFINER

Owns or Controls Retail Property (Franchisor)

LEASES TO

LEASEE DEALER

Small Business Owner (Owns the Franchise)

HISTORICAL / LEASEE SCENARIO

- Property is owned by a **MAJOR OIL**
- **COMPANY/BRANDED REFINER**.
- Property is leased and franchised to the **LEASEE DEALER** who is a small business owner. There is a property rental agreement and a supply franchise agreement.
- Dealers pay very high rents to the oil company/refiner, sometimes upwards of $20k per month.
- Gasoline is sold to the dealer at a price determined by the **MAJOR OIL COMPANY/BRANDED REFINER**. This price is called DTW (Dealer Tank Wagon) and is considerably higher than the refiner sells to distributors at the rack (Rack Price).
- Dealers purchase gasoline in full truck loads of 8500 gallons and manage their own inventory.
- The employees at this location are all employed by the franchisee dealer (small business owner). The traditional gasoline service station has 2-3 service bays and does auto repairs too, or may include a convenience store to make ends meet.
- Does not widely exist any longer in New Jersey.

36 RETAIL OPERATIONS – WHO OWNS WHAT?

GASOLINE MARKET SCENARIO #2

DISTRIBUTOR / JOBBER

Owns or Controls Retail Property (Franchisor)

LEASES TO

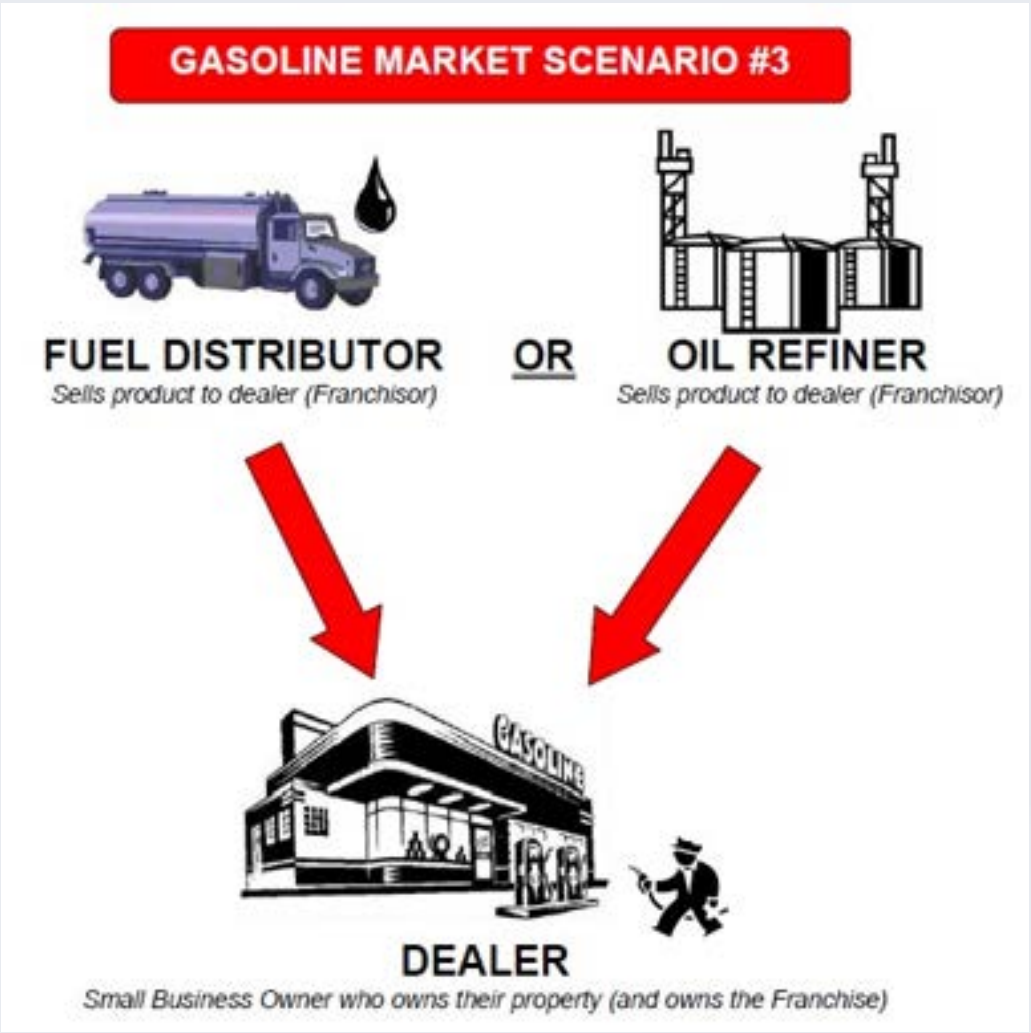
LEASEE DEALER

Small Business Owner (Owns the Franchise)

MODIFIED TRADITIONAL SCENARIO

- The service station property may be owned by a **DISTRIBUTOR/JOBBER**, is leased and franchised to the **LEASEE DEALER** who is a small business owner. There is a property rental agreement and a supply franchise agreement.
- Gasoline is sold to the dealer at a price that is determined by the **DISTRIBUTOR/JOBBER**. This price is called DTW (Dealer Tank Wagon) and is considerably higher than the distributor/jobber pays at the rack (Rack Price).
- Dealers purchase gasoline in full truck loads of 8500 gallons and manage their own inventory.
- Dealers set the retail price on the pump. This is determined by local market competition.
- The employees at this location are all employed by the dealer (small business owner).
- Agreements between the **MAJOR OIL COMPANY/BRANDED REFINER** allow the **DISTRIBUTOR/JOBBER** to be the franchisor and the **LEASEE DEALER** is the franchisee (owns the franchise).

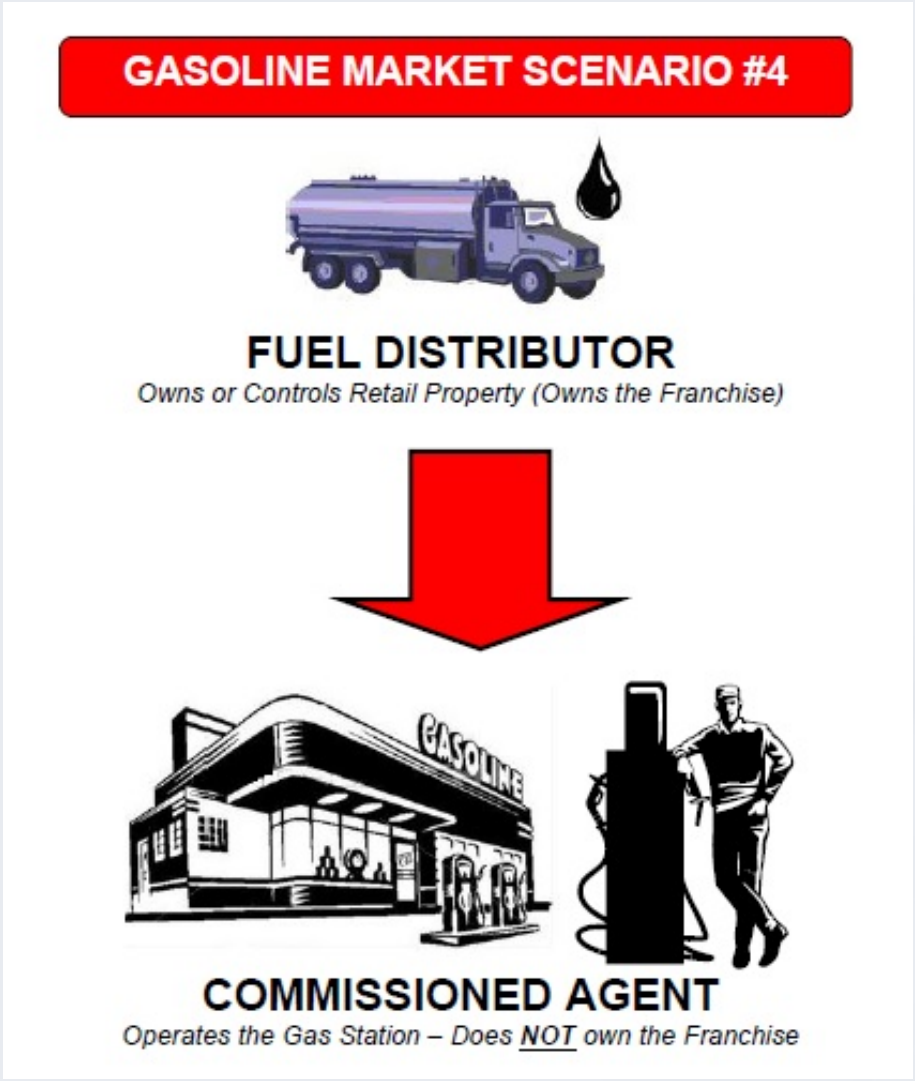
37 RETAIL OPERATIONS – WHO OWNS WHAT?



PROPERTY OWNER SCENARIO

- The traditional gasoline service station property may be owned by the **LEASEE DEALER**, who is a small business owner.
- The **LEASEE DEALER** controls what brand is sold at the location and negotiates with multiple **MAJOR OIL COMPANY/BRANDED REFINER** and **DISTRIBUTOR/JOBBER** to get the best contract price.
- The dealer usually buys at rack price plus delivery charges and a small markup for the distributor.
- **LEASEE DEALER** that own or control the retail property have a price advantage because they decide who will supply product at their location and refiners and/or distributors compete for their business.
- Dealers purchase gasoline in full truck loads of 8500 gallons and manage their own inventory. Dealers set the retail price on the pump. This is determined by local market competition.
- The employees at this location are all employed by the dealer (small business owner)
- Agreements between the branded refiner allow the distributor to be the franchisor and the dealer is the franchisee (owns the franchise).

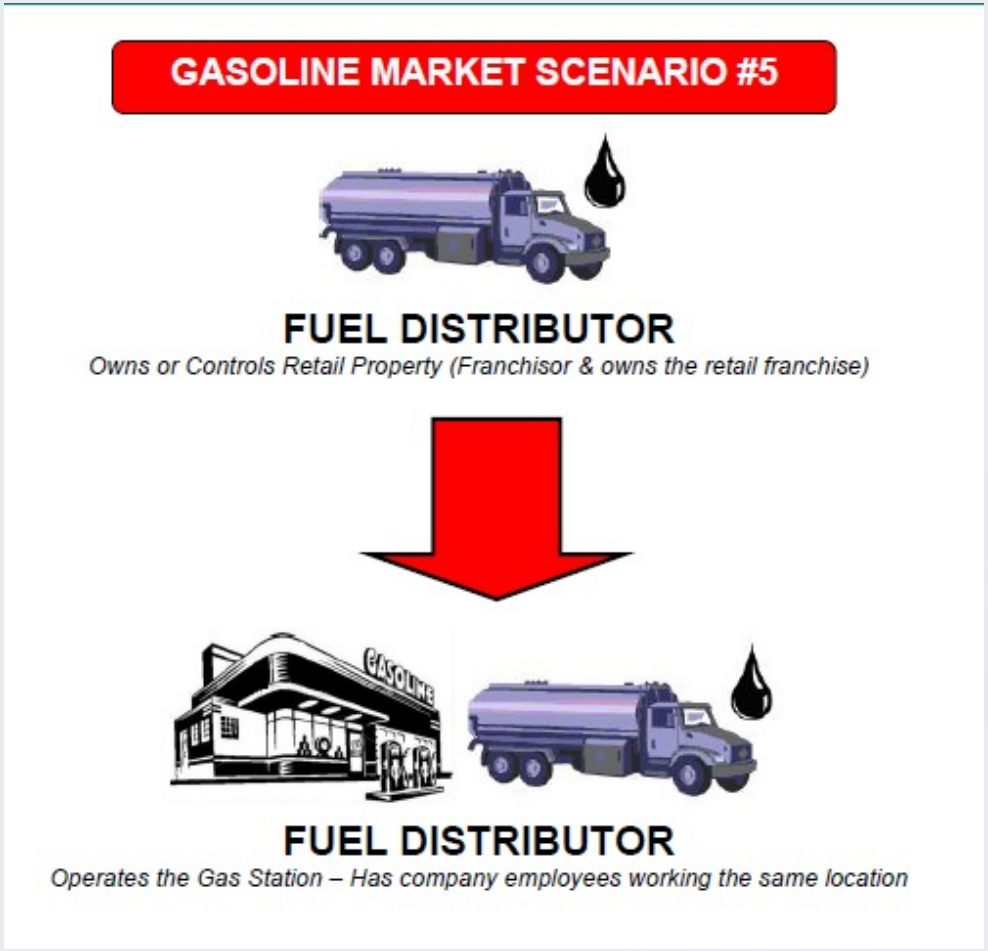
38 RETAIL OPERATIONS – WHO OWNS WHAT?



COMMISSIONED AGENT SCENARIO

- The service station property may be owned by a **DISTRIBUTOR/JOBBER**. The franchise is owned by the distributor and the **COMMISSIONED AGENT** operates the location and is paid a commission (usually based on a XX cents per gallon model).
- Gasoline is delivered to the station as needed but remains the property of
- the distributor. The distributor sets the retail price at the pump. **COMMISSIONED AGENT** do not set the price.
- Since distributors pay rack price for product, the price at the pump is usually more competitive than retail locations that require dealers to pay a higher wholesale (DTW) and also must add a markup for profit.
- The employees at this location are usually employed by the commissioned agent. Many times commissioned agents rent the service bays from the distributor landlord and supplement profits by doing auto repairs.
- Although commissioned agents may be considered small businesses because they operate repair shops, commissioned agents do not have any franchise rights and agreements may be terminated at any time.
- Not as common in New Jersey.

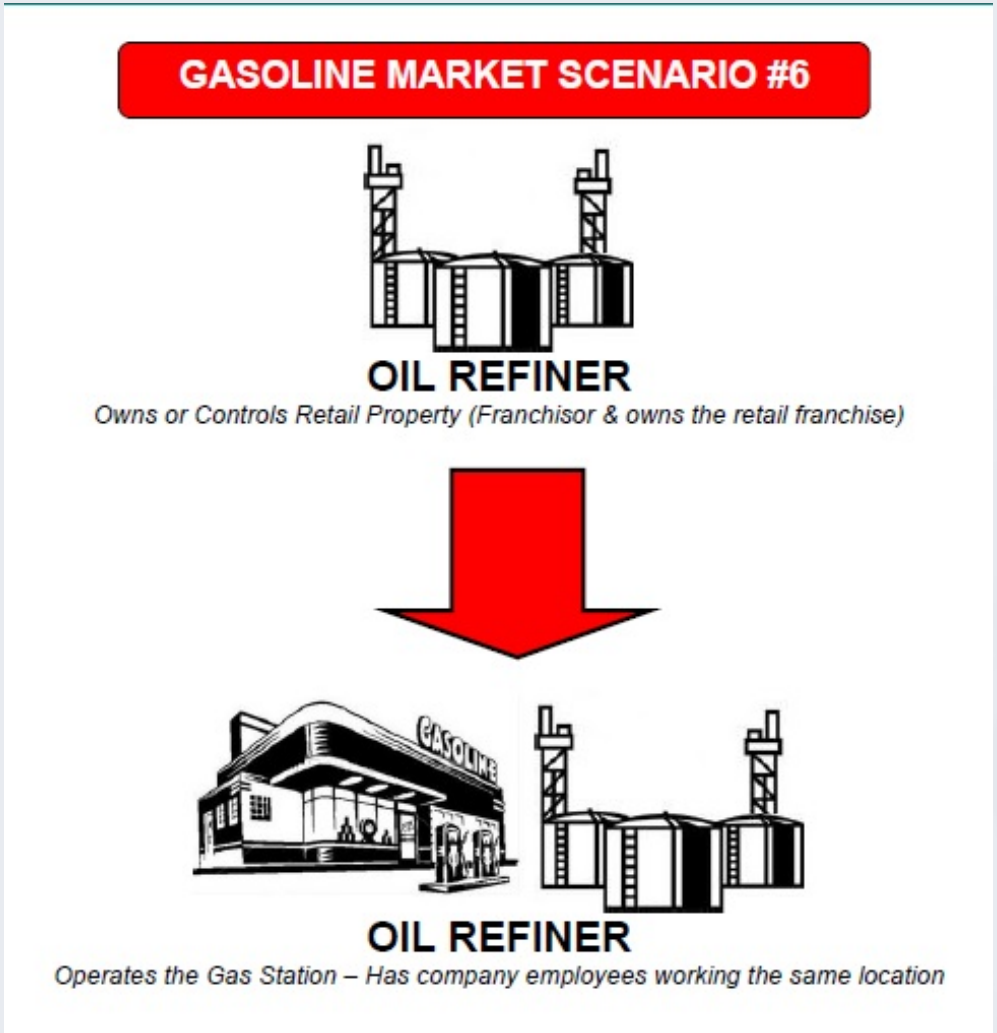
39 RETAIL OPERATIONS – WHO OWNS WHAT?



DISTRIBUTOR/STATION OPERATOR SCENARIO

- Gasoline service station property may be owned ***AND*** operated by a **DISTRIBUTOR/JOBBER**. The franchise is owned by the distributor and workers are employed by the distributor/jobber.
- Gasoline is delivered to the station as needed and is the property of the distributor. The distributor sets the retail price at the pump.
- Since **DISTRIBUTOR/JOBBER** pay rack price for product, the price at the pump is usually more competitive than other retail locations that require dealers to pay a higher wholesale (DTW) and also must add a markup for profit.
- Some mega distributors that operate their locations purchase in such large volume that they can buy whole barges of finished product and may even have their own bulk storage and rack facilities. This allows mega distributors to price hyper competitive compared to other retail locations.
- Becoming more common in New Jersey.

40 RETAIL OPERATIONS – WHO OWNS WHAT?



HISTORICAL INTEGRATED SCENARIO

- The traditional gasoline service station property may be owned ***AND*** operated by the **OIL COMPANY/BRANDED REFINER**.
- The franchise is owned by the distributor/jobber and workers are employed by the distributor/jobber.
- Gasoline is delivered to the station as needed and is the property of the distributor. The oil company/refiner sets the retail price at the pump.
- Since refiners control the rack price, prices at the pump are usually more competitive than other retail locations that require dealers to pay a higher wholesale price (DTW) and also must add a markup for profit.
- **OIL COMPANY/BRANDED REFINER** that owns retail locations and operate them are a dying breed (in both New Jersey and nationwide).

41 RETAIL OPERATIONS – NEW JERSEY

Challenges for New Jersey Retail Station Owners:

- NJ motor fuel (gasoline and diesel for road use) usage peaked in 2016 at 5.14 billion gallons of motor fuel, 2023 was 4.48 billion gallons (2020 was 3.94 billion gallons)—fewer gallons to spread costs around.
  - Some blame EVs, but mostly it's been higher vehicle fuel efficiency
- 10-20 years ago average GROSS markup for gasoline was around 15-20¢ a gallon. Today it is 33-39¢.
  - Two major drivers are salaries (minimum wage has doubled in 10 years and its hard-to-find people to work at the state minimum when competing with Amazon and Uber, etc).
  - Credit Card fees are another major driver. Fees have gone up over 20 years, and usage has skyrocketed, now about 85% of sales. Interchange fees are set by Visa and MasterCard and can't be negotiated. They are 7 times what they are in Europe.
    - Remember when the retail price of gas goes from $2-$4 the credit card fee doubles for the same gallon.
    - All the other things that make it expensive for any business in NJ must be accounted for too—property taxes/rent, utilities, etc.
    - Also costs for environmental compliance companies, UST insurance, the cost of the tanks as well, general liability, etc.
- Very rare to see a location that is purely fuel. Typically, a repair shop or convenience store are part of the overall business so as to stay profitable.
  - 25 years ago, only about 20% of stations had a convenience store, now the split is about 50-50. Sometimes because the bays are converted to a store, sometimes because the repair business decides to get rid of the hassle that comes with fuel.

42 RETAIL OPERATIONS – NEW JERSEY

Final Notes:

- At one point there were over 6,000 gasoline stations in New Jersey, but that number has dwindled to approximately 2,300.
    - What are the causes?
        - Environmental and business regulations
        - High cost of doing business/Environmental compliance
        - Lots of competition (Rise of “big box, corporate owned” retail groups)
- Market trends have created a lot of blurry lines to the traditional scenarios. In today’s market, the distributors have supplanted the major oil companies/branded refiners in the retail landscape.
    - In fact, some distributors started out as retailers, owned multiple locations, and began to distribute to themselves.
- Idea of “brand” and “small business owners” being the same is untrue (LUKOIL/Newark Example).

THANK YOU
Questions?

Nick De Palma
nick@njgca.org