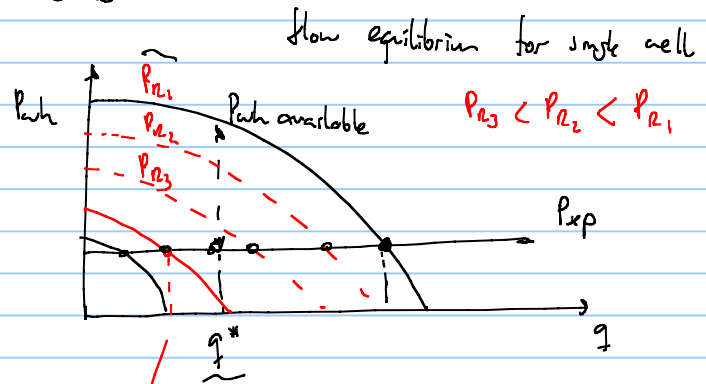
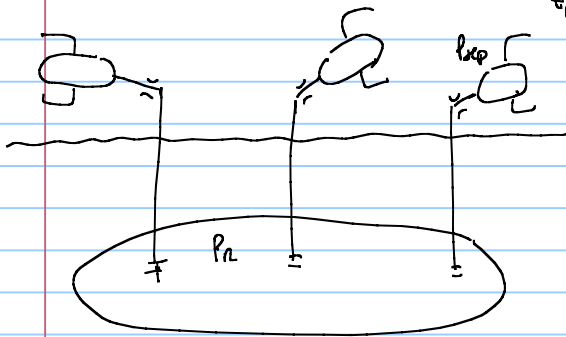


• Problem 2 exercise set 2

$$q_{\text{plateau}} = 80000 \text{ Sm}^3/\text{d} \quad \checkmark$$

$$t_{\text{plateau}} = 5 \text{ years} \quad \checkmark$$


 single well
production
potential

$$q_{\text{w}}^{\text{pot}} = q_{\text{pp}}^{\text{w}} - m G_p$$

no interference between

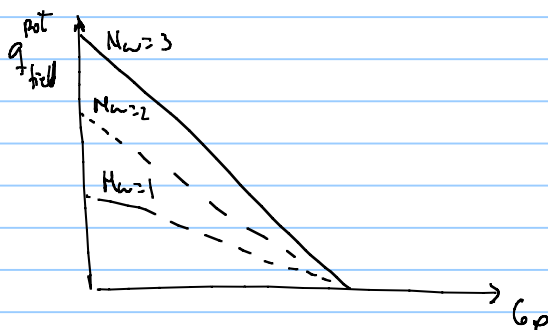
$$q_{\text{field}}^{\text{pot}} = N_w (q_{\text{pp}}^{\text{w}} - m G_p)$$

Approach NFI

Newell 1

time	G_p	$q_{\text{well}}^{\text{pot}}$	$q_{\text{field}}^{\text{pot}}$	$q_{\text{field}}^{\text{pot}}$
0	0			1
1				
2				
3				
4				
5				
6				

if $q_{\text{field}}^{\text{pot}} > 80000 \text{ Sm}^3/\text{d}$ then $80000 \text{ Sm}^3/\text{d}$
else $q_{\text{field}}^{\text{pot}} = q_{\text{field}}^{\text{pot}}$



$$q_{\text{plateau}} = 80000 \text{ Sm}^3/\text{d} \quad \left. \begin{array}{l} q_{\text{plateau end}} \\ t_{\text{plateau}} = 5 \text{ year} \end{array} \right\} G_p = G_p^* = 80000 \cdot 5.365$$

$$q_{\text{field}}^{\text{pot}} @ G_p^{\text{plateau end}} \geq 80.000 \text{ Sm}^3/\text{d}$$

$$q_{\text{field}}^{\text{pot}} = (q_{\text{pp}}^{\text{w}} - m G_p) N_w$$

$$(q_{\text{pp}}^{\text{w}} - m G_p^*) N_w \geq 80.000 \text{ Sm}^3/\text{d}$$

$$N_w \geq \frac{80000}{q_{\text{pp}}^{\text{w}} - m G_p^*}$$

for the post-plateau production profile $\rightarrow$ method 1

if q_{pp} is linear $t \leq t_{plateau}$ $q_{field} = q_{plateau}$

$t > t_{plateau}$

$$q_{field} = q_{plateau} \cdot e^{-m(t-t_{plateau})}$$

$$t_{plateau} = \left(\frac{q_{well}^{held}}{q_{plateau}} - 1 \right) \frac{1}{m}$$

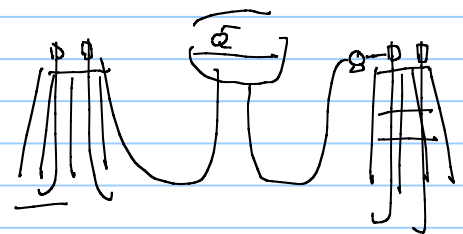
$$m_{field} = m_{well} \cdot N_{wells}$$

$$q_{ppo}^{held} = q_{ppo}^{un} \cdot N_{wells}$$

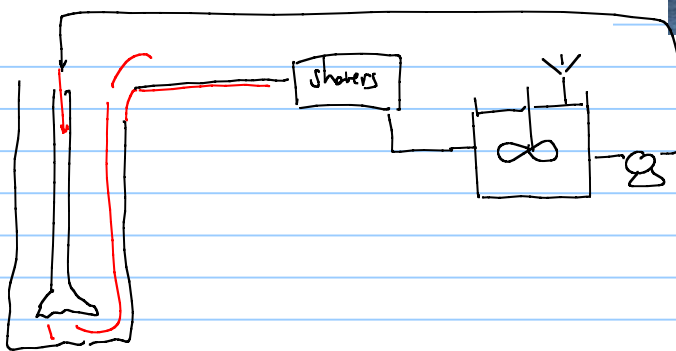
Offshore structures for oil and gas production

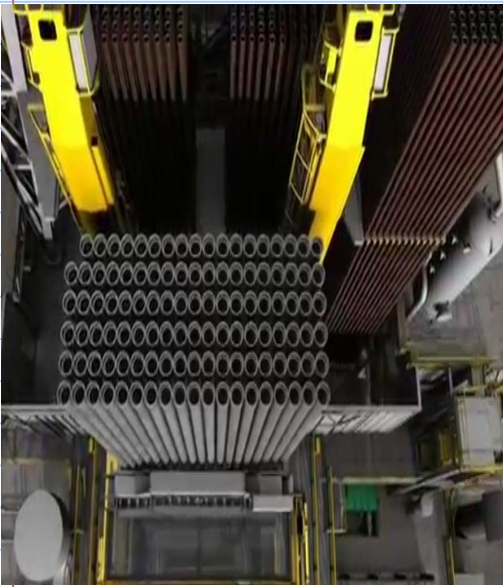
- Facilities for drilling and full intervention. This includes drilling tower, BOP, drilling floor, mud package, cementing pumps, storage deck for drill pipes and tubulars, drilling risers.
- Facilities for light well intervention. $\sim$ wireline operations, coiled tubing
- Processing facilities: separator trains for primary oil, gas and water separation, gas processing train, water processing train.
- Gas injection system
- Gas compression units for pipeline transport
- Water injection system
- Living quarters
- Helideck.
- Power generation. $\sim$ gas turbine
- Flare system. $\rightarrow$ open/close valves
- Utilities (hydraulic power fluid, compressed air, drinking water unit, air condition system, ventilation and heating system)
- Bay for wellheads and christmas trees (optional) $\sim$ dry X-mass tree
- Production manifolds $\rightarrow$ testing
- Oil storage $\rightarrow$
- Facilities for oil offloading $\sim$ to tanker
- Control system
- Monitoring system
- System for storage, injection and recovery of production chemicals (wax, scale, hydrate or corrosion inhibitors)
- Repair workshop

Not all of these are in the same offshore structure!

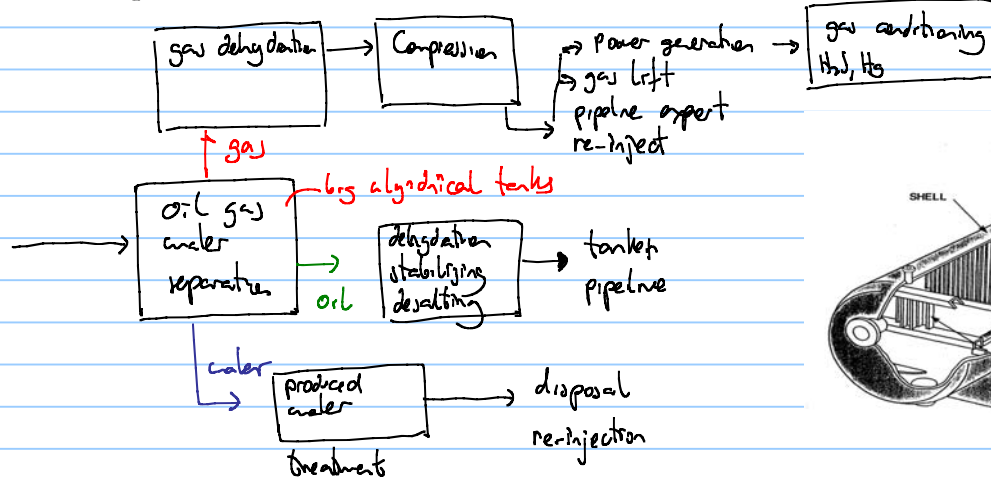


peregrino field

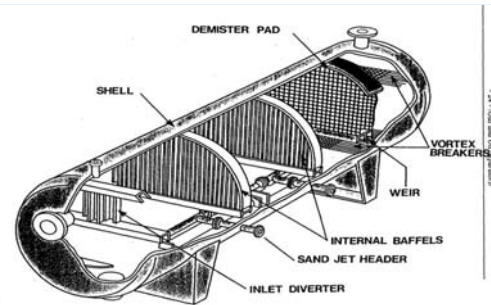




Processing facilities for oil and gas



Not so common in NCS

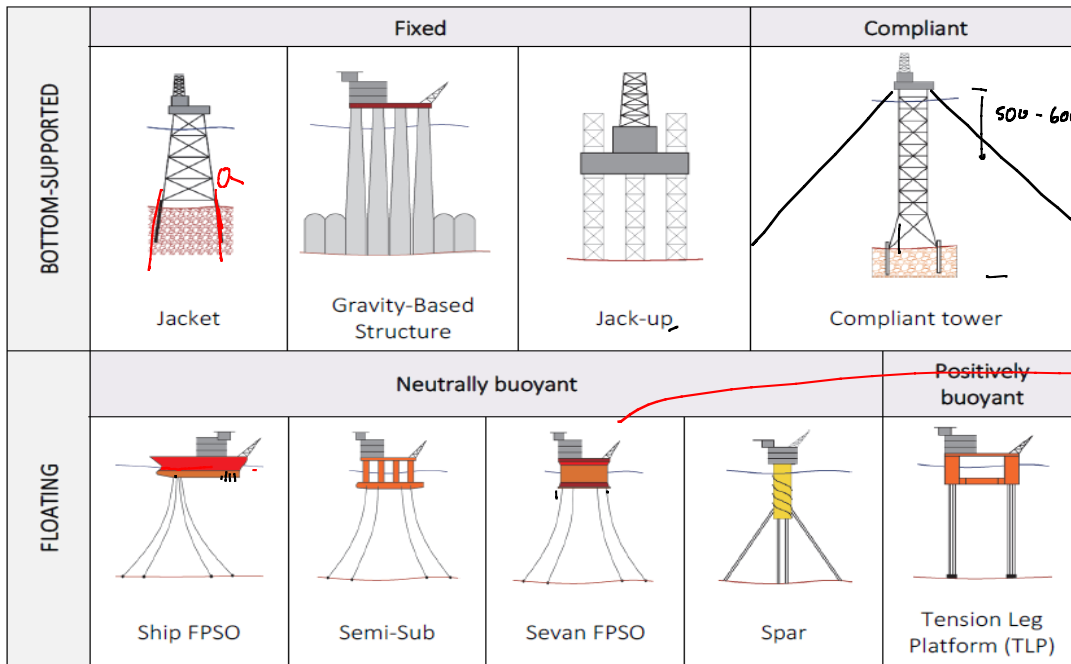


type of offshore structure for oil and gas production.

for intervention, deployment, drilling

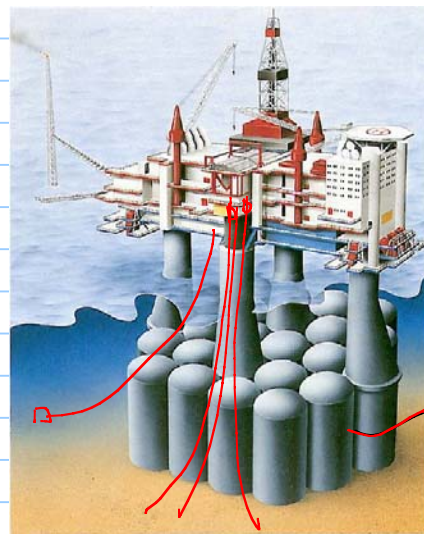
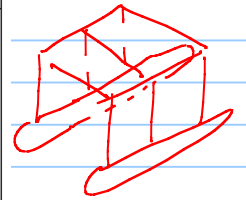
	fixed			Compliant
Bottom supported	Jacket	GBS gravity based structures	Jackup	Compliant tower
	Neutrally buoyant			Positively buoyant
floating	FPD	Semi submersible	Sevan FPSO	TLP

tension leg platform



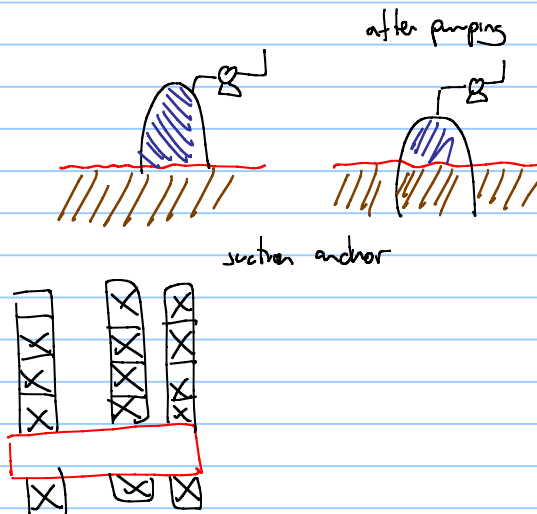
GOM
Gulf of Mexico

Gobiat (ENI)

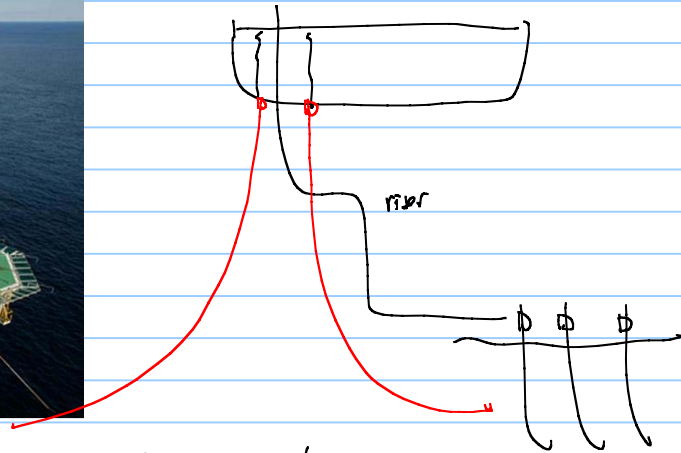


GBS

storage
100 - 300,000 m³

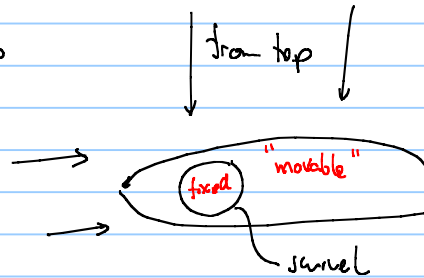


Have

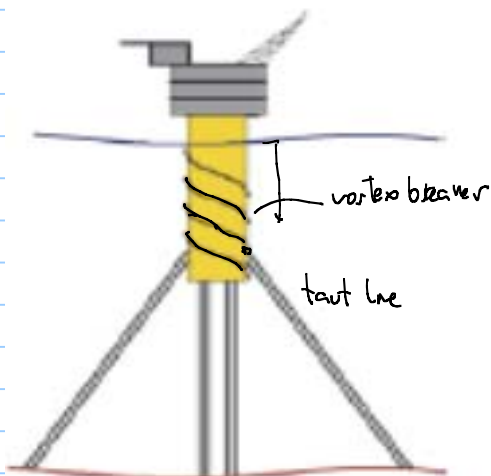
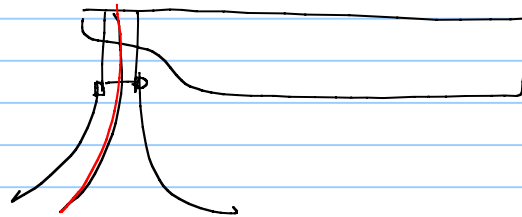


Big storage $\rightarrow$ 1 EOC $\rightarrow$ 3 EOC stb

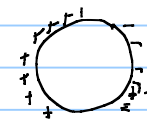
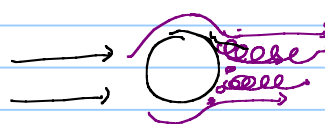
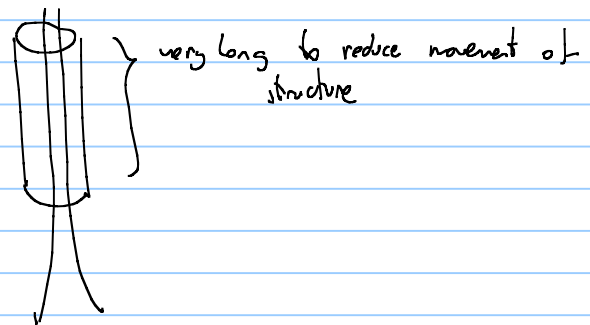
Asta Havnem



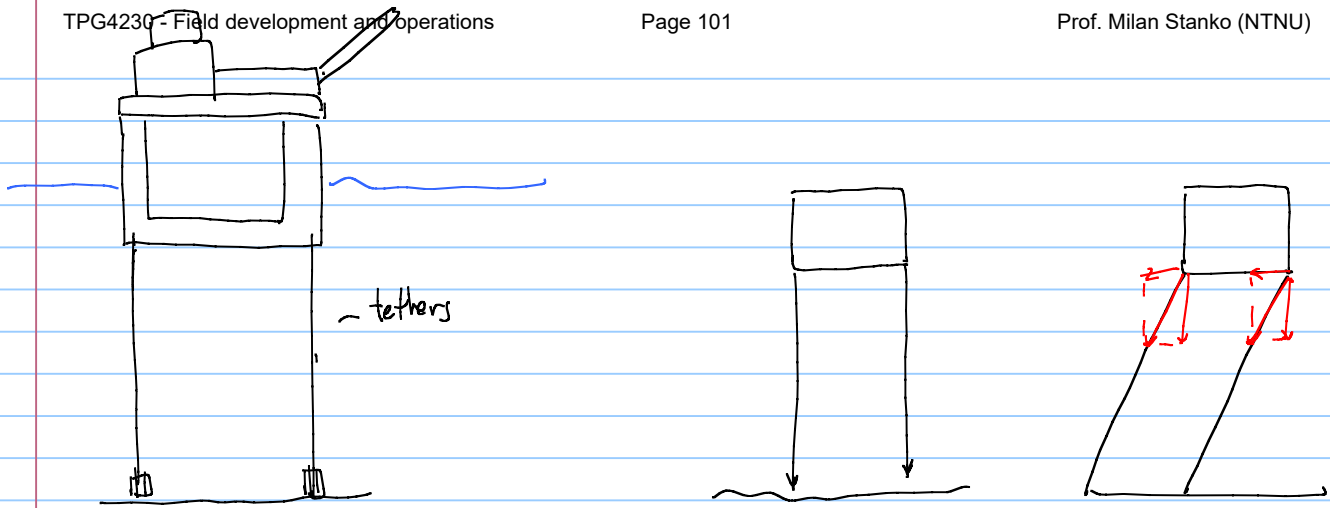
for rough weather conditions the FPSO often has to rotate



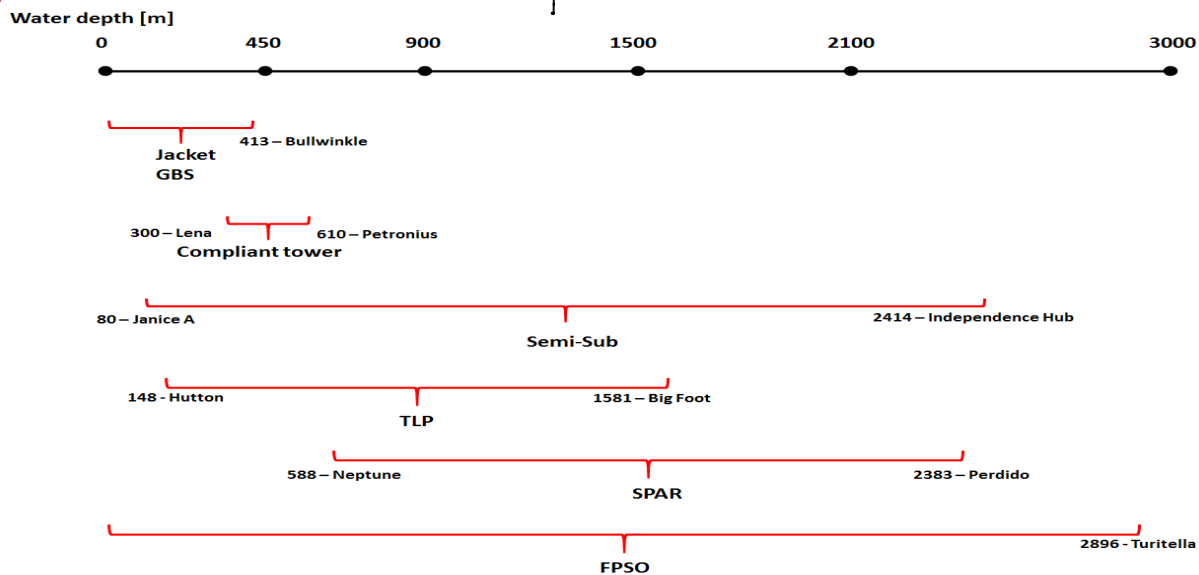
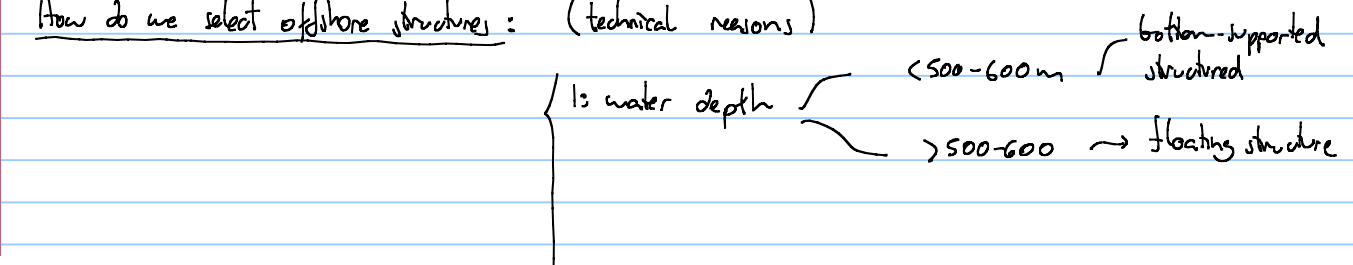
Spar



Churn



How do we select offshore structures: (technical reasons)



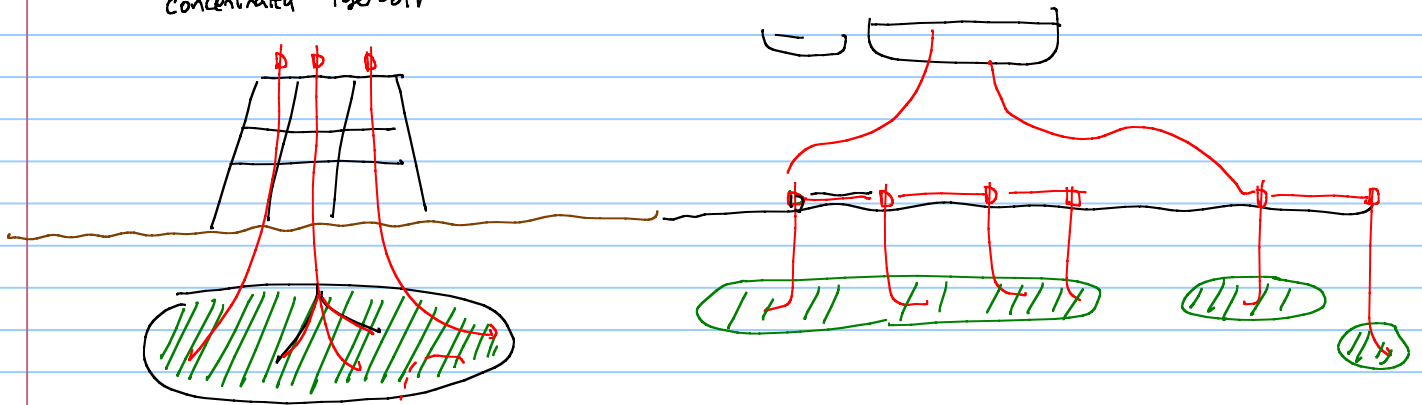
2 • location of well tree
 ↗ dry
 ↘ wet (subsea)

3 • Need for oil storage

4 • marine loads

- Location of tree:
 - water depth dry X-mas tree is 1500 m water depth
 - reservoir spread/structure

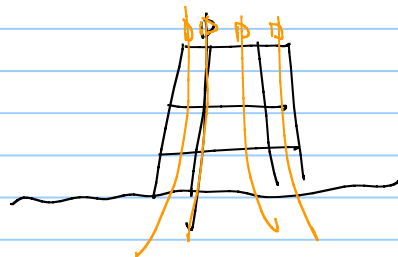
concentrated reservoir



- well intervention needs =
 - tubing replacement
 - completion modification
 - artificial lift (ESP)

↳ if frequent intervention is expected → dry with drilling package
 " " " " not expected → wet

- infill drilling? → if yes → dry X-mas tree with drilling package



the only offshore structures that allow dry X-mas tree are:

- jacket
- jackup
- GBS
- compliant tower
- TLP
- SPAR

