

PETROLEUM 101: EXPLORATION, DEVELOPMENT AND PRODUCTION

***Petroleum Resources Development Division
Energy Resource Development Bureau
Department of Energy***



OUTLINE

- 1. Contracting System**
- 2. Petroleum Exploration**
- 3. Development Planning**
- 4. Production System & Facilities**



The Contracting System

- 1. Geophysical Survey and Exploration Contract**
- 2. Service Contract**
 - » Petroleum Energy Contracting Round**
 - » Philippine Conventional Energy Contracting Program**



Petroleum Exploration

- 1. Geological and Geochemical Studies**
 - ❖ **Field Sampling**
 - ❖ **Laboratory Analysis**

- 2. Geophysical Studies**
 - ❖ **Seismic Survey (Onshore/Offshore)**

- 3. Exploration Drilling**
 - ❖ **Wells, Types of Rigs**
 - ❖ **Data Gathering**



Petroleum Exploration

Geological Field Survey (Field Sampling)



- ❖ **Source & Reservoir Rocks Sampling**
- ❖ **Oil Sampling**
- ❖ **Gas Sampling**



Petroleum Exploration

Laboratory Analysis



Petroleum Exploration

Geophysical Studies

Seismic Survey

- ❖ **Onshore Seismic Survey**
- ❖ **Offshore Seismic Survey (2D, 3D & 4D)**
 - **Acquisition**
 - **Processing**
 - **Interpretation**

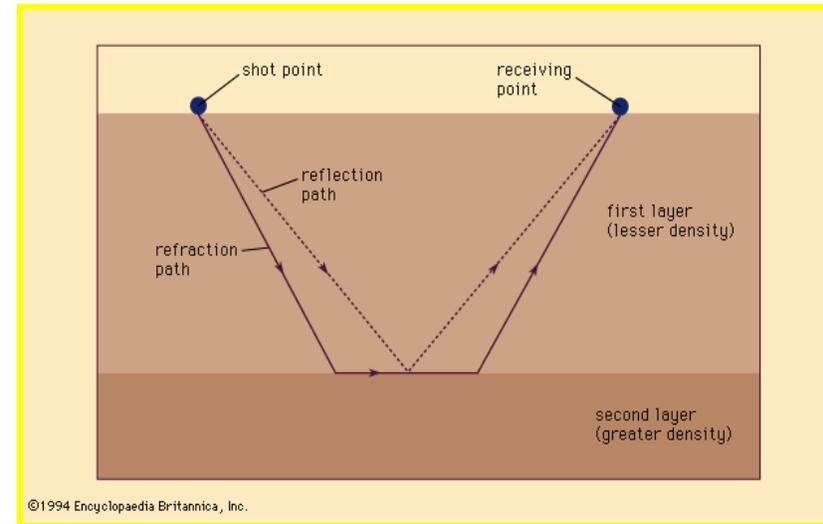
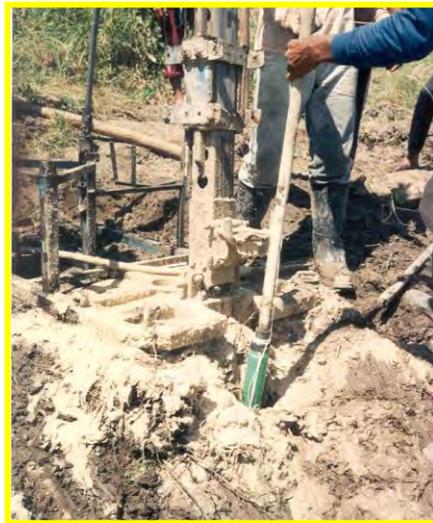


Petroleum Exploration

Onshore Seismic Survey

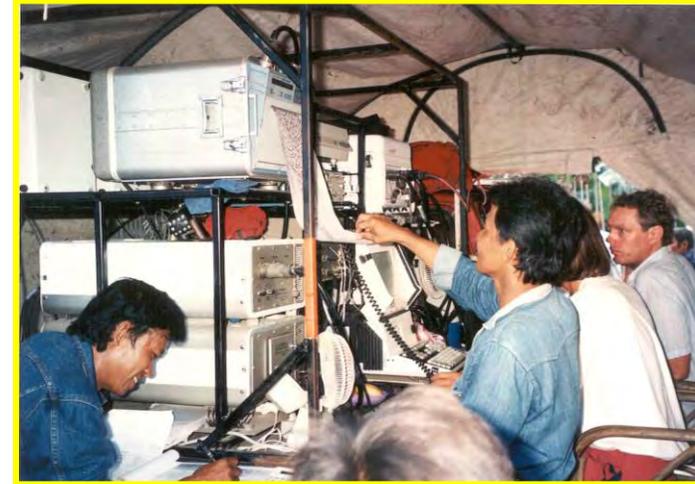


- ❖ Shot holes are drilled to penetrate the **ground's** weathered zone.
- ❖ An explosive charge, usually dynamite, is loaded into the shot holes and detonated, sending sound waves into the sub-strata which are variably reflected back to the surface.



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Onshore Seismic Survey



Sound waves reflected from the sub-surface are picked up by an array of geophones (receivers) which are laid out on the ground along a seismic line and connected to recording instruments through a seismic cable.



Petroleum Exploration

Offshore Seismic Survey



Air-Guns



**Streamer
Cable**



Source: Offshore Engineer

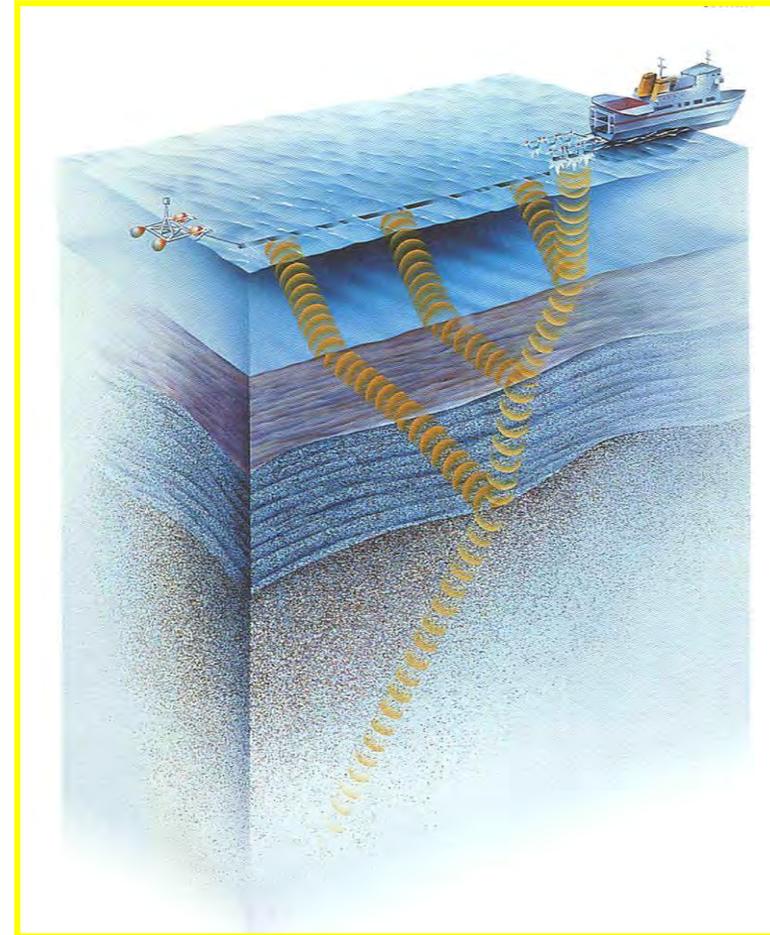
Seismic Vessel



Petroleum Exploration

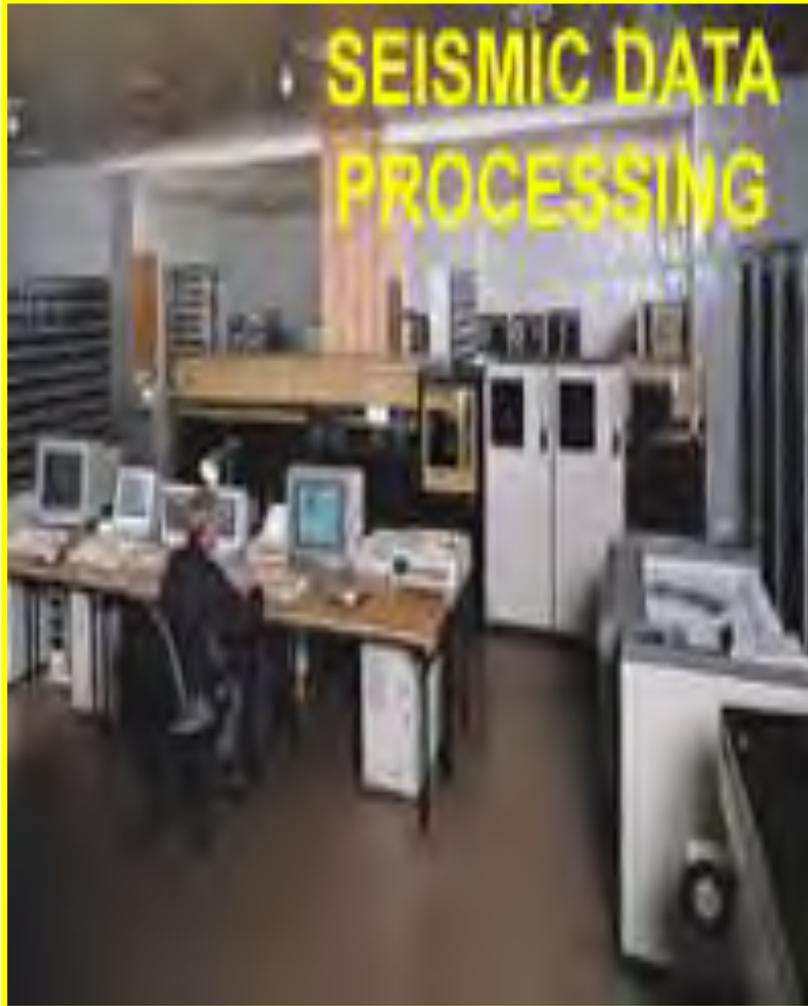
Offshore Seismic Survey

An energy pulse (from an air explosion or an electrical discharge) is sent to the subsurface layers and reflected waves are picked up by hydrophones (receivers) contained in a streamer (cable) being towed by the survey vessel.



Petroleum Exploration

Seismic Data Processing

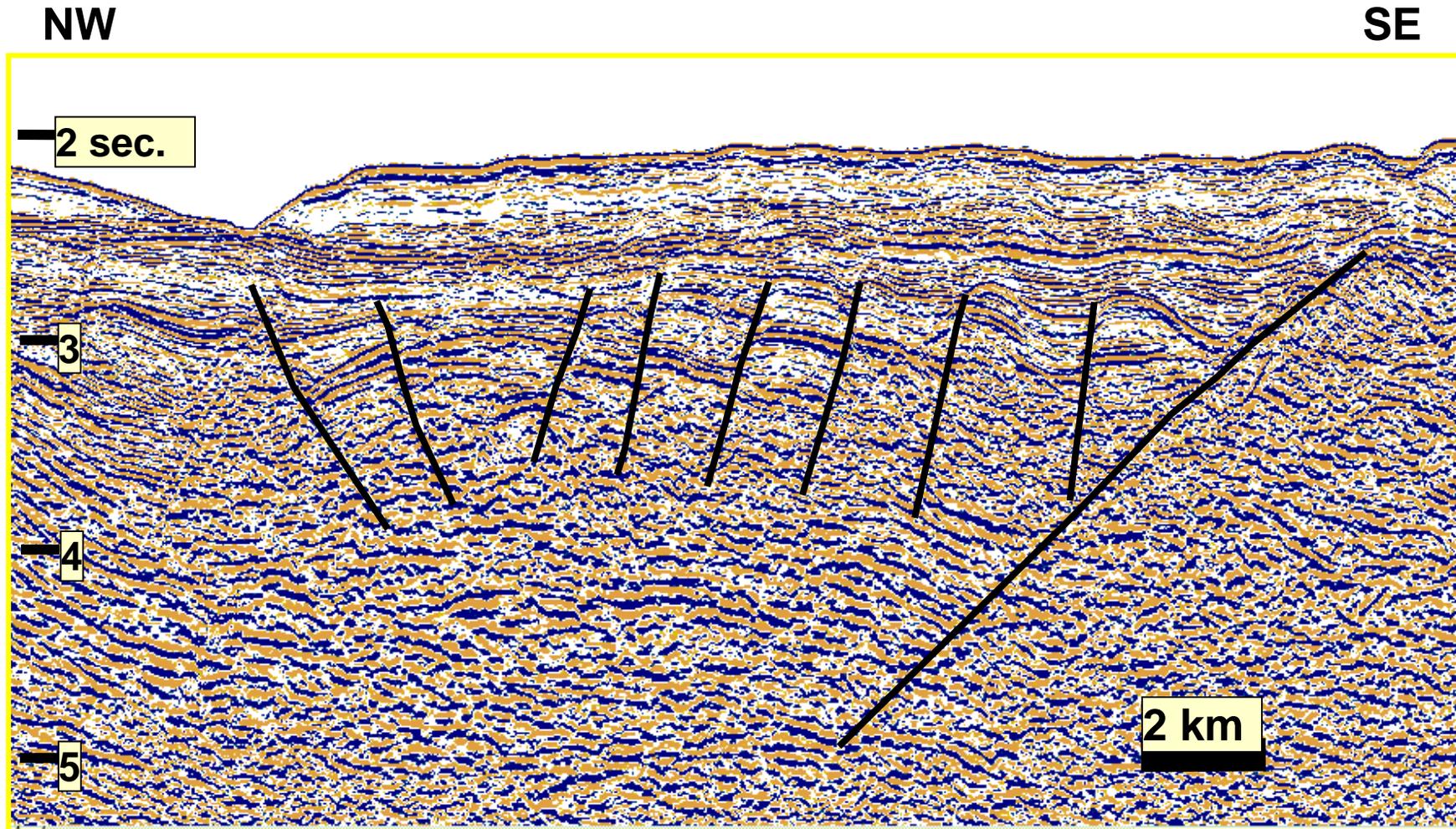


The processing outputs are used by geophysicists or explorationists in their interpretation work; paper plots for manual interpretation or digital data for workstation interpretation.



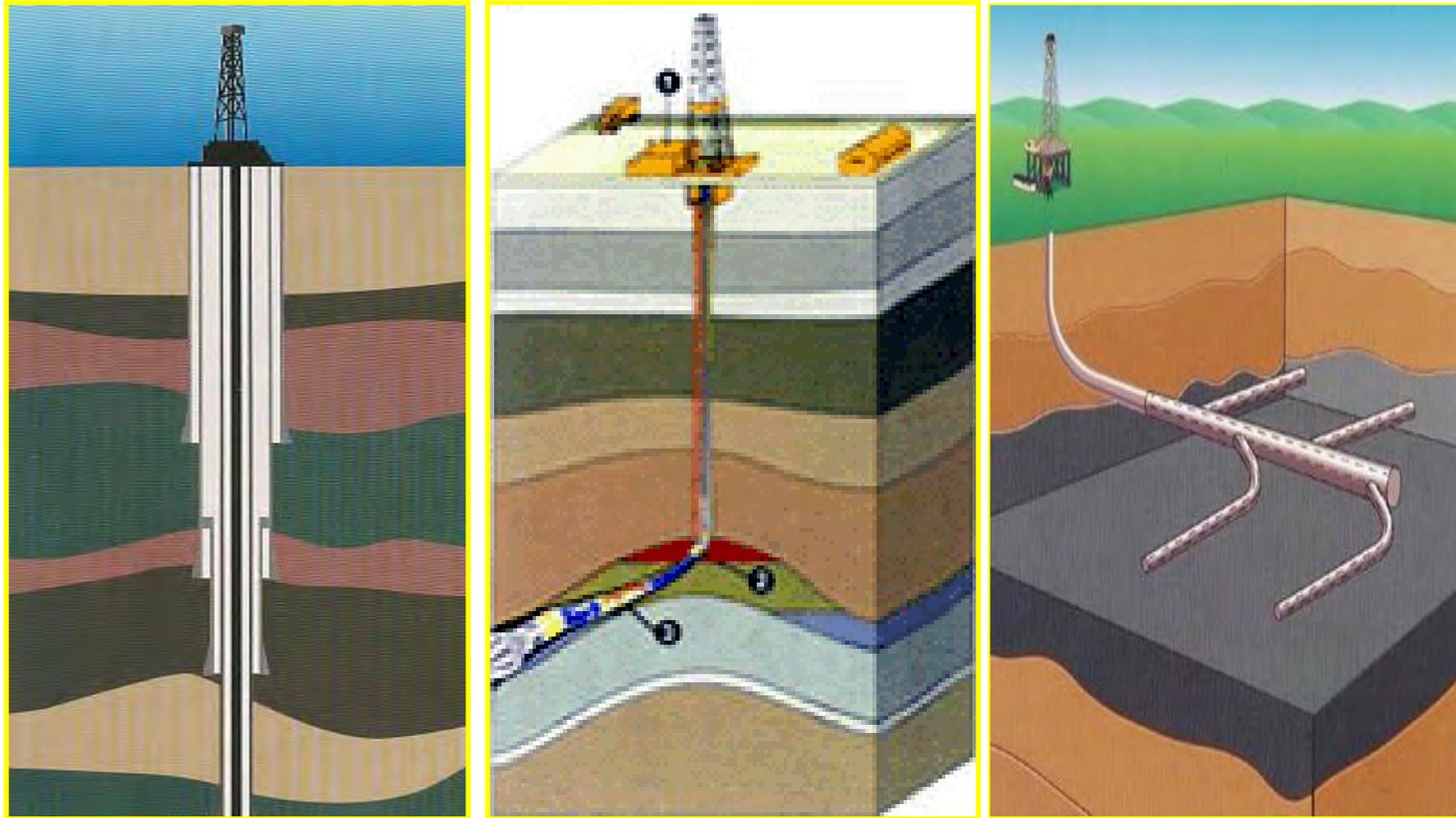
Petroleum Exploration

Interpreted Seismic Section



Petroleum Exploration

Exploration Drilling



Petroleum Exploration

Drilling Rig (Onshore)



Petroleum Exploration

Drilling Rigs (Offshore)



- ❖ **JACK-UP** – water depth is < 350 ft.
- ❖ **SEMI-SUBMERSIBLE** – for water depth of about 6,000 ft.
- ❖ **DRILLSHIP** - for water depth of 13,000 ft.

Development Planning

❖ **PROCESS AND FIELD FACILITIES**

- Deepwater Development Systems (FPSO, FPS, SPAR)
- Field Facilities (CGS, FPSO, WHP, FSU, OGP)
- Pipelines (Routing, Landfall Sites)

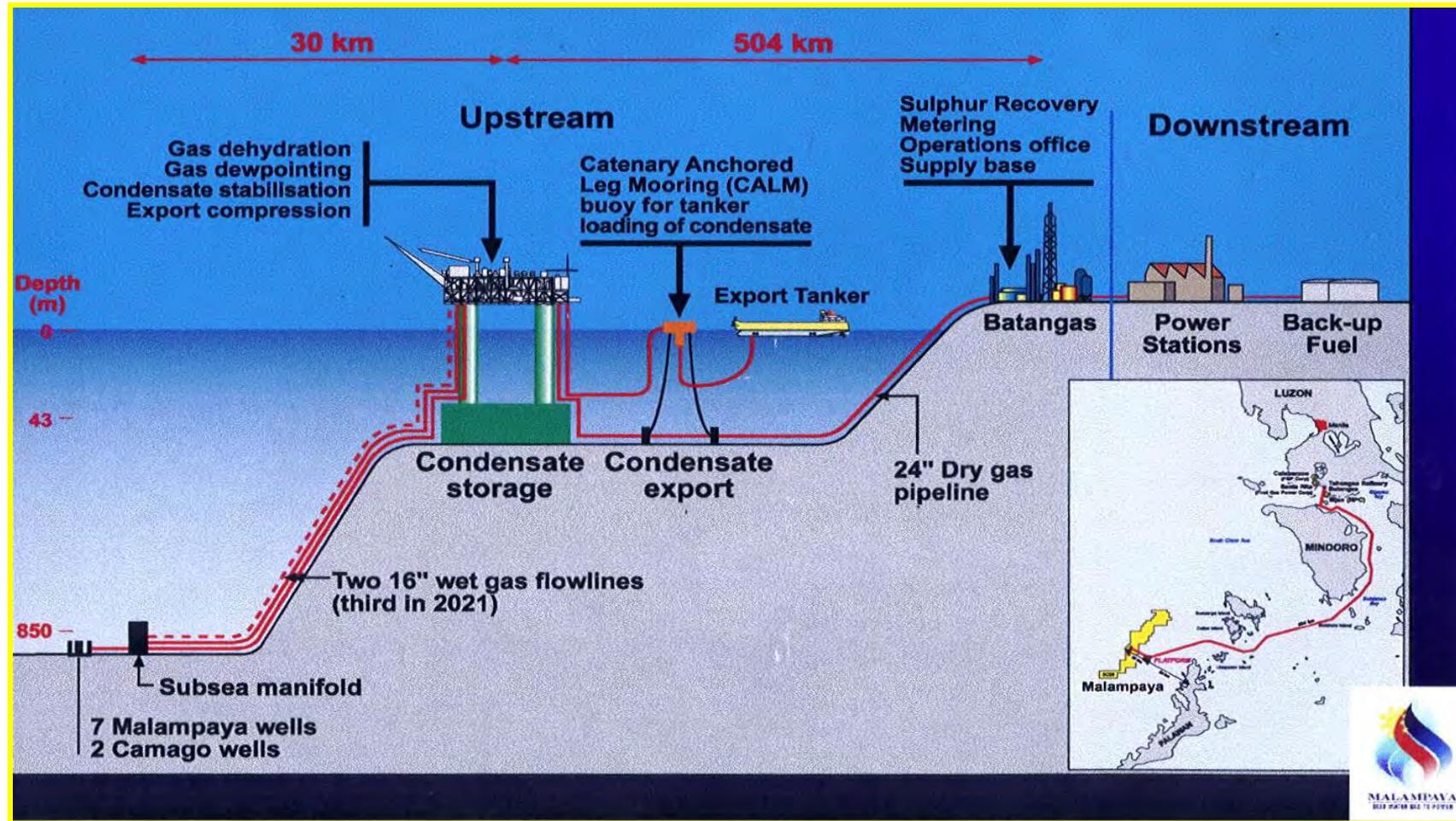
❖ **DEVELOPMENT OPTIONS**

- Deepwater Oil and/or Gas Discovery
- Shallower Oil and Gas Discovery



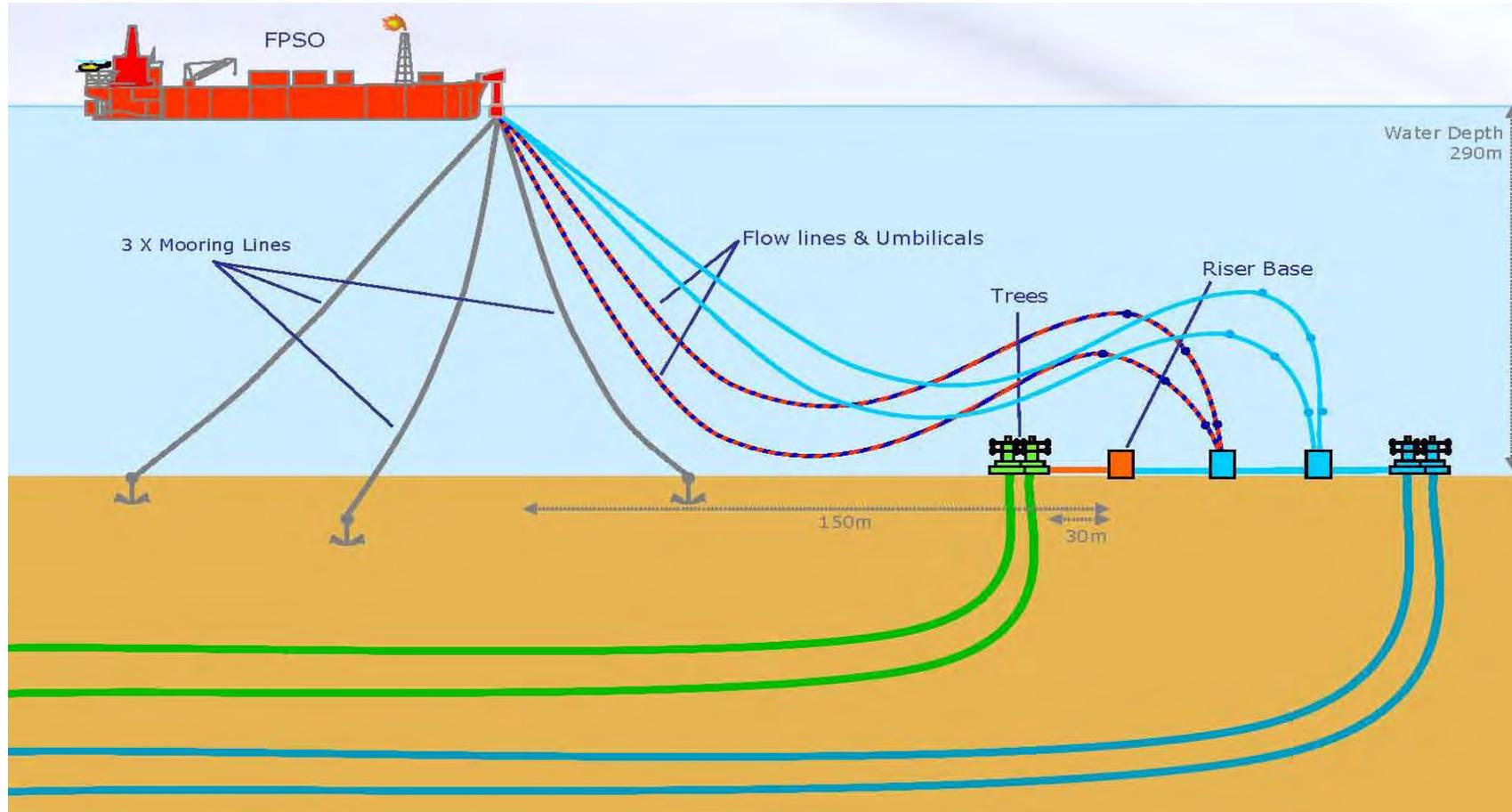
Development Planning

Development Concept of Malampaya Gas-to-Power Project



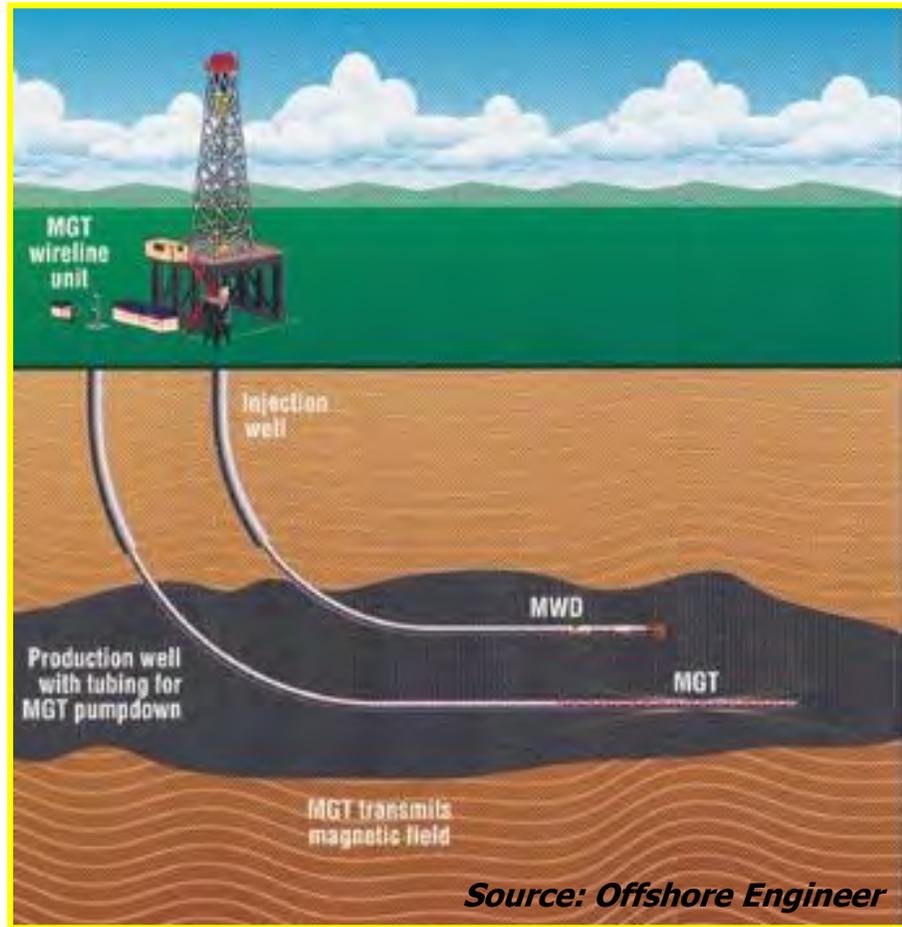
Development Planning

Galoc Field Development Concept



Development Planning

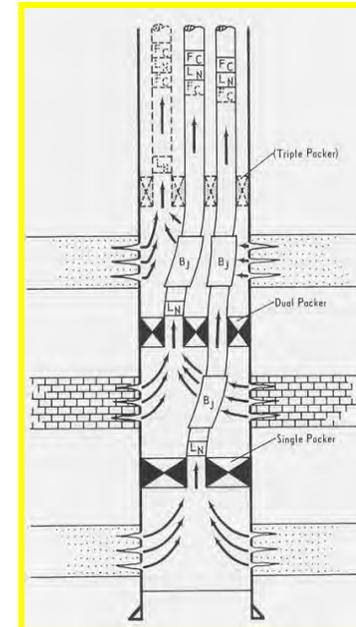
Development Drilling



❖ Development Wells

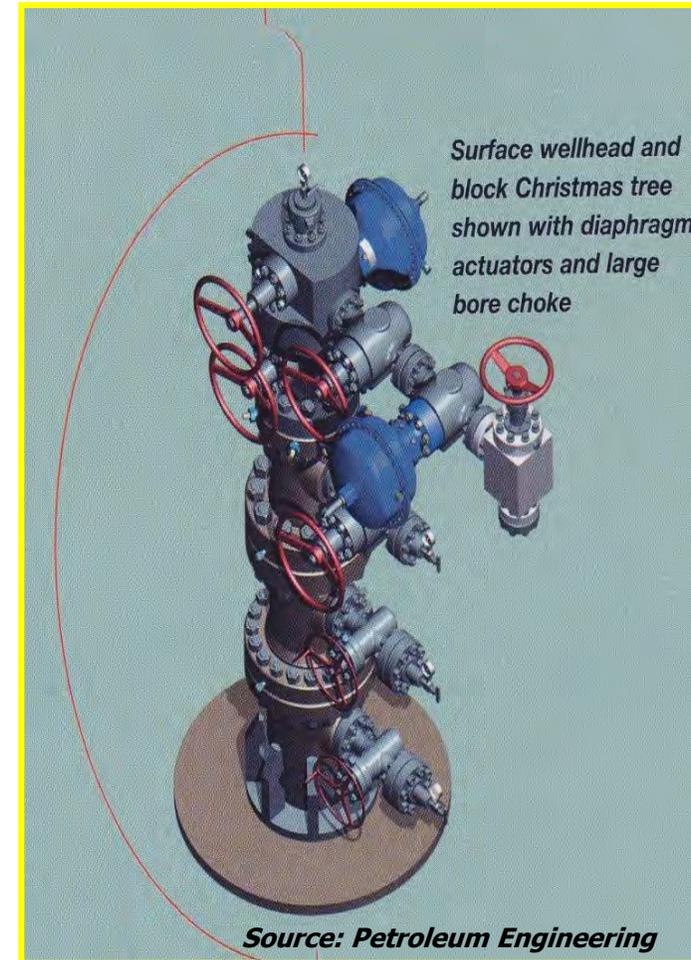
- Producer
- Injector

❖ Well Completion



Production System & Facilities

❖ Onshore Wellhead

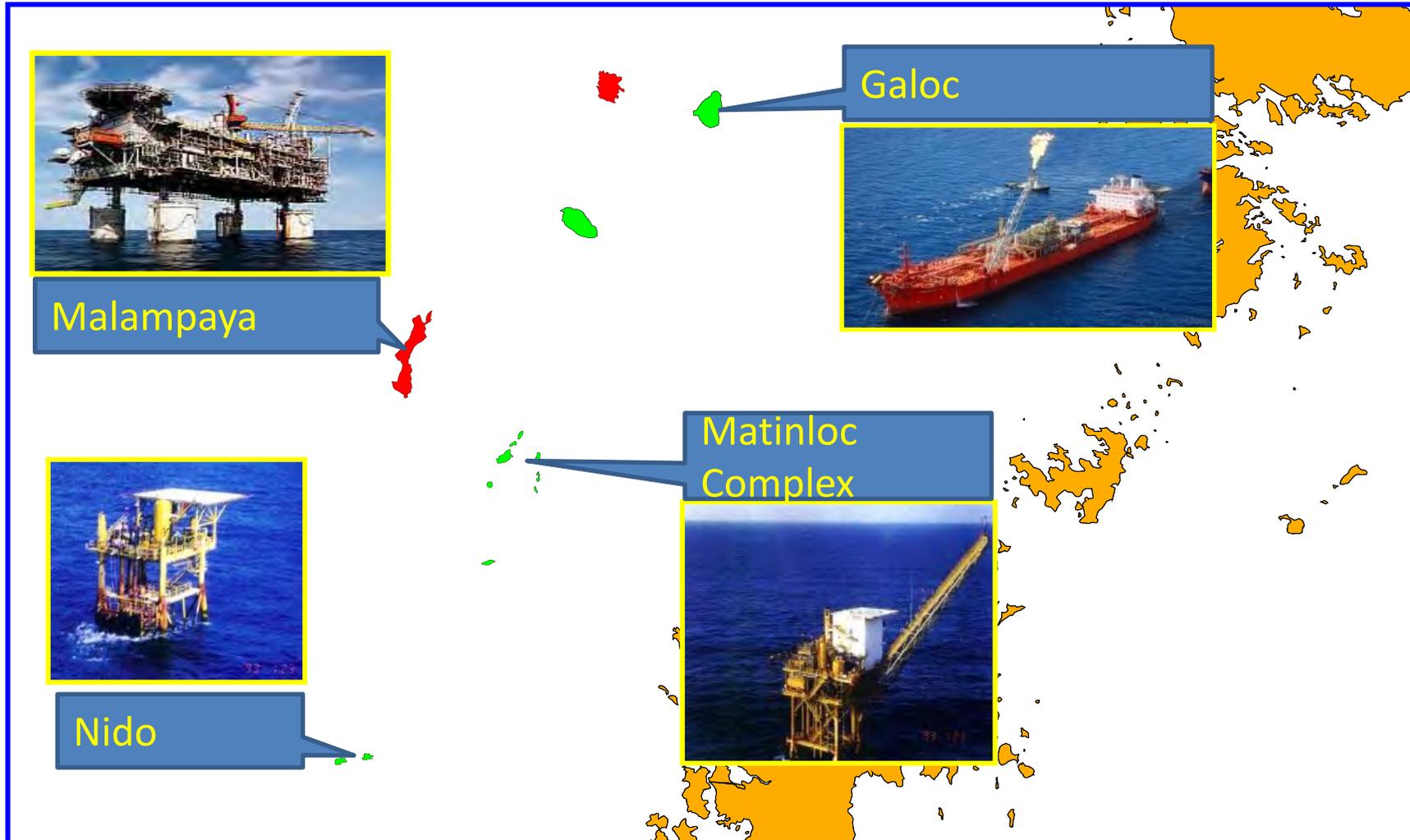


Production System & Facilities



Production System & Facilities

Current Offshore Producing Fields



Thank You!

