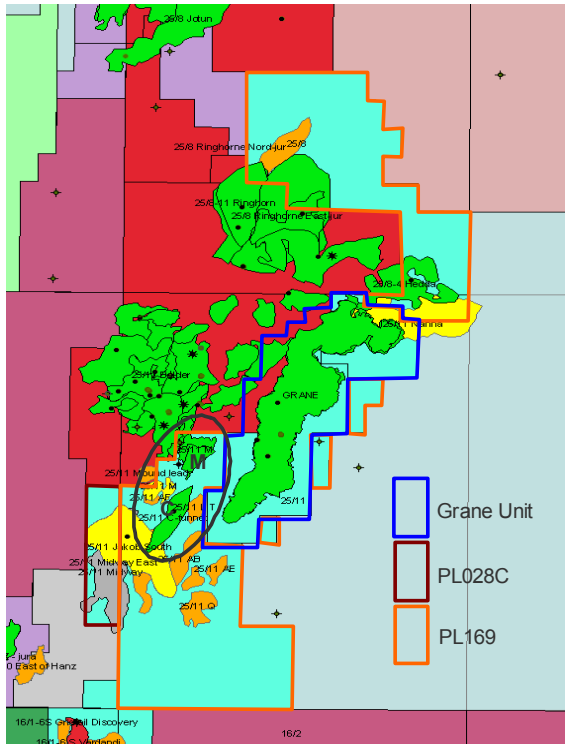
Svalin tie-in til Grane

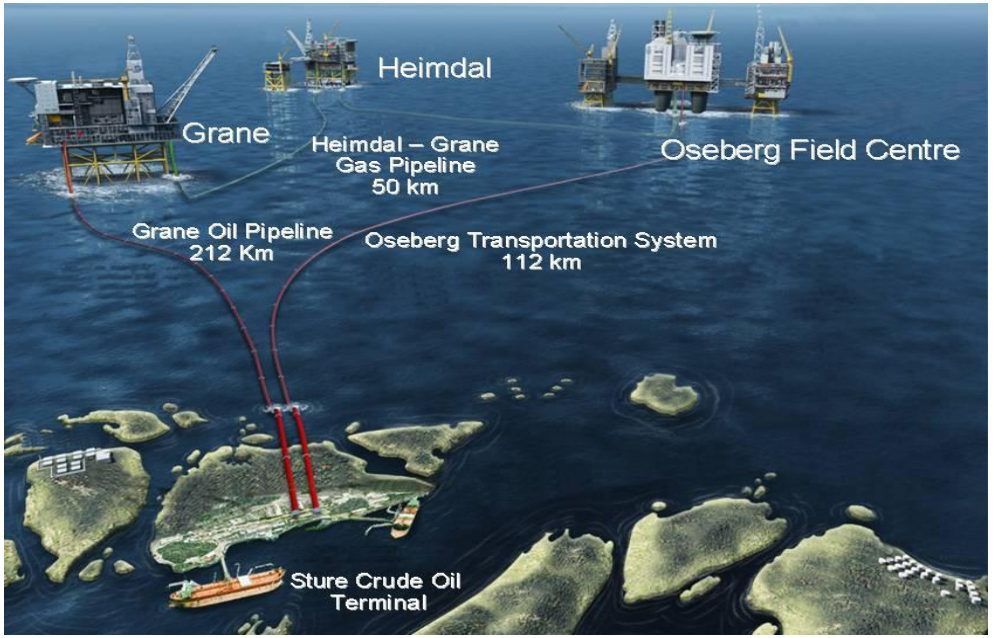
Kost nytte vurdering, NFOGM 15-03-2013

Øyvind Nesse, Statoil

2013-03-14

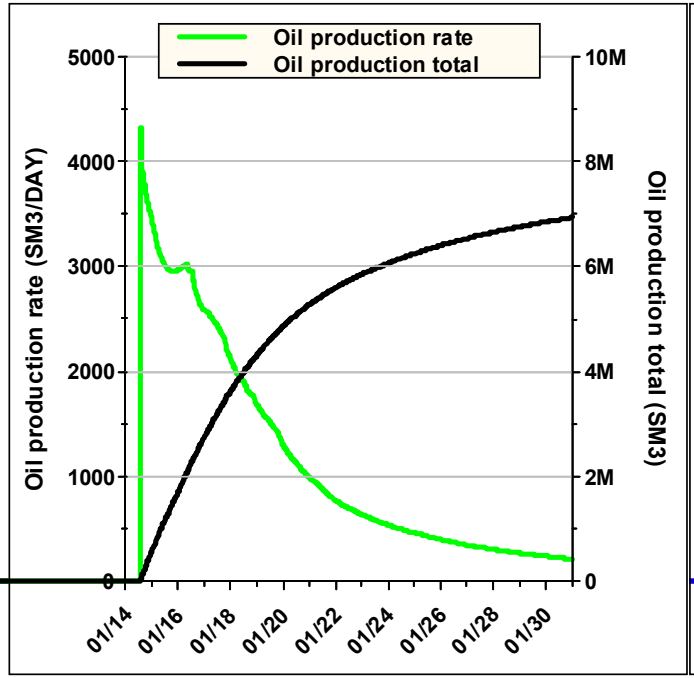
The Svalin Field PL169 tie-in host Grane

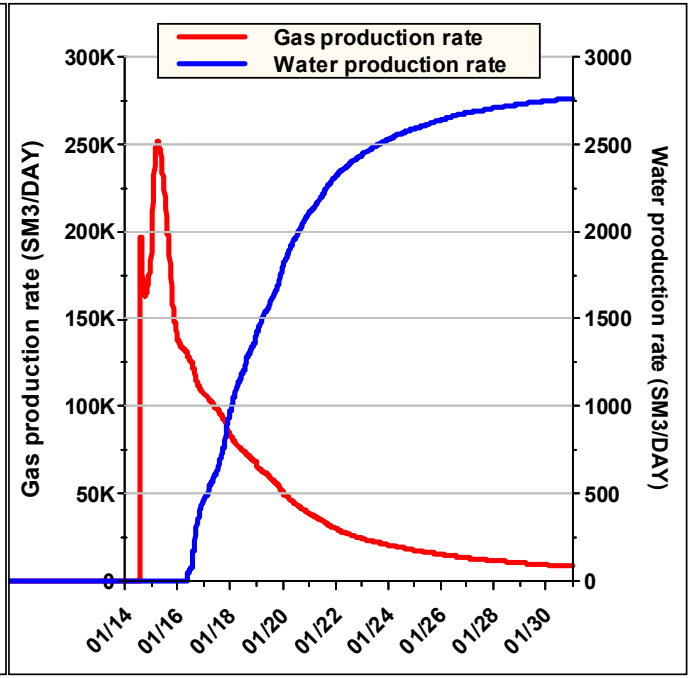




In-place (MSm³)	P90	Mean	P10	Reserves (MSm³)
Svalin C	7	11.2	15.4	**6.4**
Svalin M north	6.4	11.9	17.3	**6.9**

Svalin M production profiles (not updated)





Field rate limitations	M structure
Oil (Sm^3/sd)	5 000
Liquid (Sm^3/sd)	5 000
Water (Sm^3/sd)	3 000
Gas (Sm^3/sd)	400 000
Lift gas (Sm^3/sd)	250 000

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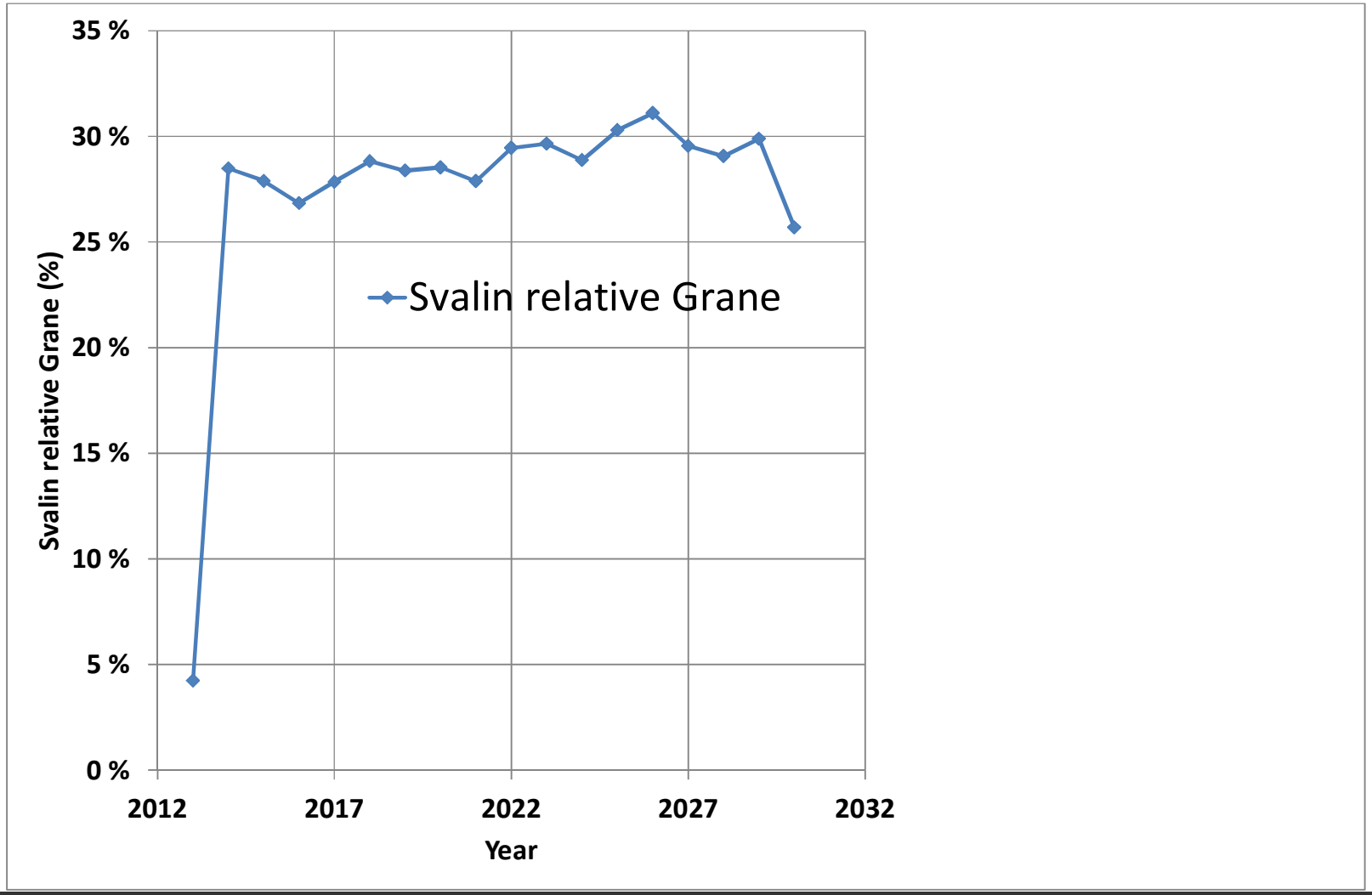
Svalin production relativ tot. Grane production



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Owners

	PL169	Grane Unit	Δ
Statoil	57%	36,7%	20,3%
ExxonMobil	13%	28,2%	15,2%
Petoro	30%	28,9%	1,1%
ConocoPhillips	-	6,2%	6,2%

Forutsetninger i kost-nytte analysen

- Produksjonsprofil: «Low case»
- Eierfordeling: 21.4 %
- Oppstart: 1. august 2014
- Avkastningskrav (NPV): 8%
- Oljepris : 75 $/bbl
- Prosess og transport tariff: 9 $/bbl
- Valuttakurs: 6 NOK/$
- Risikofaktor: 0.2

Hoderegning «Cost Benefit Analysis» (CBA)

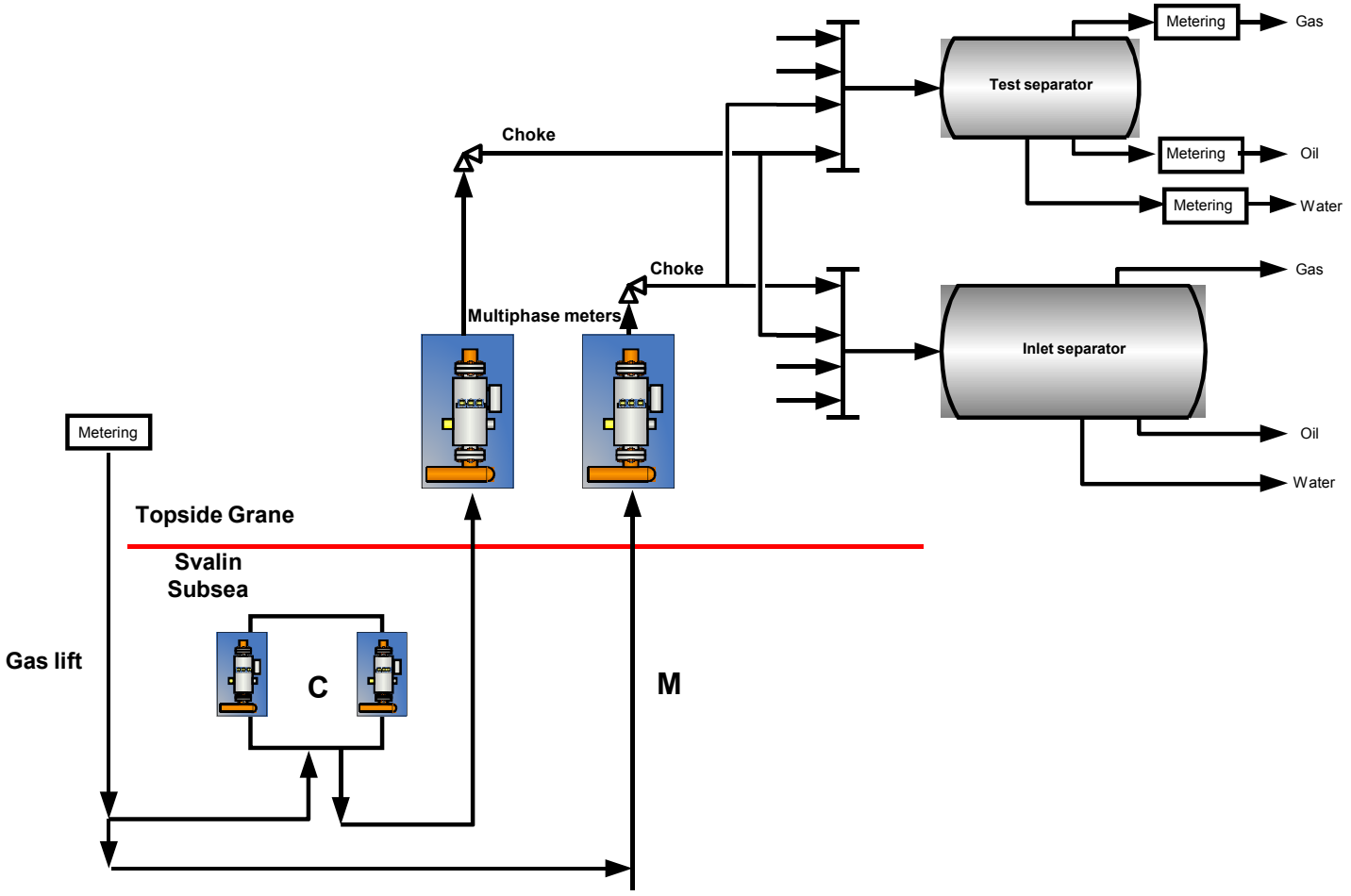
- **CBA=NPV * PartnerDiff * RiskFactor * Uncertainty**

- NPV= 18 740 MNOK
- Partnerdiff= 21.4%
- RiskFactor= 0.2
- Uncertainty= 1%

- CBA=18740E6*0.214*0.2*0.01=**8 MNOK per % Uncertainty**

- **Reduced uncertainty from what? Traceable!!**

Svalin Metering Concept



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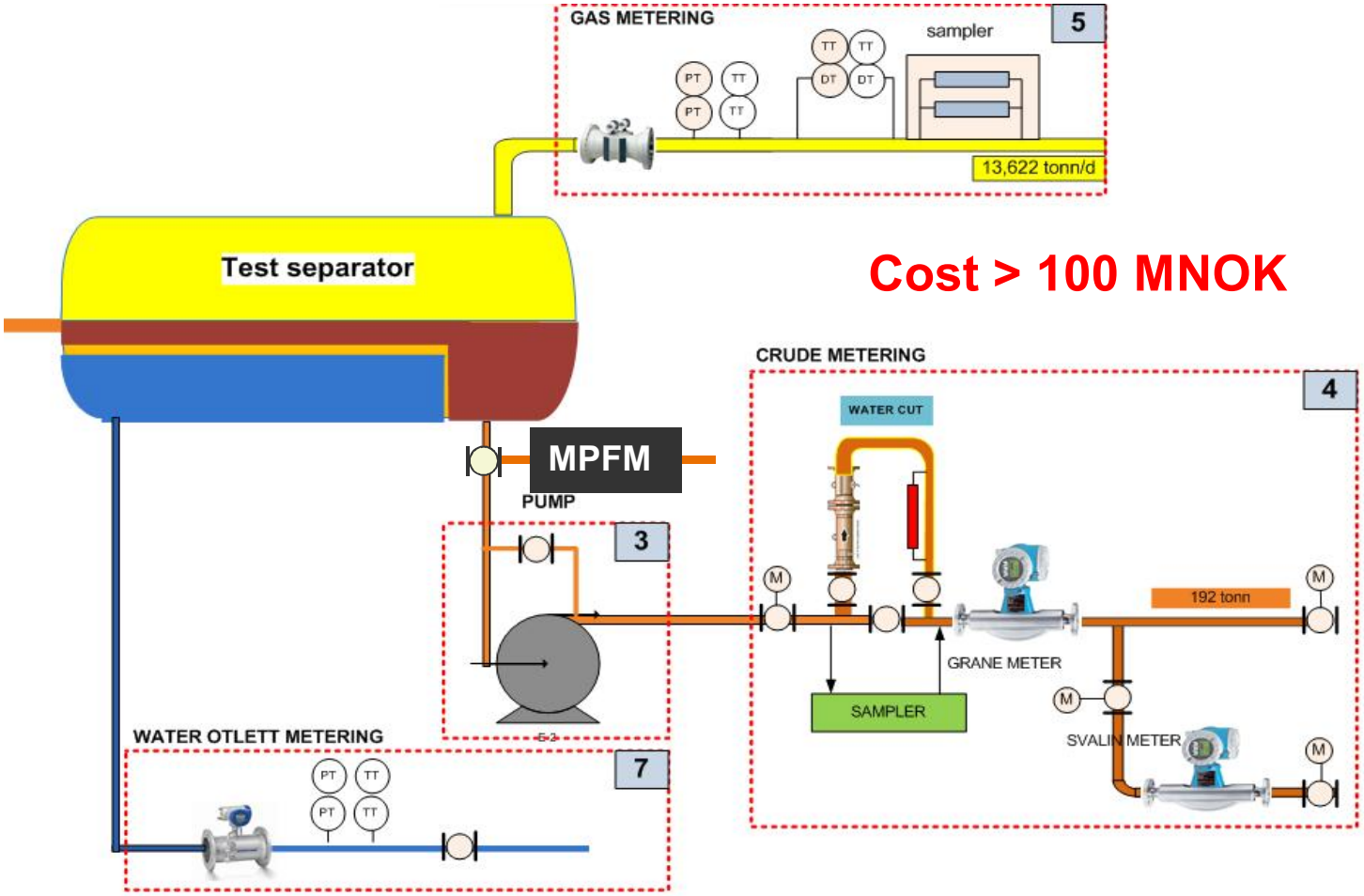
Initial Fiscal Metering Scope, Uncertainty± 5%

Allocation principle: Measurement by difference



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Merknader fra Oljedirektoratet (flere møter)

- OD er positiv til foreslått fiskal målekonsept, men bemerker at Statoil må vurdere kostnadene med måling og oppgradering av testseparator
- Risk faktor på 0.2 i «regnemodellen» er en anerkjent størrelse, men OD anser den som noe høy for dette formål.
  - (Phillip Stockton,"Cost Benefit Analyses in the Design of Allocation Systems", 27th NSFMW, 2009).

- Statoils opplysning om at differanseallokering ikke anses som hensiktsmessig dersom tilknytningsfeltet har større usikkerhet enn +/- 1% vil innebære en betydelig endring i forhold til nåværende praksis.

Svalin metering enquiry

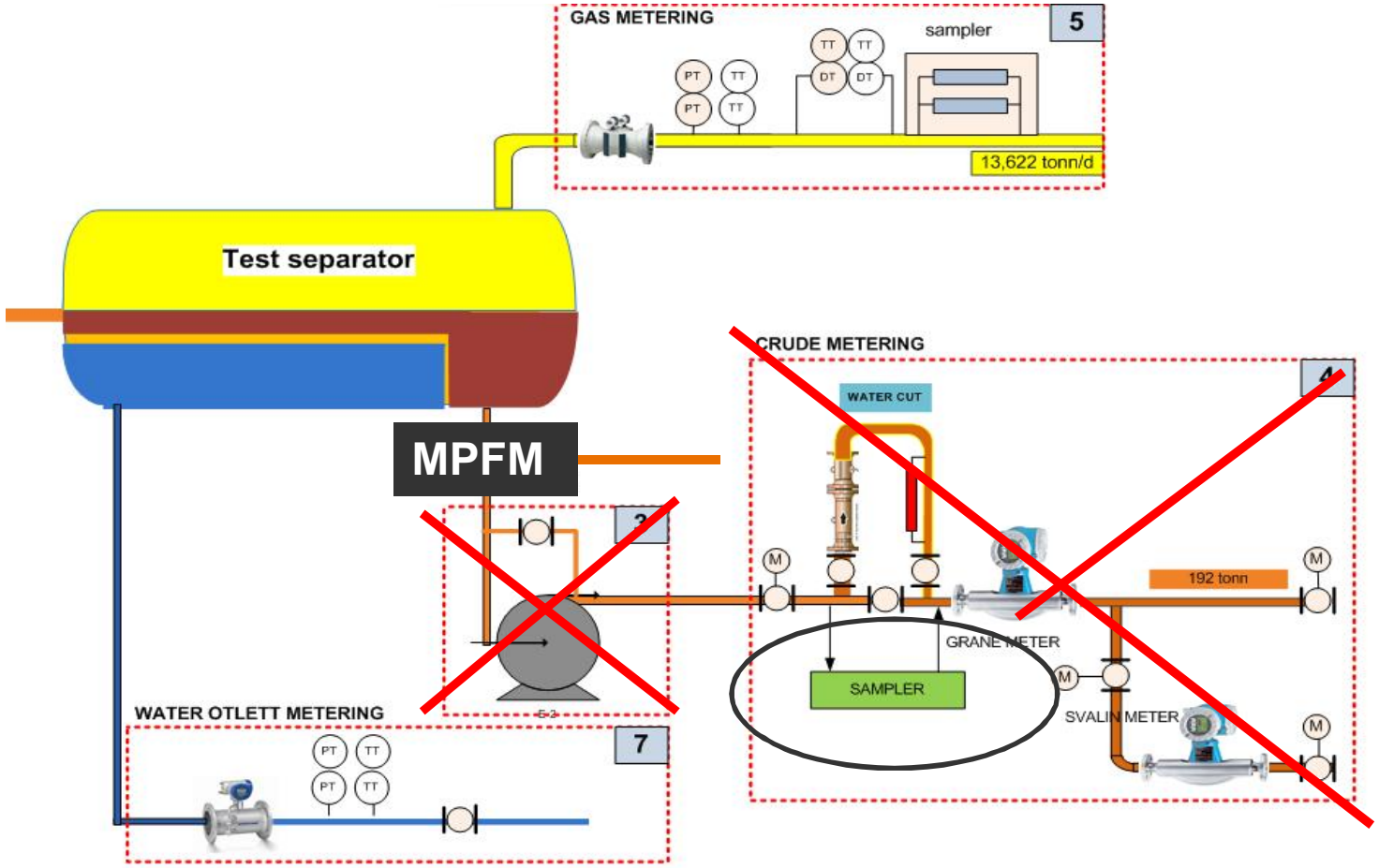
- MoM PL169 22 March 2012:

  “With reference to the multiphase meter ExxonMobil asked the operator to look into this and asked if the upgrade of the metering gave us any value for money.”

  (with reference to the operator’s model for such calculations)

New Svalin Metering

Use existing MPMF on oil outlet. New oil sampling cabinet



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Svalin metering assessment

- Based on questioning of the need for metering upgrade the operator will conduct an evaluation of the metering scope.

- Estimated effect on level of **accuracy**.
- Method of **allocation** is one main factor

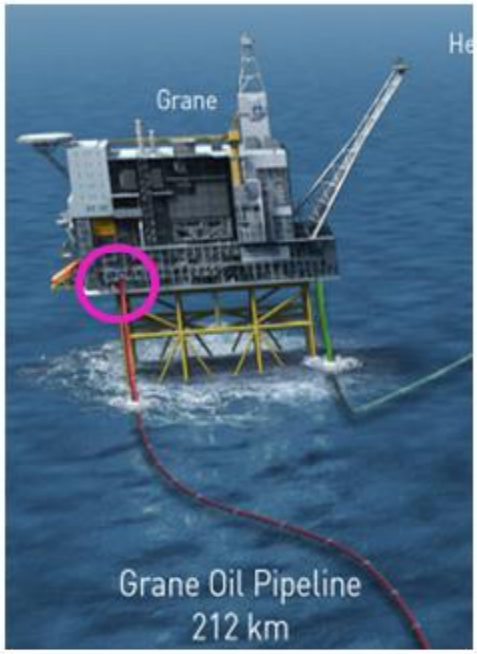
a) The metering scope decided was based on the assumption that Grane would be **allocated by difference** (between Sture fiscal station and Svalin meters). This method implies that Grane will carry the difference for the combined stream.

b) Alternative allocation method would be to allocate based on Grane well allocation and the new mpfm meters to be installed for Svalin. Such method would imply that the diffence would be **split pro-rata** between the groups.

Production allocation

Fiscal measurement

Measurement of total oil production from all wells



Sture Export

<u>Allocation on Grane is to distribute the total production from entire field onto each well.</u>

Calculated rates for each well are corrected using field factors for oil, gas and water.

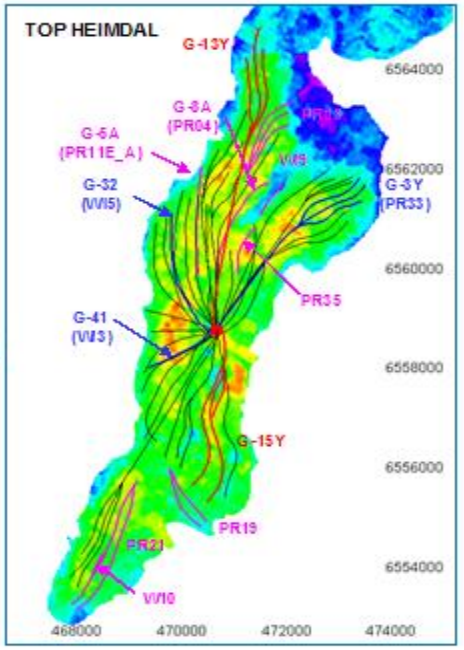
$$\text{Field factor} = \frac{\text{Measured volume}}{\text{Sum of calculates volumes for all wells}}$$

Field Factor Oil differs from 1 if calculated rates in Flowmanager are not correct for individual wells. Reasons for deviation in calculations:

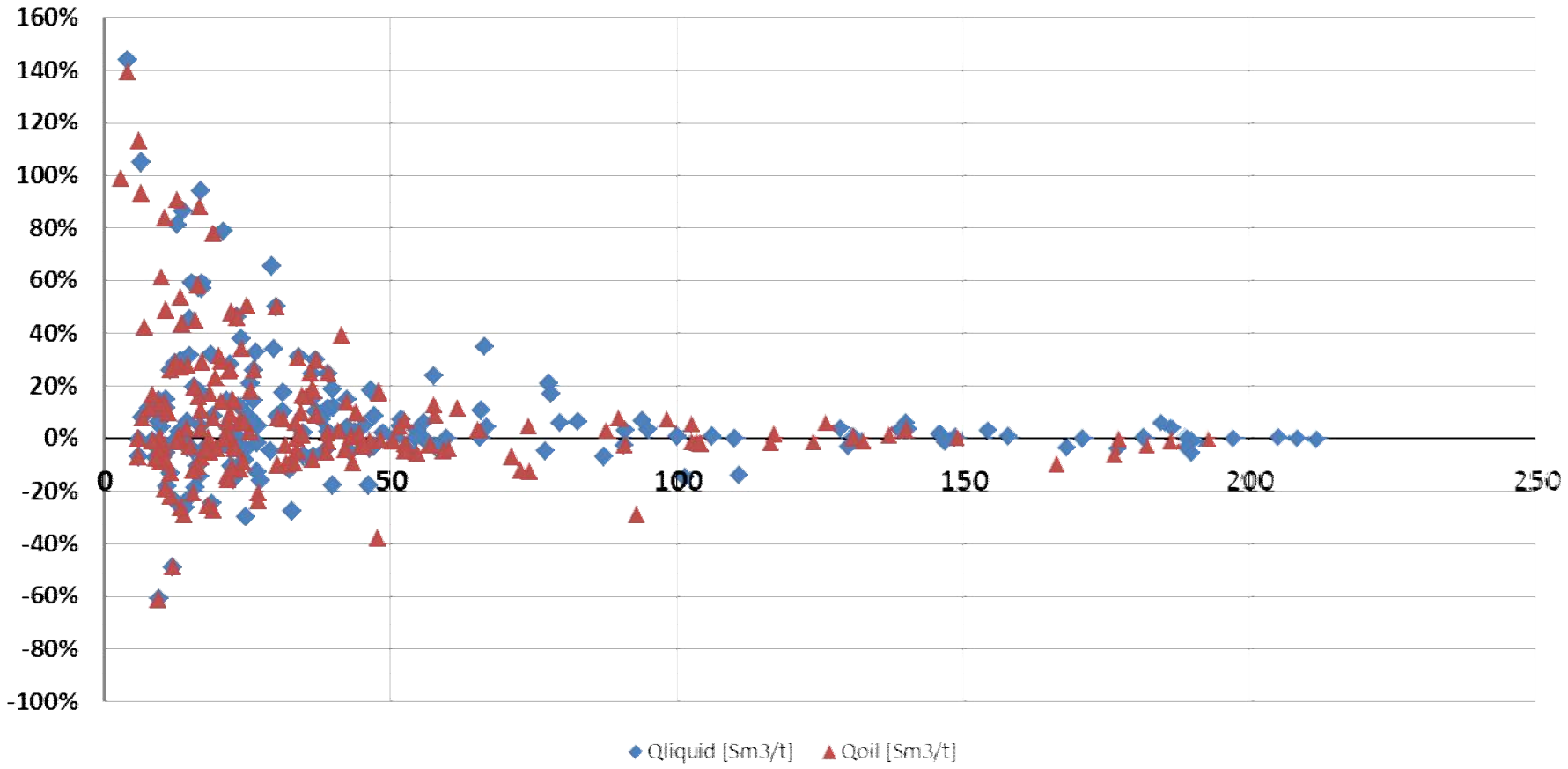
-Wrong tuning parameters (from well tests)
- Wrong water cut (manual input)

FlowManager

Calculated rates of oil, gas and water for each well



Correction of Flowmanager rates compared to test separator



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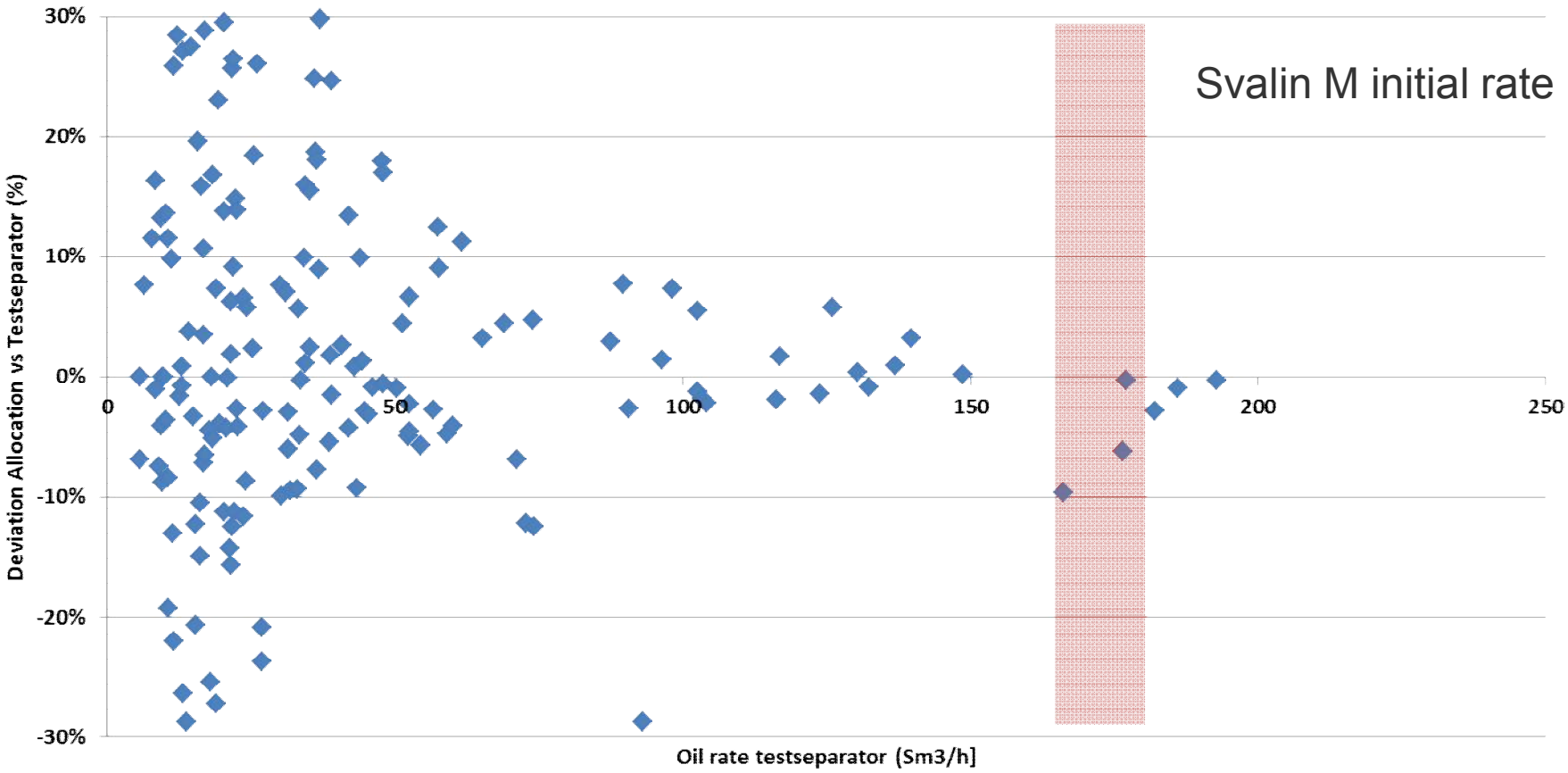
Correction of Flowmanager rates, cont.



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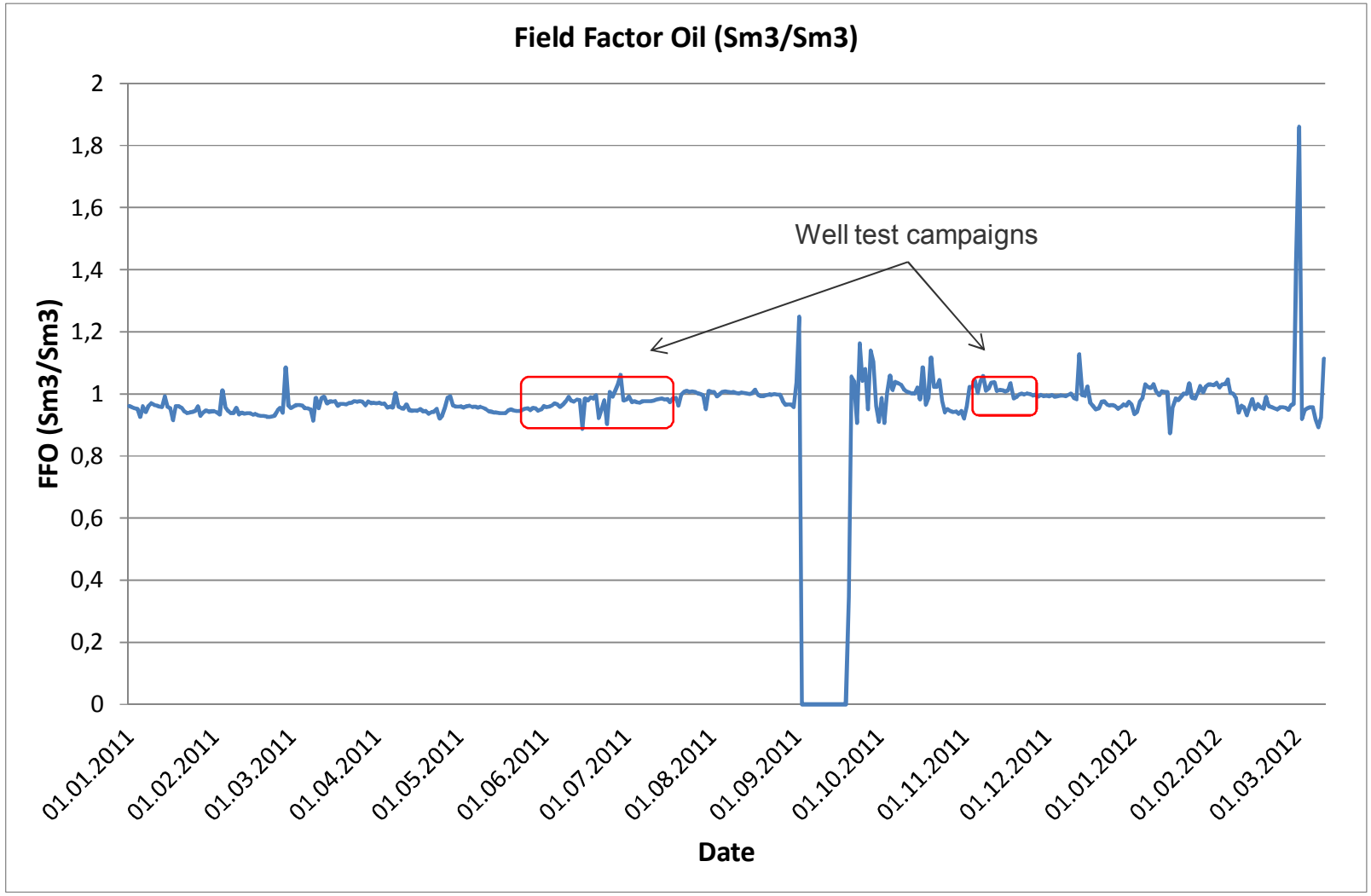
Grane FFO = 0,98



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Compensating measure to improve FFO

- **Grane low flow upgrade of test separator**
  - In the new project «Grane low flow» the test separator will be upgraded with a new oil outlet to measure oil rates below 50 m3/h.

- **Test wells and mpfm against test separator min. 4 times a year (ARIS)**

Assumed measurement uncertainties
Input risk assessment, 2 cases:

- Measurement by difference (Initial allocation principle):
  - Upgrade of the oil outlet of test separator
  - Measurement uncertainty = ± 5%

- Production allocation (pro rata):
  - No upgrade of the test separator
  - Measurement uncertainty = ± 10%

Svalin Allocation by Difference, worst case

Actual production			
	Svalin	Grane	Total Sture
Oil, Sm3	5 000	7 500	12 500

Svalin uncertainty	**5%**	**1,05**			
Sture uncertainty	**0.3%**	**1,003**			
Svalin metered, + 5%	Grane theoretical	Total production	Deviation production	Deviation Sture export	**Total deviation Grane**
Sm3	Sm3	Sm3	Sm3	Sm3	**Sm3**
5 250	7 500	12 750	250	38	**288**
			(Grane lose oil to Svalin)	(Grane lose oil to export)	

New Grane		
Sm3	Grane imbalance	Rel. theoretical Grane
7213	-288	-3,8 %

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Svalin Allocation by Pro Rata, worst case

Actual production			
	Svalin	Grane	Total Sture
Oil, Sm3	5 000	7 500	12 500

Svalin uncertainty	**10%**	**1,10**			
Sture uncertainty	**0.3%**	**1,003**			
Svalin metered, + 10%	Grane theoretical	Total production	Export	Total deviation	**Grane&Svalin FFO**
Sm3	Sm3	Sm3	Sm3	Sm3	
5 500	7 500	13 000	12 463	538	**0,96**
			(lose oil to export)	(Grane&Svalin error)	

New Grane		
Sm3	Grane imbalance	Rel. theoretical Grane
7190	-310	-4,1 %

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Grane Risk per Allocation Principle worst case

- By difference
- Svalin uncertainty = 5%
- **Grane loss 3,8%**

- Pro rata
- Svalin uncertainty = 10%
- **Grane loss 4,1%**

Oppsummering

- Dersom tilknytningsfeltet har større måleusikkerhet enn +/- 1% bør differanseallokering vurderes, men nåverdi, eierandeler, produksjonsforholdene mellom lisensene osv. må inkluderes i vurderingen. Partnerne vedtar allokeringsmodellen.
- Risk faktor på 0.2 i kost-nytte beregningen er ikke en «objektiv» størrelse og må vurderes i hvert enkelt tilfelle.

- Måle- og allokeringsløsningen på tilknytningsfeltet Svalin M&C blir trolig:
  - Forenklet måling med flerfasemåler, dvs.ingen vesentlig oppgradering testseparator.
  - Pro rata.

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