



Basics of Oil & Gas Generation And The Upstream Petroleum Lifecycle - NAMCOR Race to First Oil Seminar 2023

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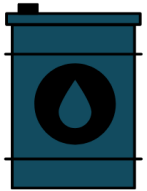
What are fossil fuels?



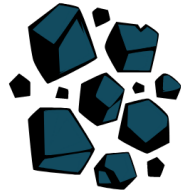
Nonrenewable high energy sources that are used to cater for majority of the world's energy needs.

Types of Fossil Fuels

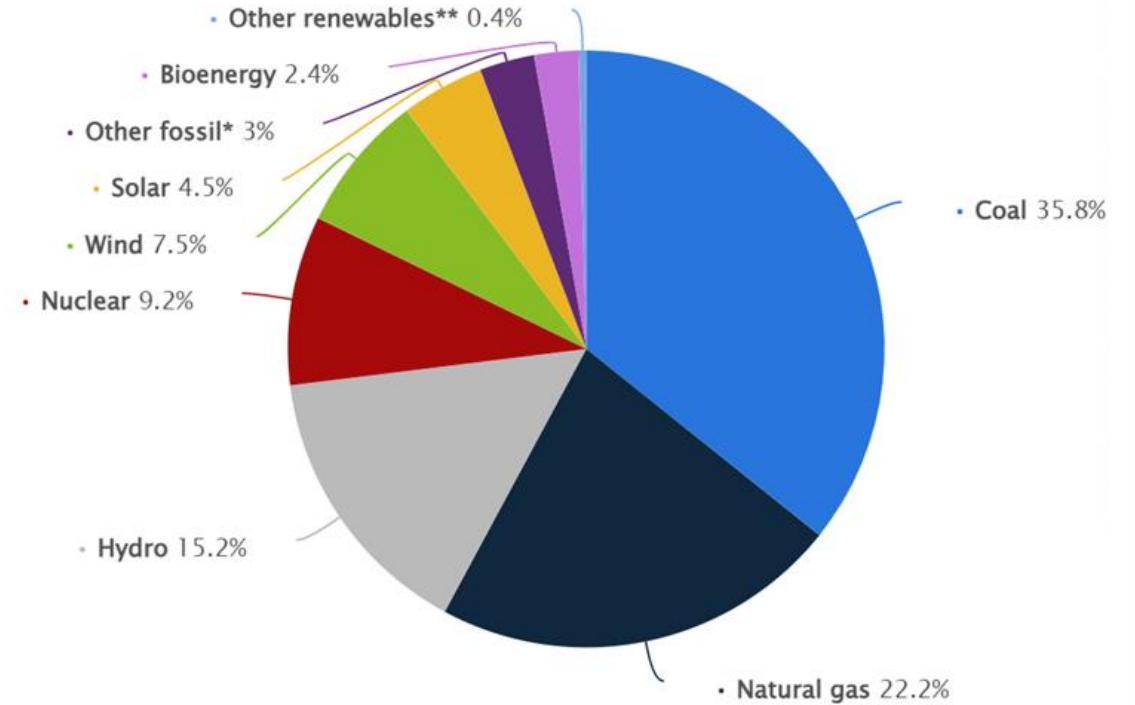
> Oil



> Coal



> Natural Gas



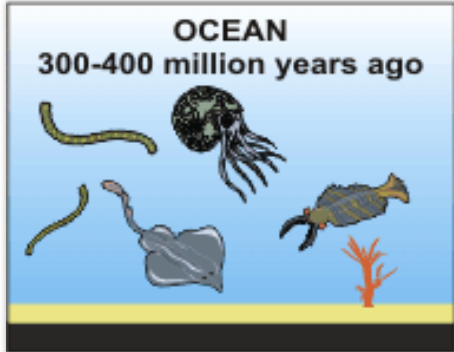
Distribution of electricity generation worldwide in 2022, by energy source



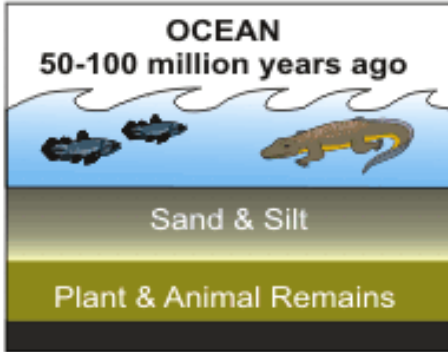
Basics of Oil and Gas Formation



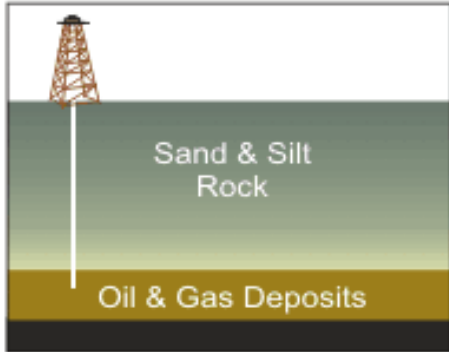
Oil and Natural Gas Formation



OCEAN
300-400 million years ago
Tiny sea plants and animals died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.

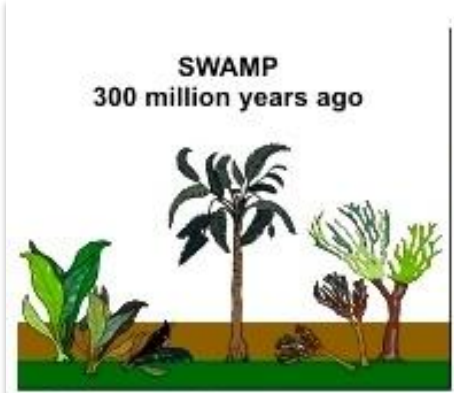


OCEAN
50-100 million years ago
Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.

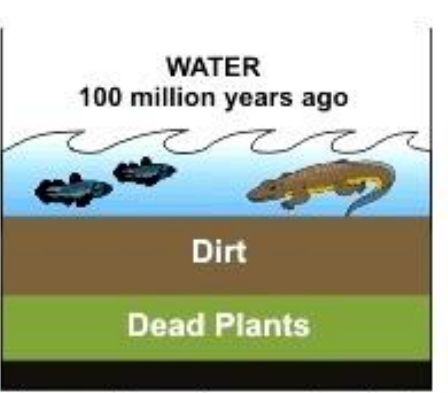


Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

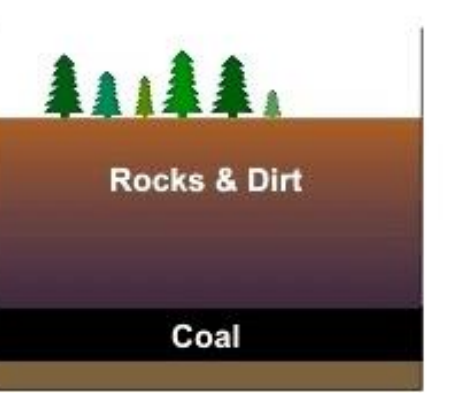
Coal Formation



SWAMP
300 million years ago
Before the dinosaurs, many giant plants died in swamps.



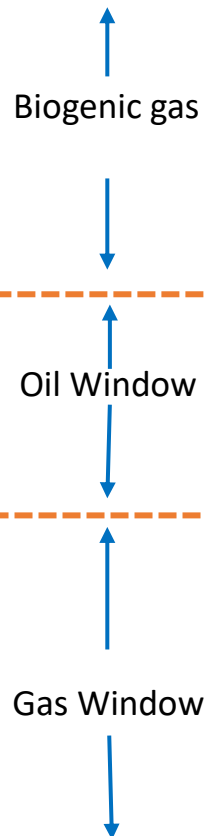
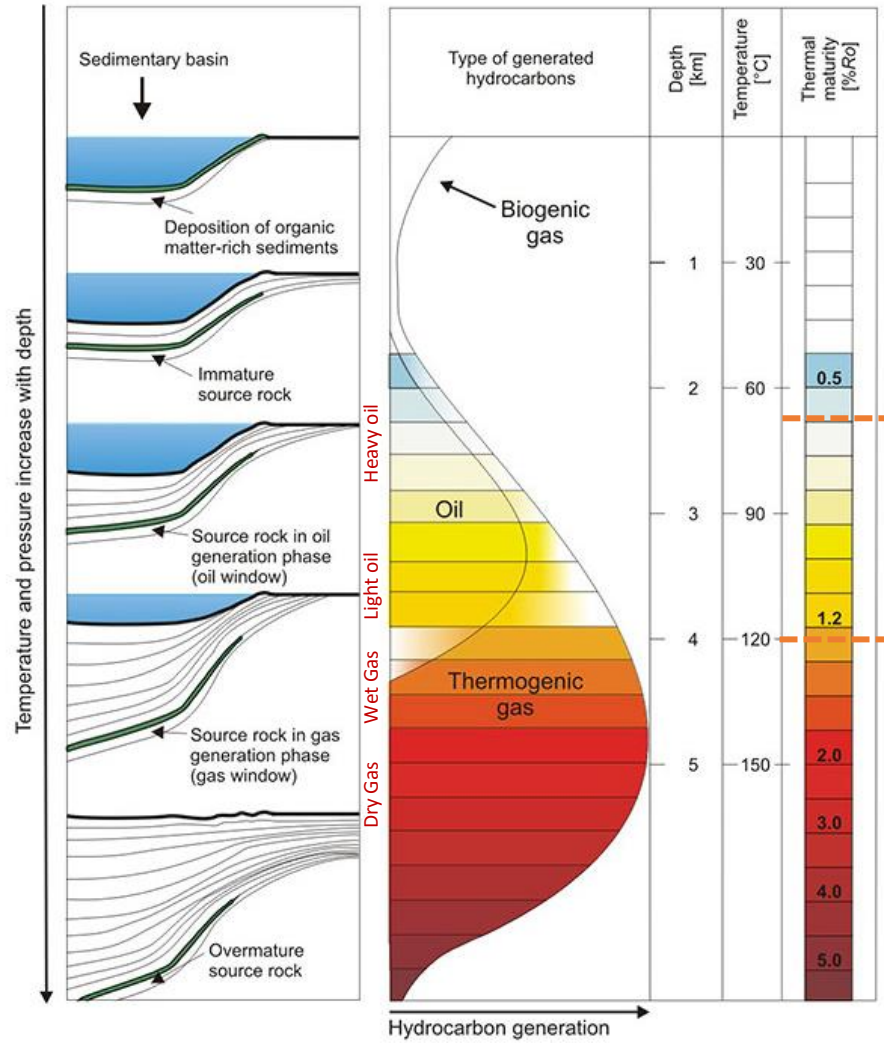
WATER
100 million years ago
Over millions of years, the plants were buried under water and dirt.



Heat and pressure turned the dead plants into coal.



Critical Conditions for Generating Oil & Gas

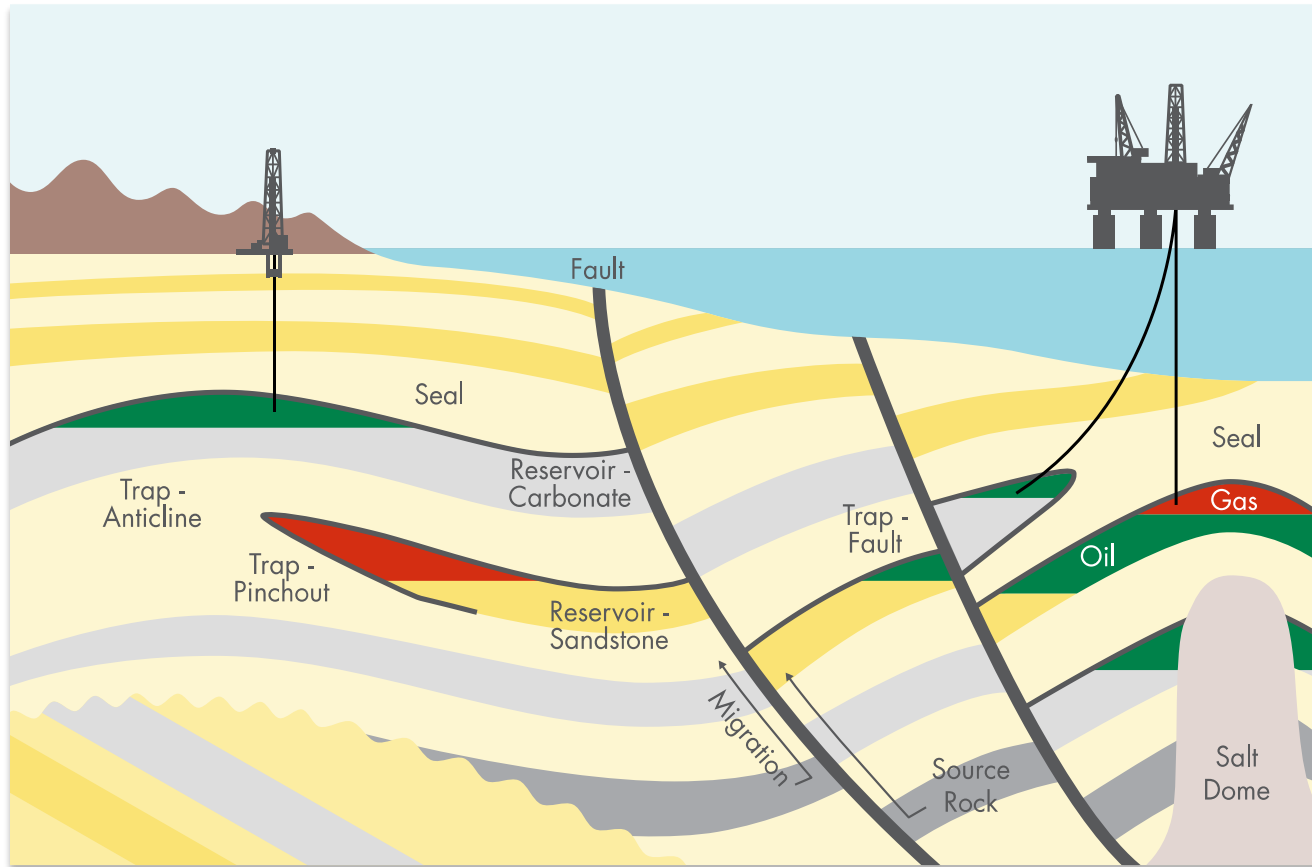


- ### Key elements
- Depth
 - Temperature
 - Pressure
 - Anoxic

CLASSIFICATION	API
Light Crude	31.1°
Medium Crude	22.3 - 31.1°
Heavy Crude	10 - 22.3°
Extra Heavy Crude	< 10°



Finding Oil and Gas: Petroleum System Elements



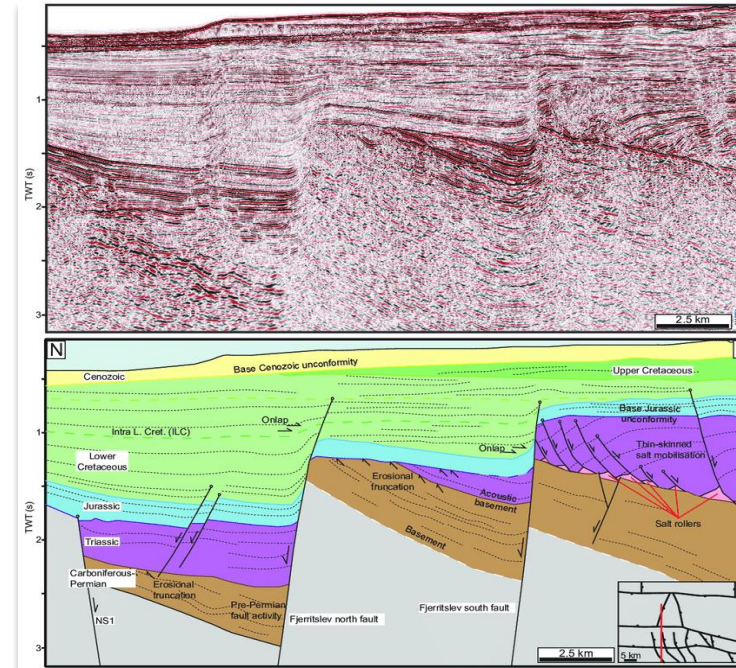
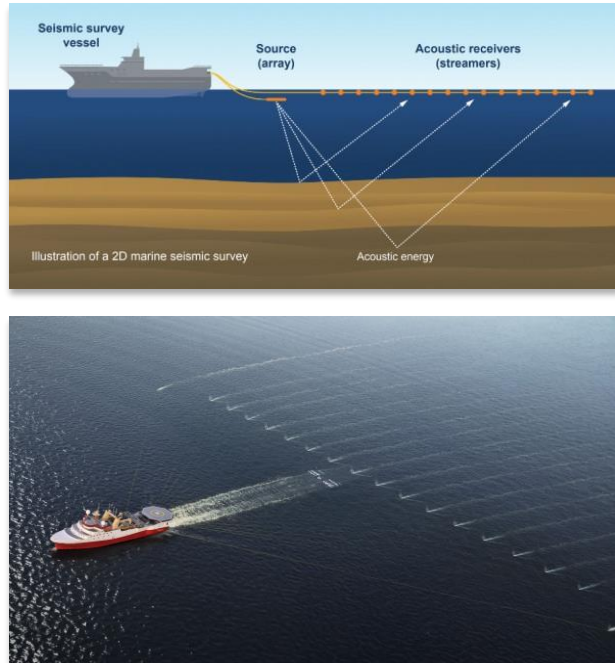
Key Petroleum Elements

- Source Rock
- Migration path
- Reservoirs
- Trap
- Seal

- **Convictional** Hydrocarbon accumulation
- **Unconventional** Hydrocarbon accumulation



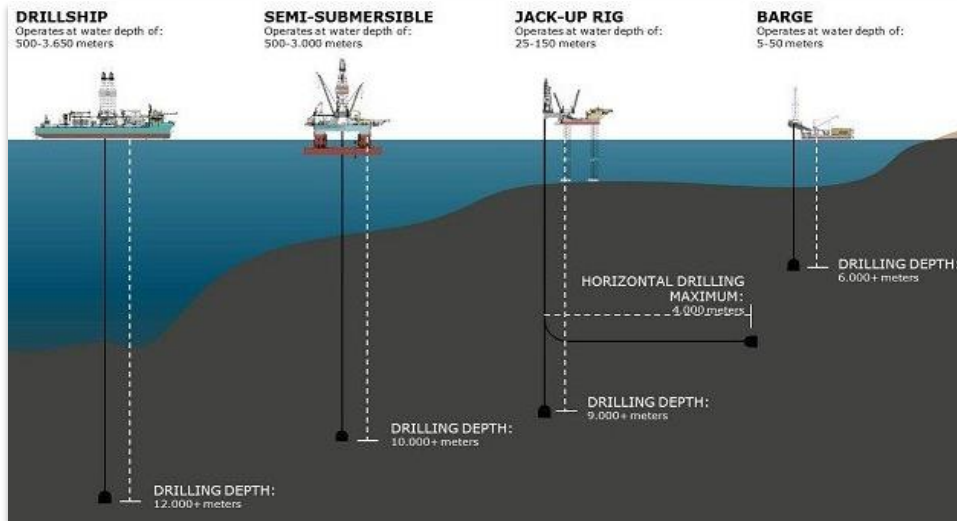
Finding Oil and Gas: Data Collection



- Collect seismic data to generate an image of the subsurface
- Processing and interpretation of acquired data
- Results from the interpretation are then used to help determine if there are any prospective locations to drill for oil or gas
- A single seismic survey can take 2-5 months to complete
- US \$20M - \$60M per survey



Finding Oil and Gas: Drilling



- **Exploration Wells**

- Establish the presence of hydrocarbons in a structure

- **Appraisal Wells**

- Define the volumes with more accuracy, in order to establish commerciality and the forward development plan

- **Production Wells**

- Drilled when a decision has been reached to develop the field

- Safely drill to test for hydrocarbon presence

- Extensive safety measures and contingency planning used to ensure operational integrity

- A single well can take several months to drill

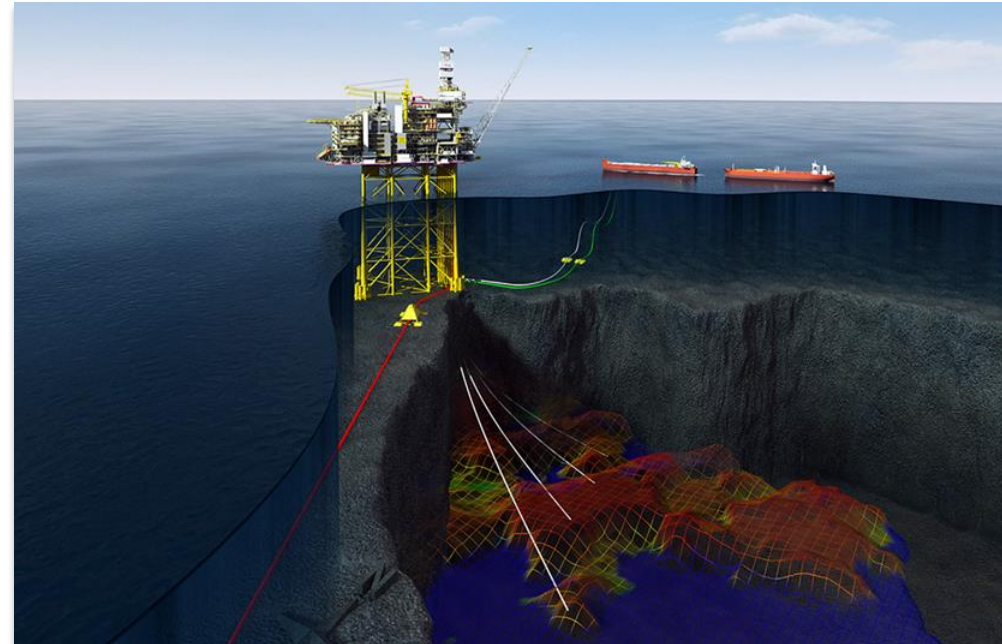
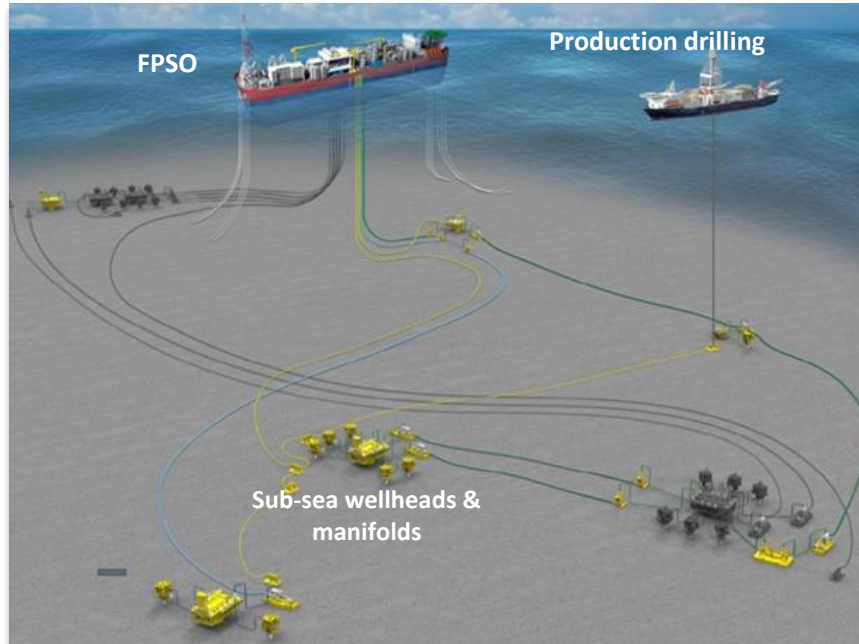
- Drilling is the only way to confirm the presence and type of petroleum;

- However, the first well hardly ever confirms commercial viability

- +/- US \$40M - \$100M per well



Finding Oil and Gas: Field Development



- After a discovery has been made, additional wells will be drilled to understand the size of the resource and the possible production rates
- Based on this data, a decision can be made whether to develop and produce the field
- Development includes building the offshore and onshore infrastructure to produce petroleum
- Total development costs US\$5B - \$20B



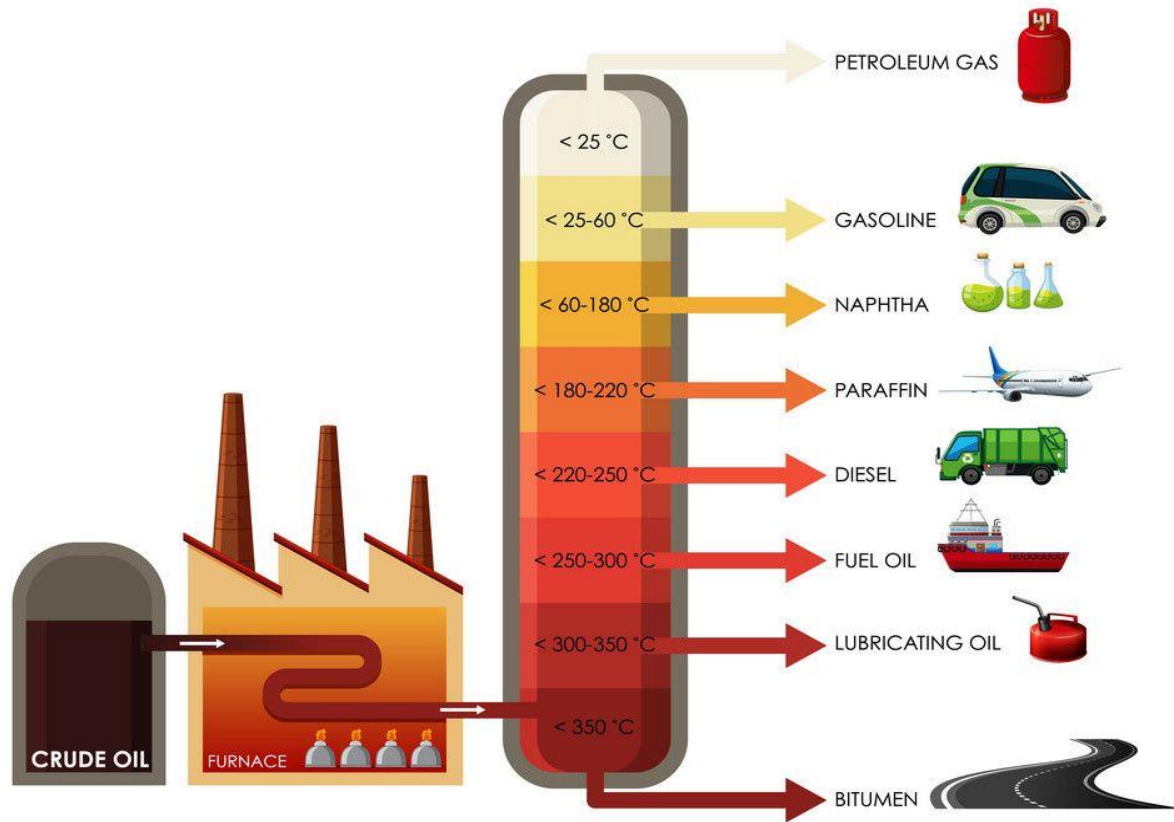
Finding Oil and Gas: Production



- Deliver oil or gas to onshore facilities for further processing into fuels, chemicals, and power generation
- First revenues are typically generated 10-15 years after exploration commences
- Fields generally produce for 20-40 years



Fractional Distillation of Crude Oil



A process by which oil refineries separate crude oil into different, more useful hydrocarbon products

Evaporation



Condensation



Collection of Condensed Liquid



Oil & Gas Every Day



Summary: Upstream Petroleum Lifecycle



ACTIVITY	Data Acquisition	Exploration Drilling	Appraisal Drilling	Field development	Production Operations
TIMEFRAME	+/- 4 years	+/- 4 years	+/- 4 years	+/- 5 years	20-40 years
CHANCE OF SUCCESS	0-20%	0-20%	30-50%	+80%	
EXPENSES	US \$20-80M NAD \$300M-\$900M	US +/- \$100M/well NAD +/- \$1.5B/well	US +/- \$0.5 B NAD +/- \$8 B	US \$5-20 Bill NAD \$80B-\$300B	Multi-Billion GRN take (Taxes, Royalties, other)



What Is In It For Me?

- The discovered oil resource belongs to you and me
- We therefore owe it to ourselves to stay abreast and informed with the ongoing discussions on the opportunities and benefits that come with this resource
- When we are informed, we will align ourselves better on when, how and at which phase of the value chain to participate in this new and exciting industry
 - Career prospects
 - Business ventures
 - Provision of services





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THANK YOU