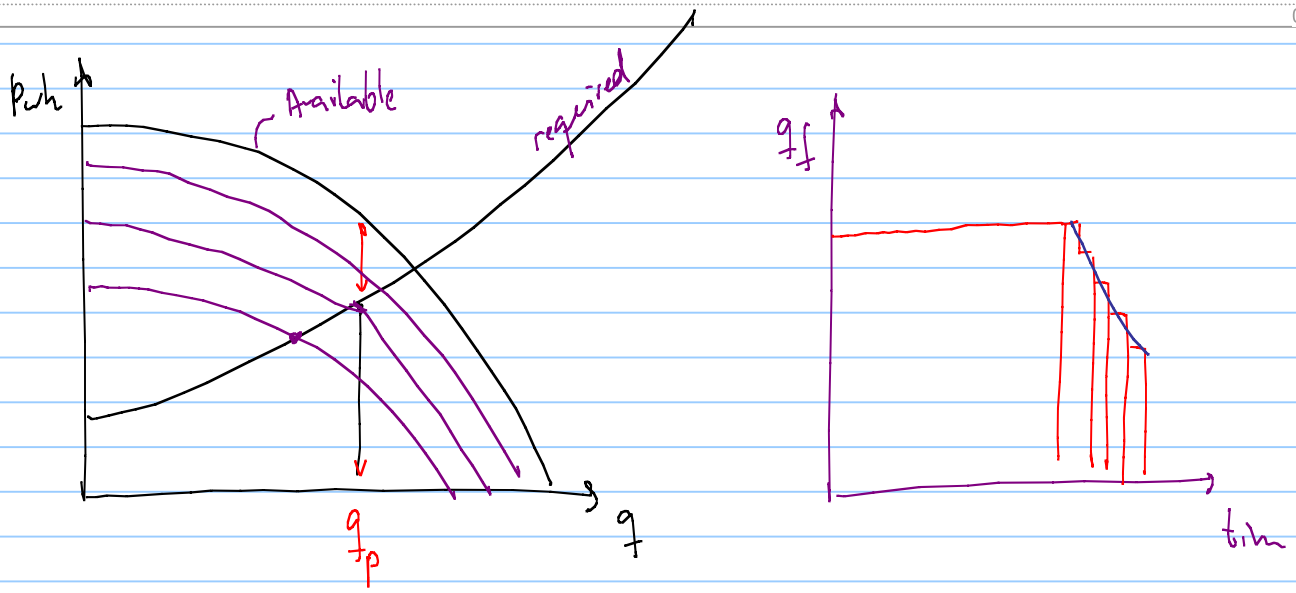
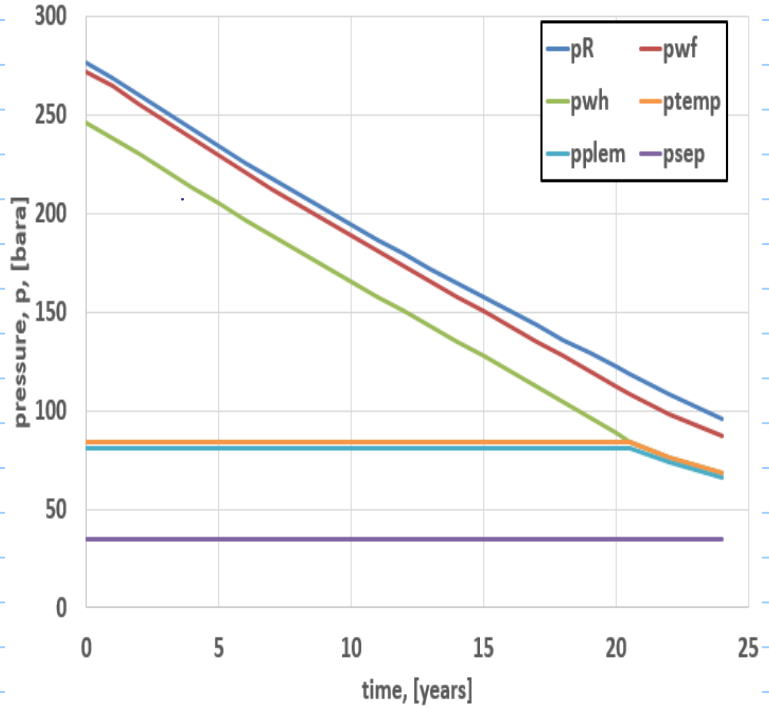
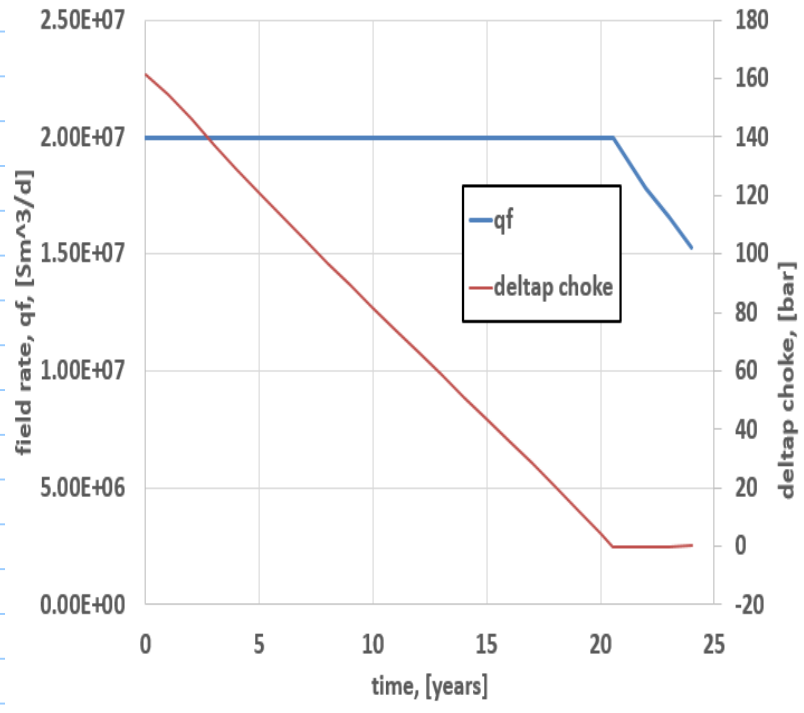
Note Title 09.02.2016







Snøhvit qas Field (Base Case Data)		
G=IGIP	270E+09	Sm3
Annual production rate	0.027	fraction of IGIP
Production days per year	365	day
T_R	92	oC
Pi, initial Res pressure	276	bara
C, inflow Back pressure coefficient	1000	Sm3/bar^2n
n, backpressure, exponent	1	
Ct, Tubing coefficient (2100 MDx0.15 ID m)	4.03E+04	Sm3/bar
Elevation coeff, S	0.155	
$C_{FL\,Flowline}$ Template-PLEM (5000x0.355 ID m	2.83E+05	Sm3/bar
$C_{PL\,Pipeline}$ PLEM-Shore (158600x0.68 ID m)	2.75E+05	Sm3/bar
Separator (slug catcher) pressure	35	bara
Gas molecular weight (Methane)	16	kg/kmole
Gas specific gravity	0.55	Gas specific gravity
Number of templates	3	
Number of wells poer template	3	
Desired plateau		years
qfield	20.0E+6	[Sm^3/d]

1. Identical wells (i.e same PR CR, n, Ct, S)
2. System is Symmetric
3. Field Rate = 20 MMSCM

qwell = qg/no.of.wells
PR= ZR* P/Zi * (1-Gp/G)
Pwf = sqrt(Pr^2-qg/C) as n=1
Pwh = sqrt((pwf^2/e^s)-((qg/Ct)^2))
Psep
Pplem
Ptempl

time	qwell	Gp	Z	RF	PR	pwf	pwh	ptemp	qtemp	qfield	Pplem	Psep	Deltpchoke
[years]	[Sm^3/d]	[Sm^3]			[bara]	[bara]	[bara]	[bara]	[Sm^3/d]	[Sm^3/d]	[bara]	[bara]	[bara]
0	2.22E+06	000.0E+0	0.967	0.000	276	272	246	84	6.66E+06	2.00E+07	81	35	162
1	2.22E+06	7.3E+9	0.963	0.027	269	264	238	84	6.66E+06	2.00E+07	81	35	154
2	2.22E+06	14.6E+9	0.957	0.054	260	256	230	84	6.66E+06	2.00E+07	81	35	146
3	2.22E+06	21.9E+9	0.953	0.081	251	247	221	84	6.66E+06	2.00E+07	81	35	138
4	2.22E+06	29.2E+9	0.948	0.108	242	238	213	84	6.66E+06	2.00E+07	81	35	129
5	2.22E+06	36.5E+9	0.944	0.135	234	229	205	84	6.66E+06	2.00E+07	81	35	121
6	2.22E+06	43.7E+9	0.941	0.162	226	221	197	84	6.66E+06	2.00E+07	81	35	113
7	2.22E+06	51.0E+9	0.937	0.189	218	213	189	84	6.66E+06	2.00E+07	81	35	105
8	2.22E+06	58.3E+9	0.935	0.216	210	204	181	84	6.66E+06	2.00E+07	81	35	97
9	2.22E+06	65.6E+9	0.932	0.243	202	196	173	84	6.66E+06	2.00E+07	81	35	89
10	2.22E+06	72.9E+9	0.931	0.270	194	188	165	84	6.66E+06	2.00E+07	81	35	81
11	2.22E+06	80.2E+9	0.929	0.297	187	181	158	84	6.66E+06	2.00E+07	81	35	74
12	2.22E+06	87.5E+9	0.928	0.324	179	173	150	84	6.66E+06	2.00E+07	81	35	66
13	2.22E+06	94.8E+9	0.927	0.351	172	165	143	84	6.66E+06	2.00E+07	81	35	59
14	2.22E+06	102.1E+9	0.927	0.378	165	158	135	84	6.66E+06	2.00E+07	81	35	51
15	2.22E+06	109.4E+9	0.926	0.405	157	150	128	84	6.66E+06	2.00E+07	81	35	44
16	2.22E+06	116.6E+9	0.927	0.432	150	143	120	84	6.66E+06	2.00E+07	81	35	36
17	2.22E+06	123.9E+9	0.927	0.459	143	135	112	84	6.66E+06	2.00E+07	81	35	28
18	2.22E+06	131.2E+9	0.928	0.486	136	128	104	84	6.66E+06	2.00E+07	81	35	20
19	2.22E+06	138.5E+9	0.929	0.513	129	120	96	84	6.66E+06	2.00E+07	81	35	13
20	2.22E+06	145.8E+9	0.931	0.540	122	113	88	84	6.66E+06	2.00E+07	81	35	4
21	2.22E+06	149.7E+9	0.932	0.555	118	109	84	84	6.66E+06	2.00E+07	81	35	0
22	1.98E+06	160.4E+9	0.935	0.594	108	98	77	77	5.94E+06	1.78E+07	74	35	0
23	1.84E+06	166.9E+9	0.937	0.618	102	92	72	72	5.52E+06	1.66E+07	70	35	0
24	1.70E+06	172.9E+9	0.939	0.640	96	87	68	68	5.10E+06	1.53E+07	66	35	0

to find plateau end, use solver $\Delta p_{choke}=0$ by changing time

to find rate when choke is fully open solver $\Delta p_{choke}=0$ by changing q_{well}.

Score group

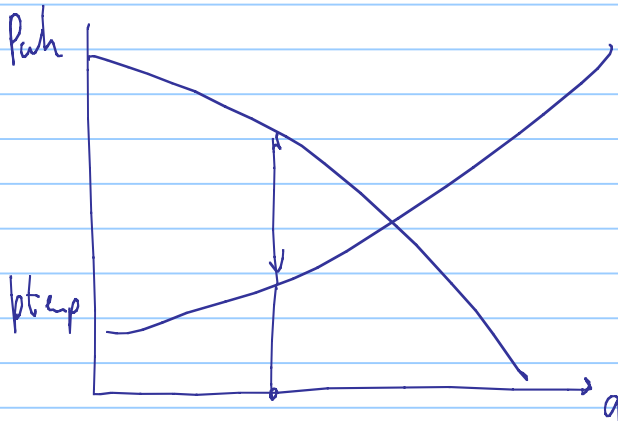
	1	2	3	4	5
task 1					1
task 2	1				1
task 3	1				

challenges
Observations about the first task ?
errors
questions

2nd task plot wellhead performance relationship WPR : Available pressure considering IPR + tubing

flowline + pipeline performance relationship : required pressure flow in pipeline P_{plem}

flow in flowline template

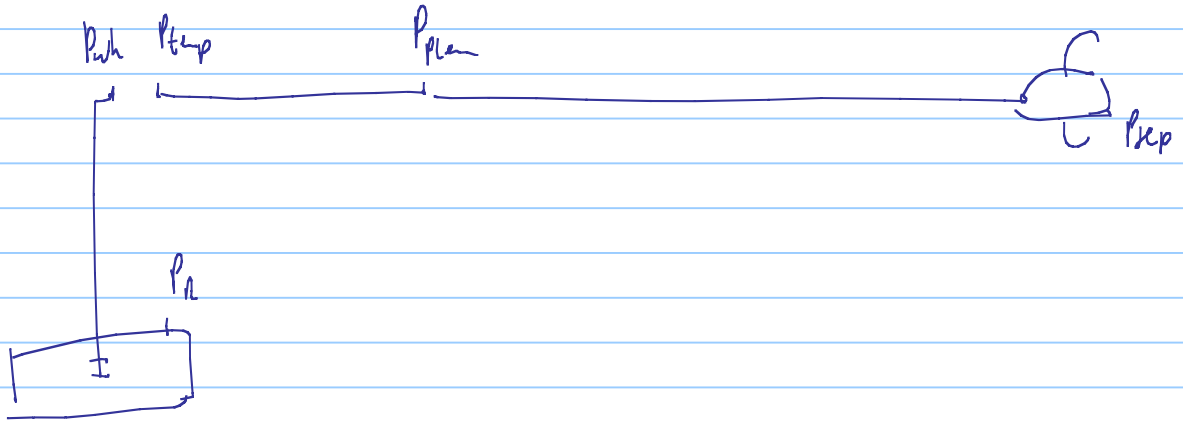


for

end of year	0
end of year	90
end of plateau	15
	20.54

indicate Δp choke. (current operating point)

indicate the production potential of the well.



P_R [bara] = 276 bara

t = 0 year

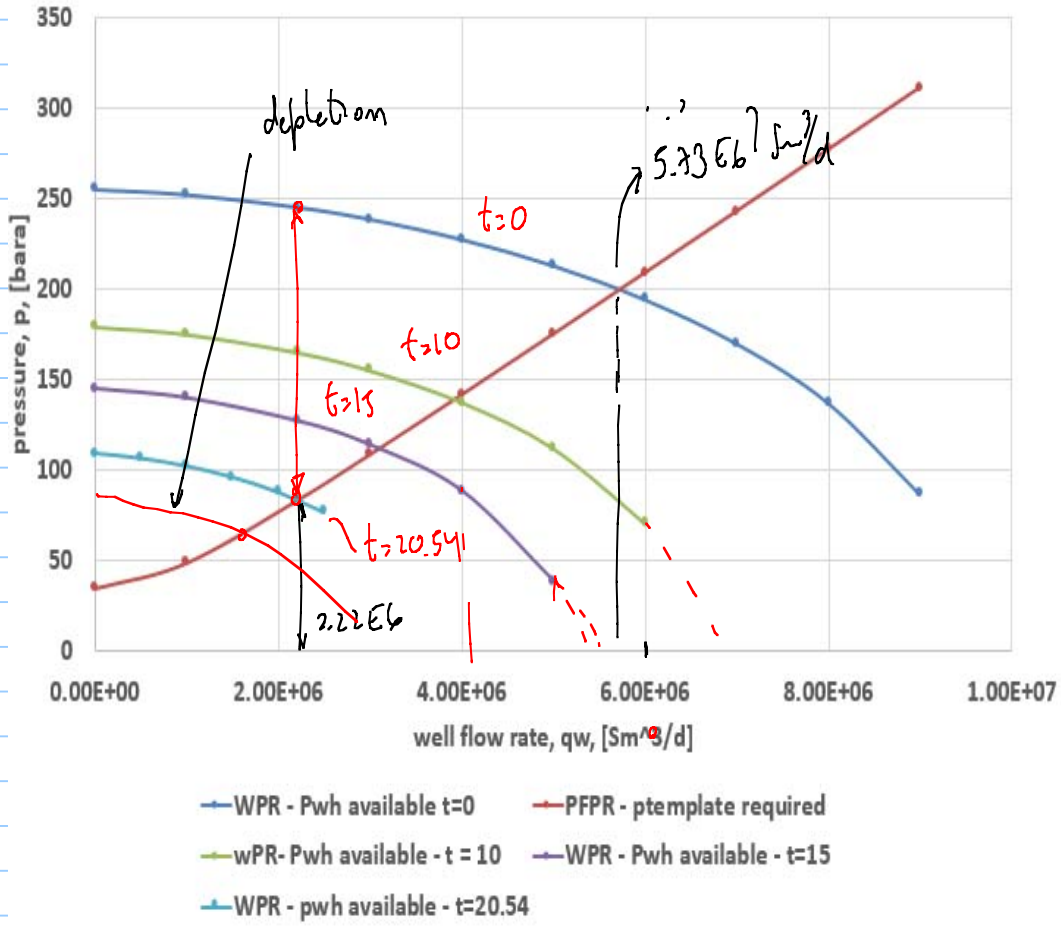
TPR

q_{well} [Sm³/d] | P_{wf} [bara] | P_{wh} [bara] | $P_{template}$ [bara] | $P_{pipeline}$ [bara] | P_{sep} [bara]

0 | available | required

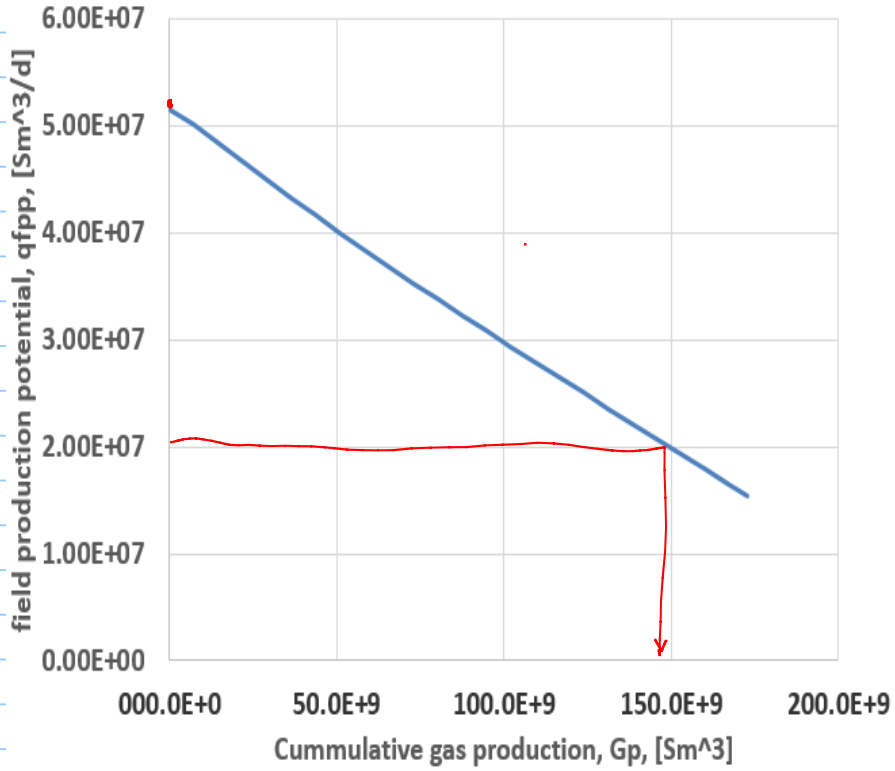
$q_{well} \cdot N_{flowline} \cdot N_{well/flowline}$

~0



task 3. Compute q_{pp} vs G_p for all points in my excel sheet. G_p

Compute plateau duration based on this curve.



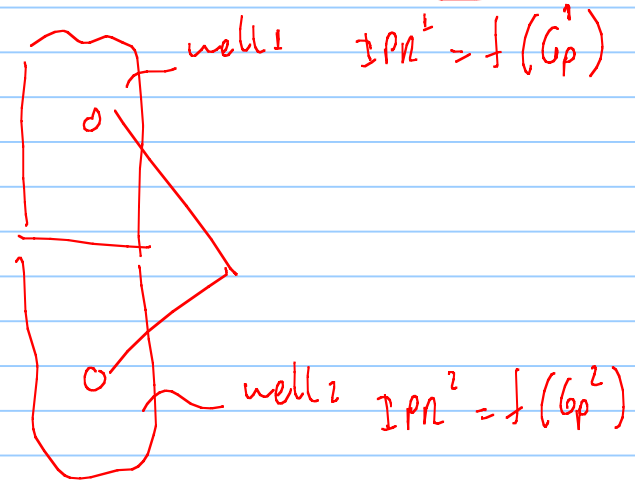
Gp for qfpp=20E6 =	149.7E+9
Number of plateau years	20.54E+0

$= 20.54$

$(20E6 \cdot 365)$

$IPR^i = f(G_p)$ — i: every well "i"

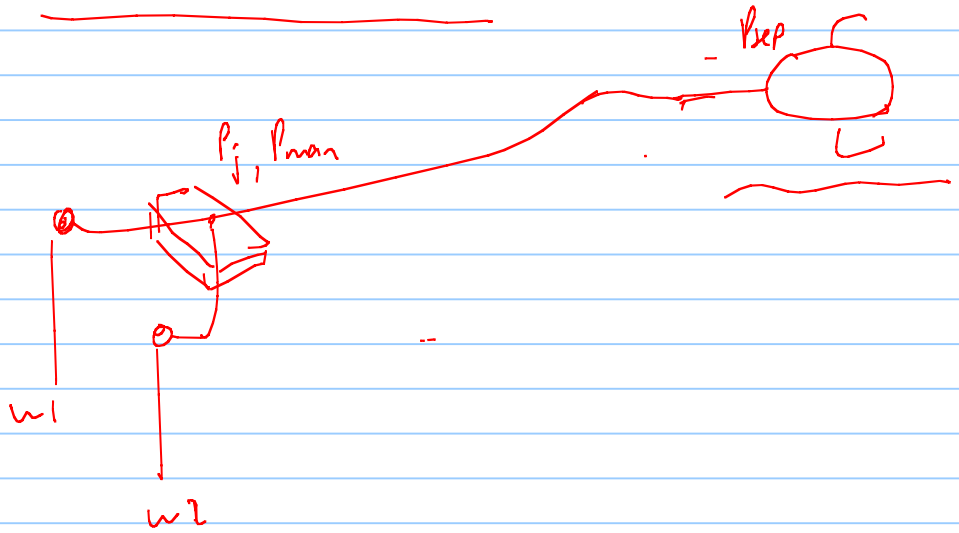
$q_g = C_R \cdot (P_R^2 - P_{wf}^2)^n$ — C: const



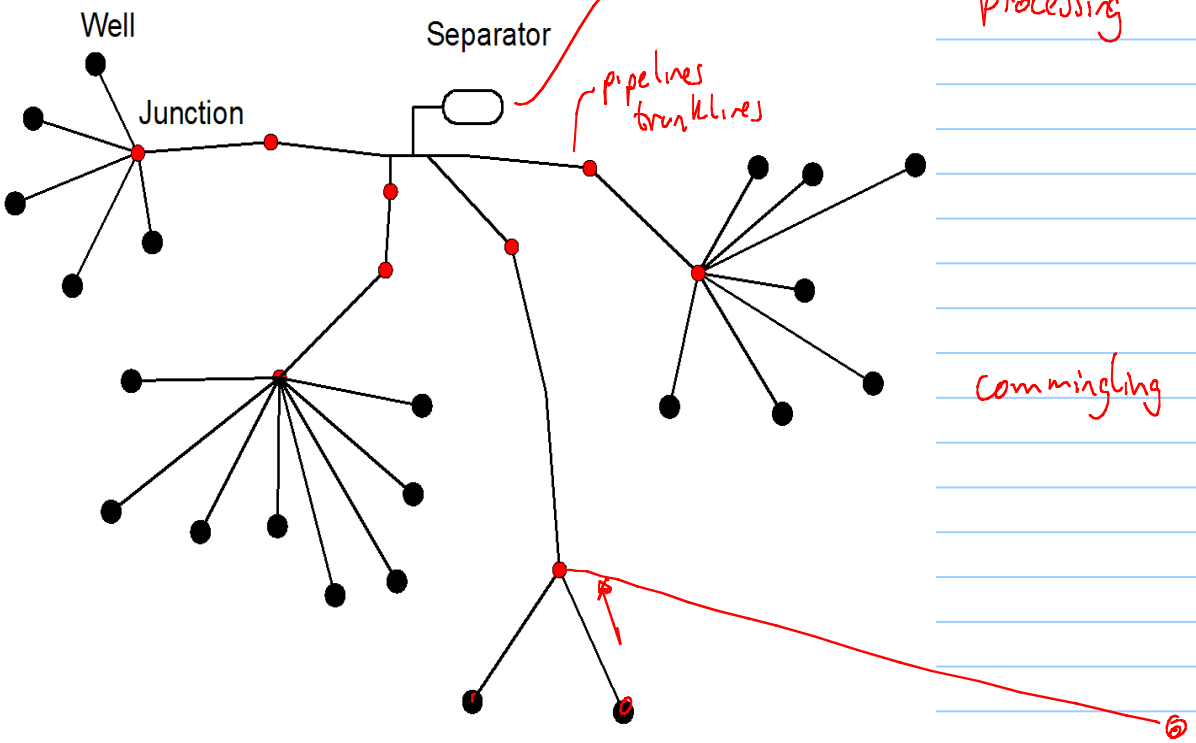
$IPR^1 = f(G_p^1)$

$IPR^2 = f(G_p^2)$

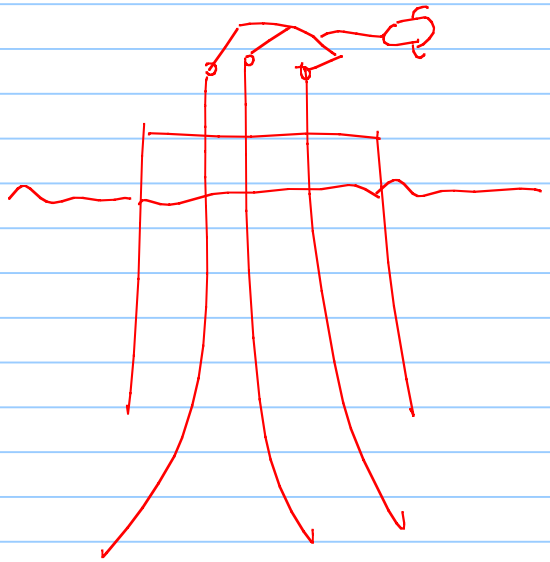
Production networks



GOSP ~ gas oil separation and processing



commingling network



distribution networks { injection gas
injection CO2
injection water