

Uncertainty calculations related to allocation

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- Field allocation uncertainty
- Ownership allocation uncertainty
- Summary

Introduction

- Uncertainty in flow metering stations:
 - Authority requirements established
 - Calculation methods established
- Field allocation uncertainty depends on
 - Uncertainty in several metering stations
 - Production profiles
 - Process simulations
 - Etc.
- Main allocation principles
 - By difference
 - Pro rata

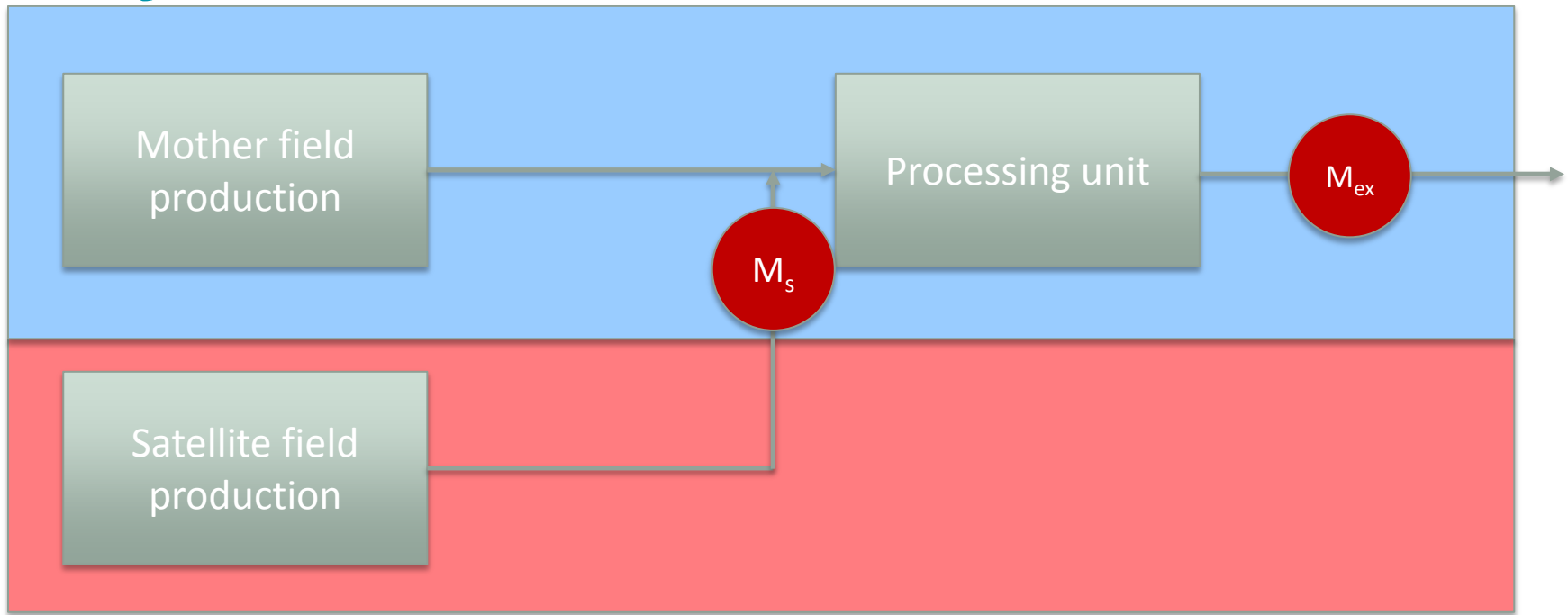
Introduction

- What to allocate between fields and calculate uncertainty of?
 - Mass of oil
 - Mass of gas
 - Mass of hydrocarbons
 - Volume of oil
 - Volume of gas
 - ...same after subtraction of fuel and flare
- Value/money – (main focus in this presentation)

Field allocation

-simplified example

«By difference» - allocation

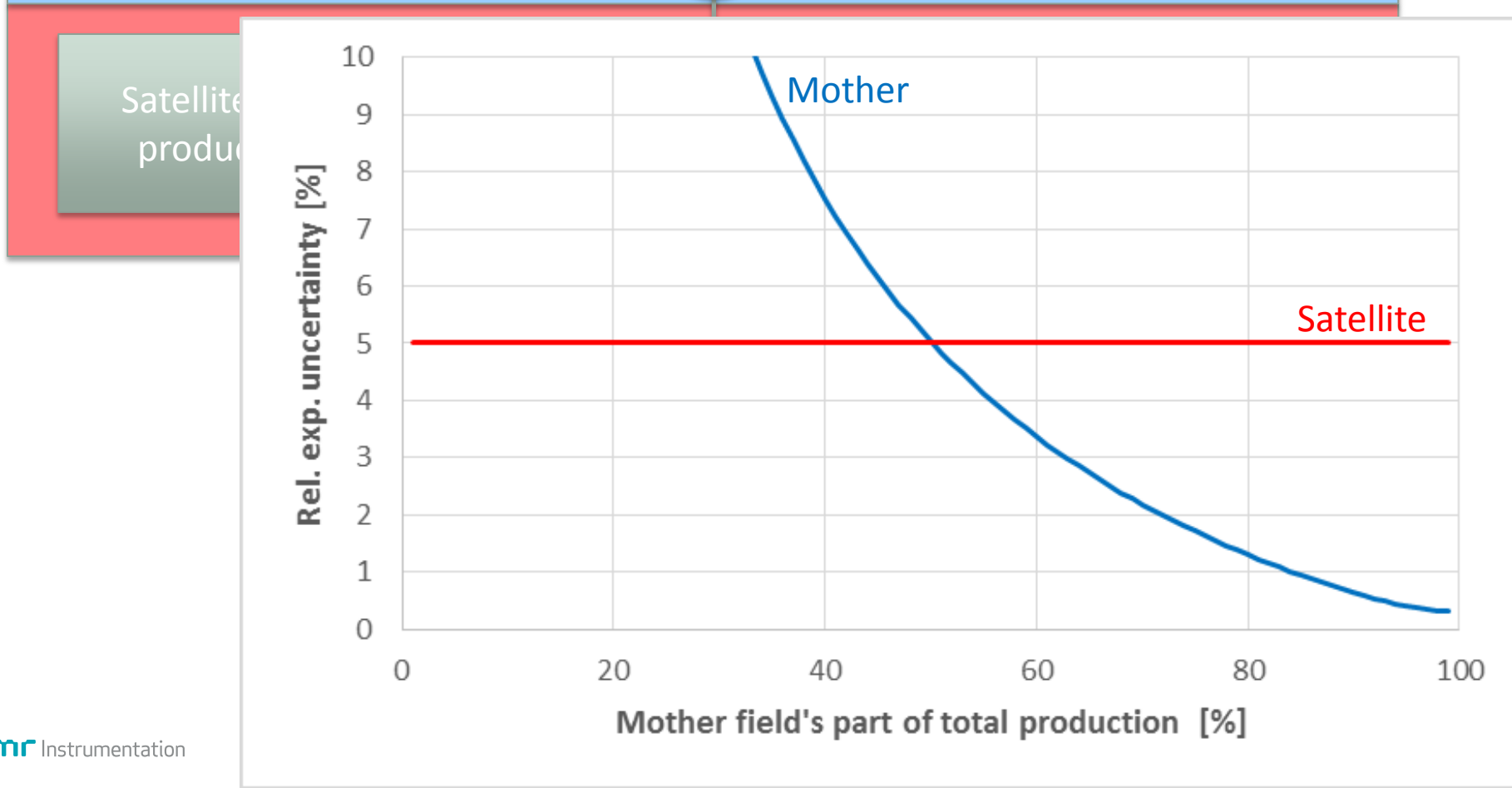
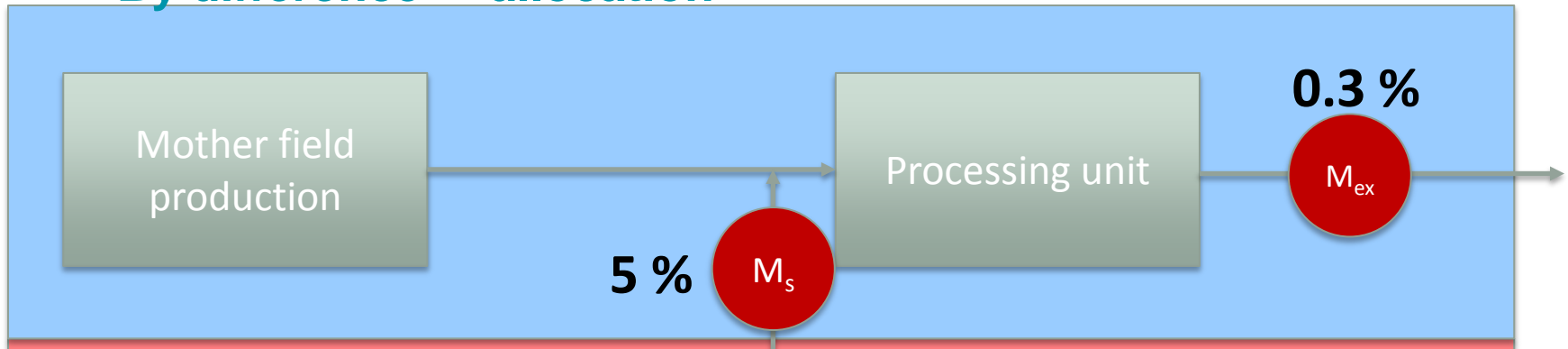


Allocated to mother field: $M_{ex} - M_s$

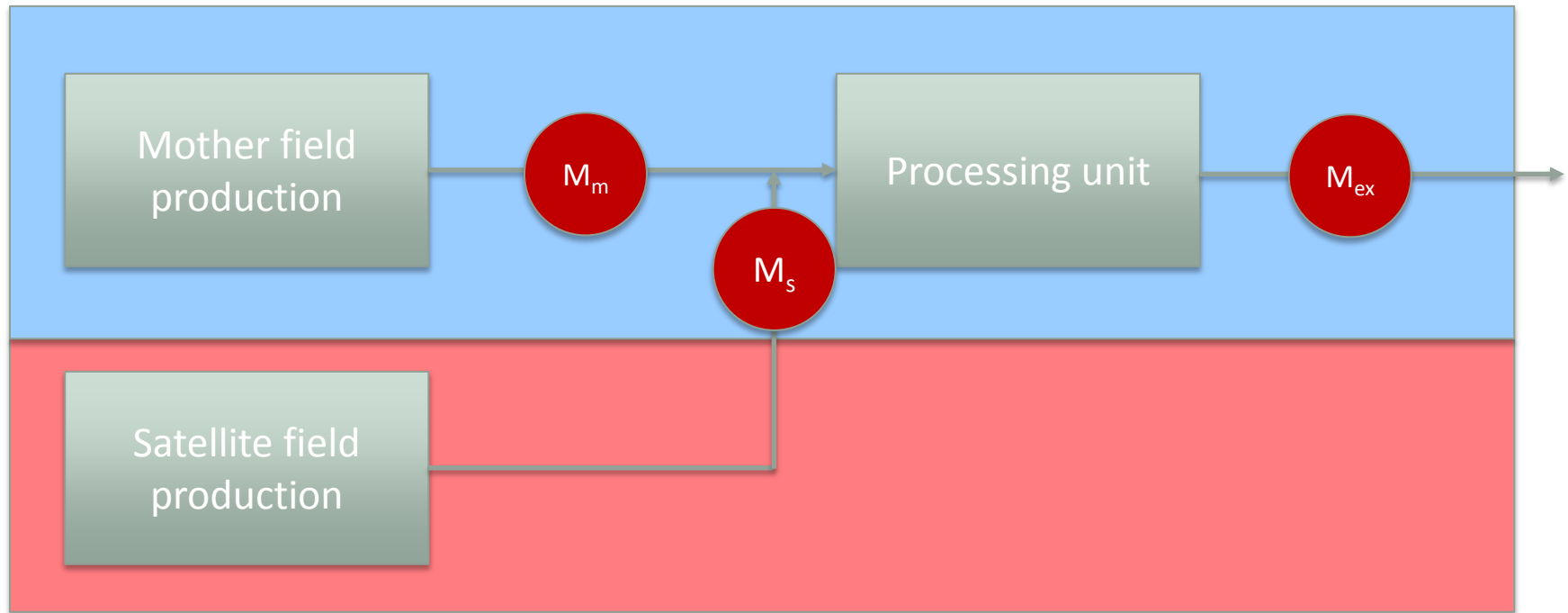
Allocated to satellite field: M_s

Uncertainty in allocated values

-«By difference» - allocation



«Pro rata» - allocation



Allocated to mother field:

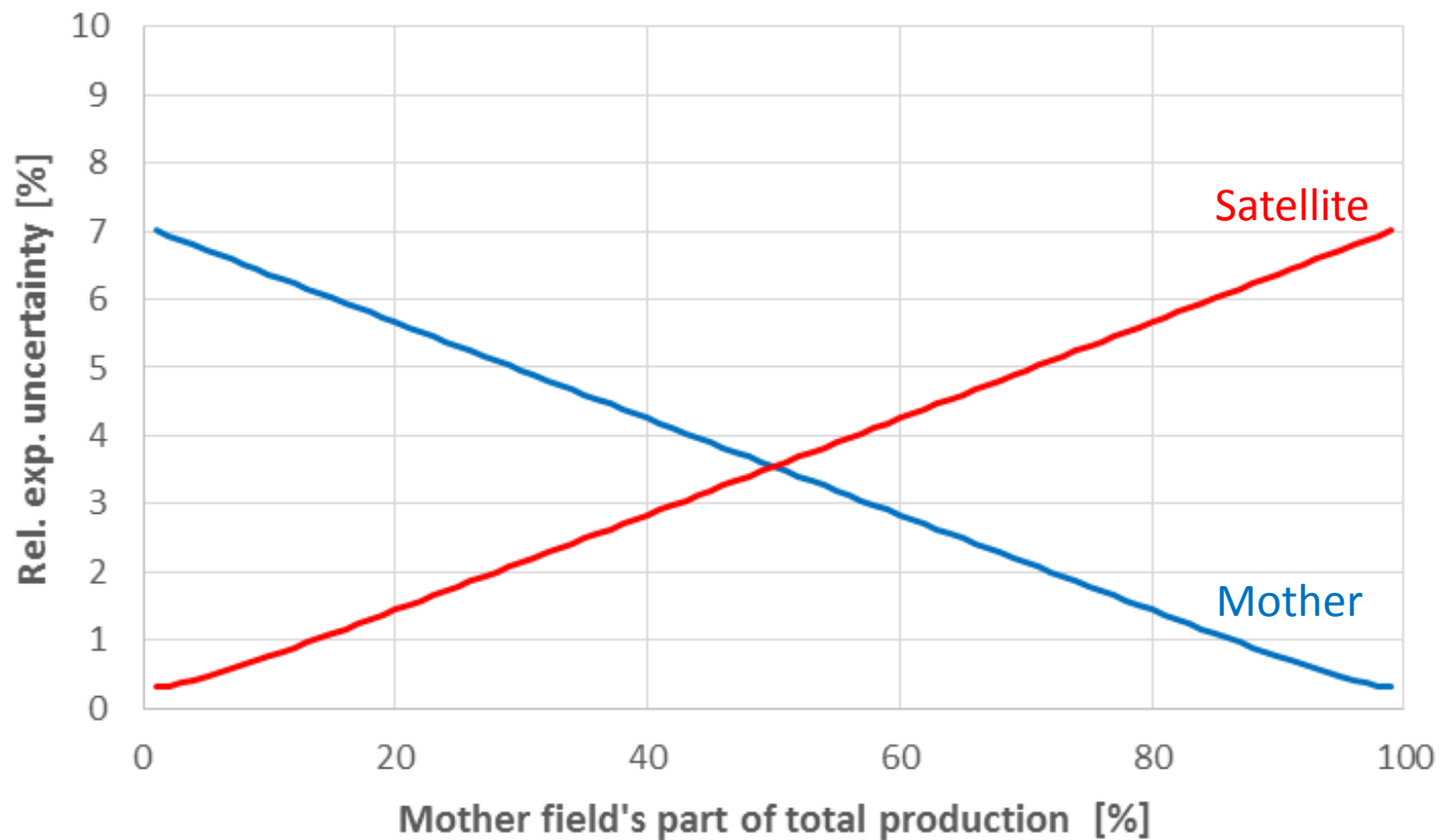
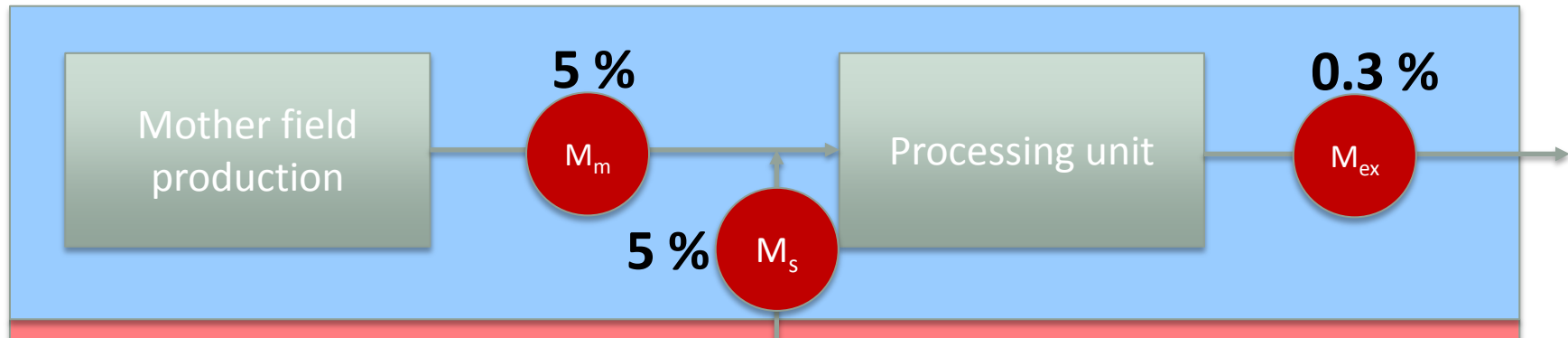
$$\frac{M_m}{M_m + M_s} M_{ex}$$

Allocated to satellite field:

$$\frac{M_s}{M_m + M_s} M_{ex}$$

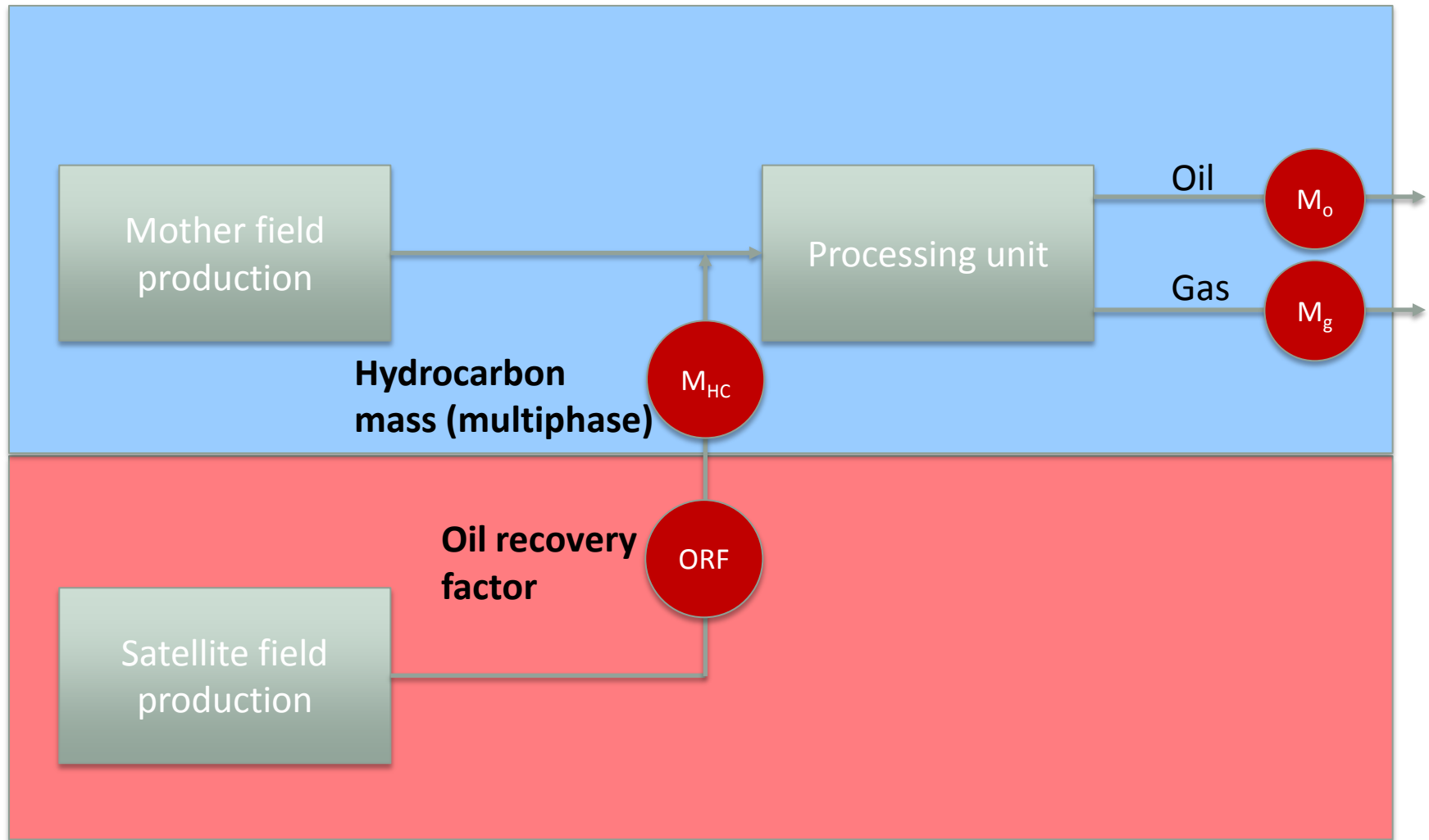
Uncertainty in allocated values

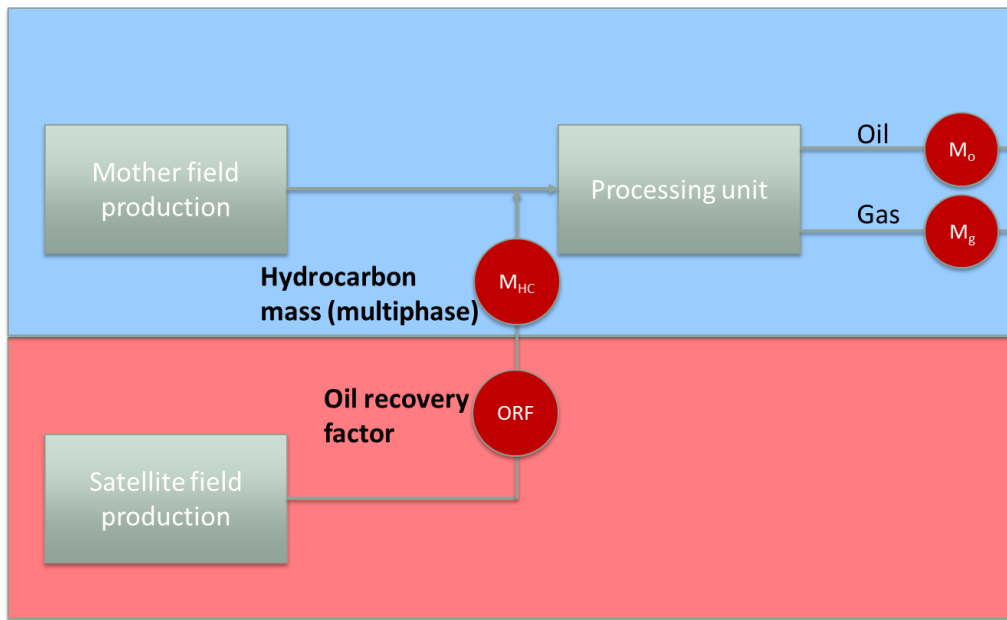
-«Pro rata» - allocation



More realistic example (but still simplified)

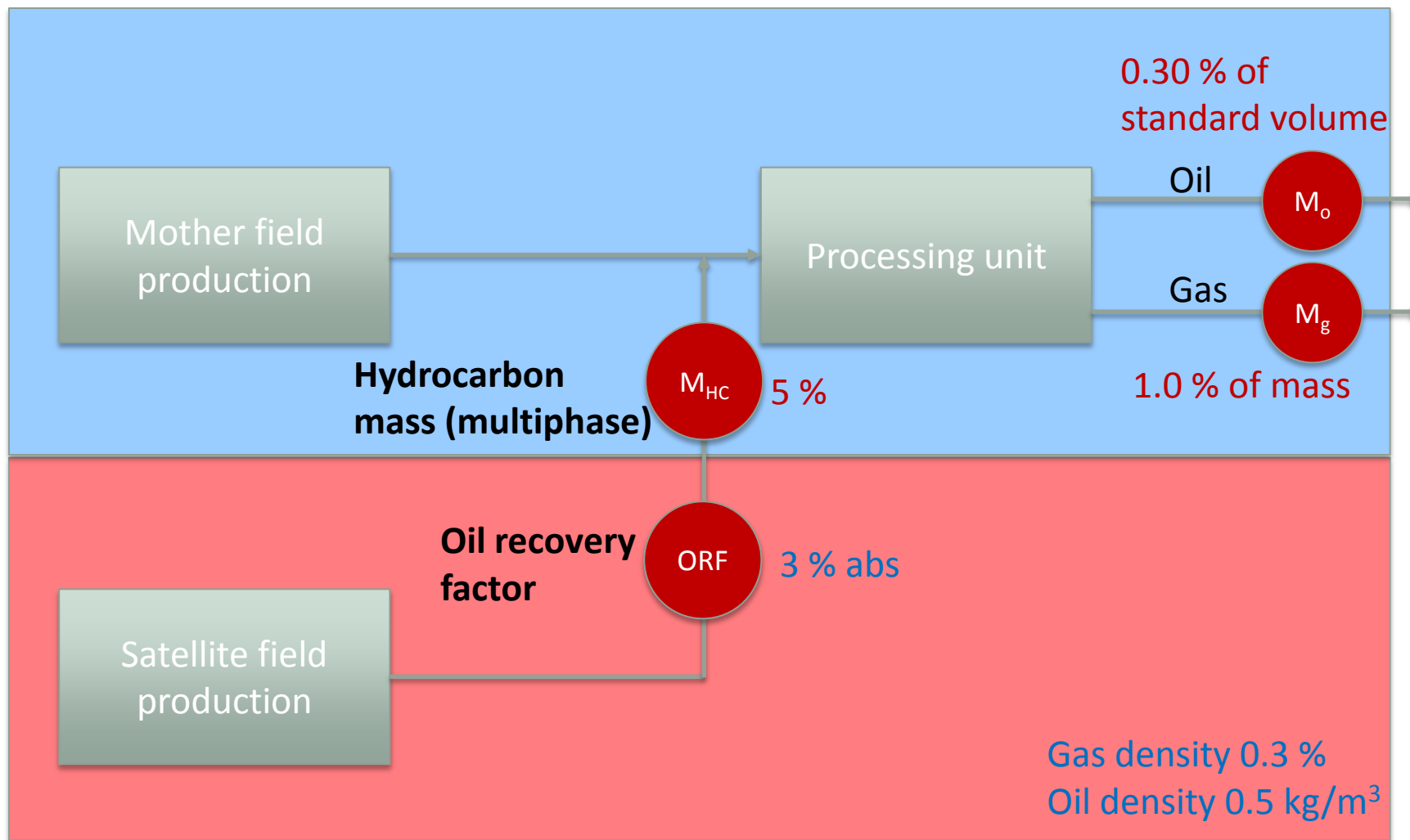
«By difference»-allocation





- Oil price: 100 USD/bbl
 - ≈ 4 NOK/kg
- Gas price: 20 EUR/MWh
 - ≈ 1 NOK/kg

Input uncertainties



Allocated money

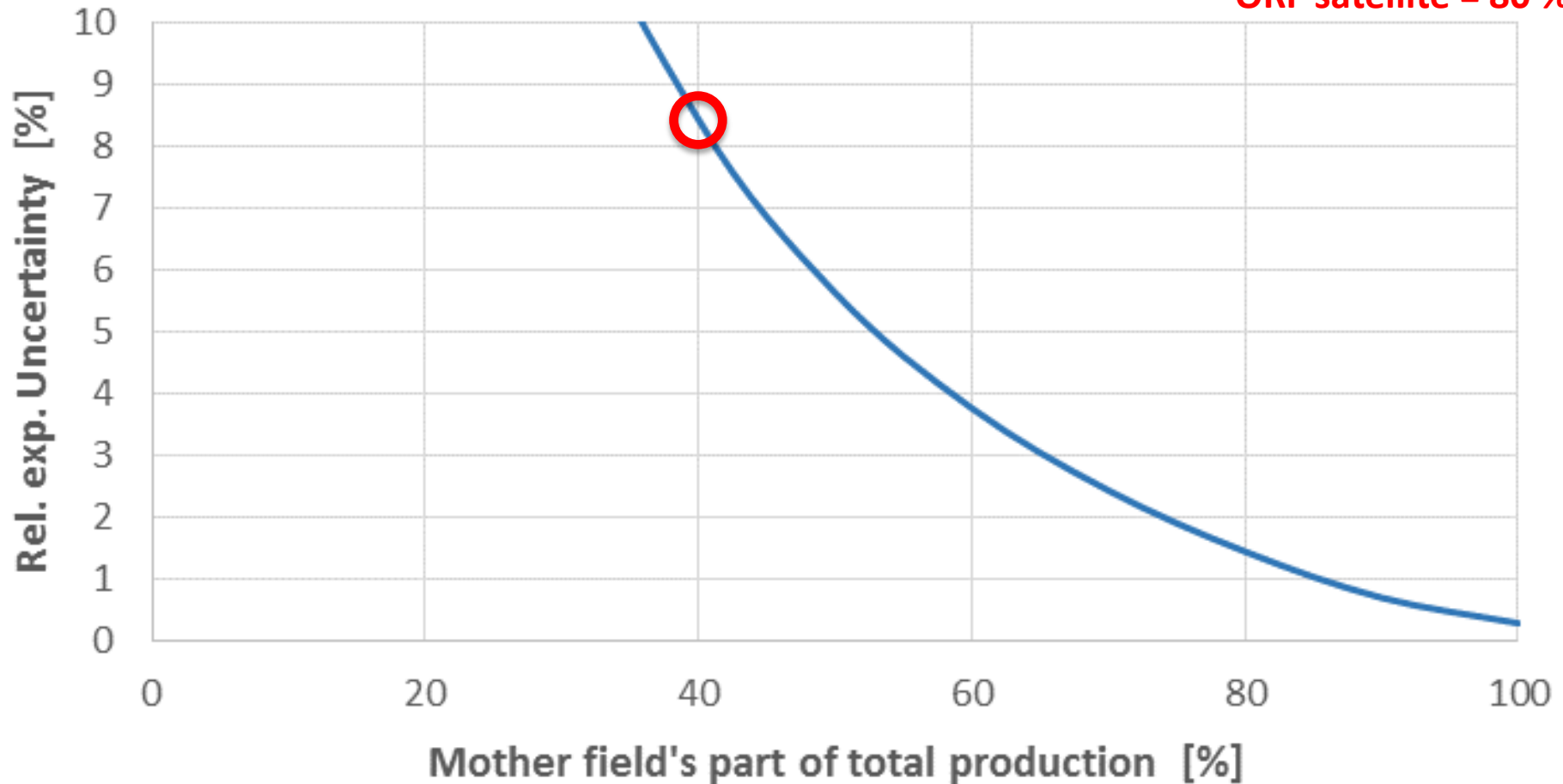
– «by difference» allocation



Mother field allocation

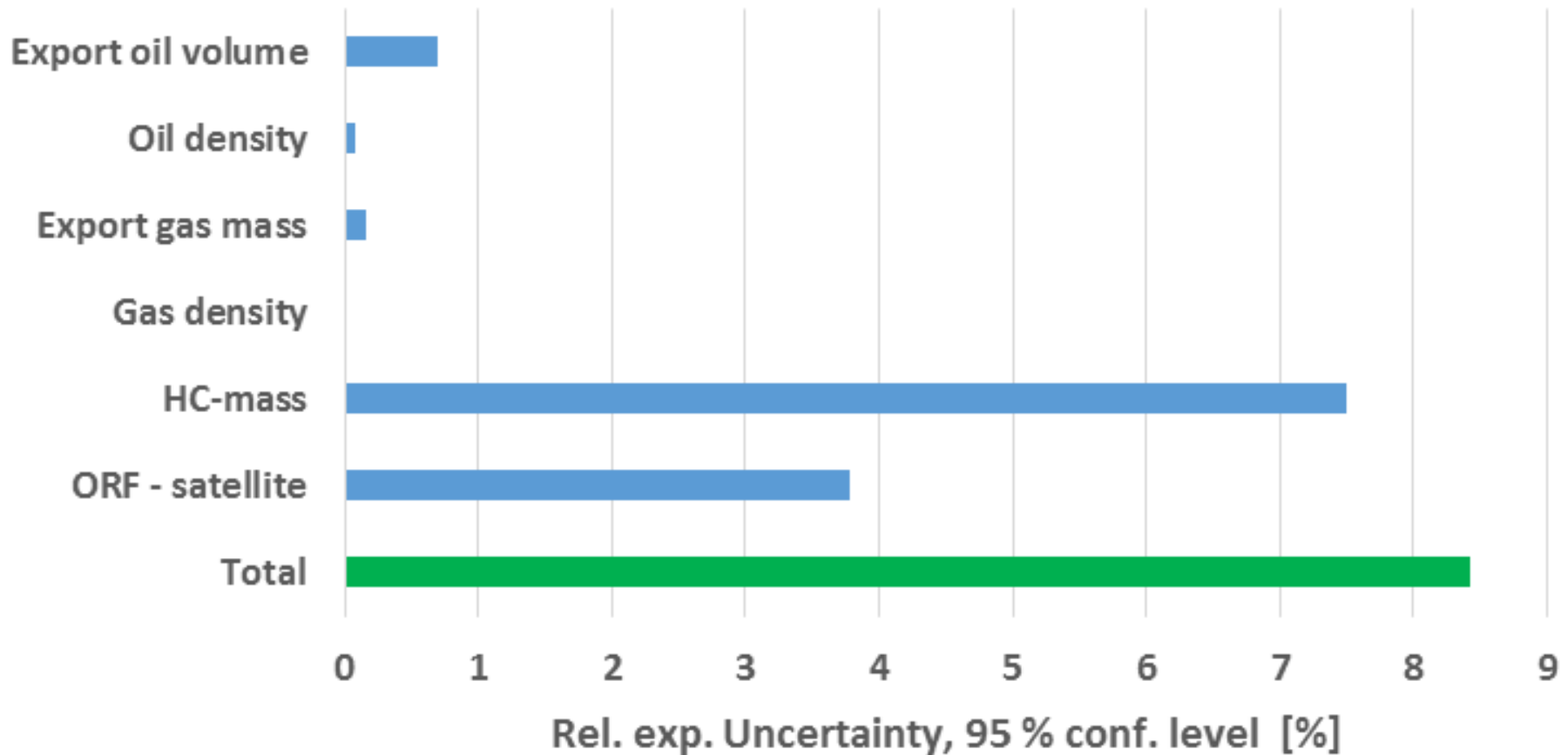
ORF mother = 80 %

ORF satellite = 80 %



ORF – mother = 80 %; ORF – satellite = 80 %;
Mother field: 40 % of total hydrocarbon production

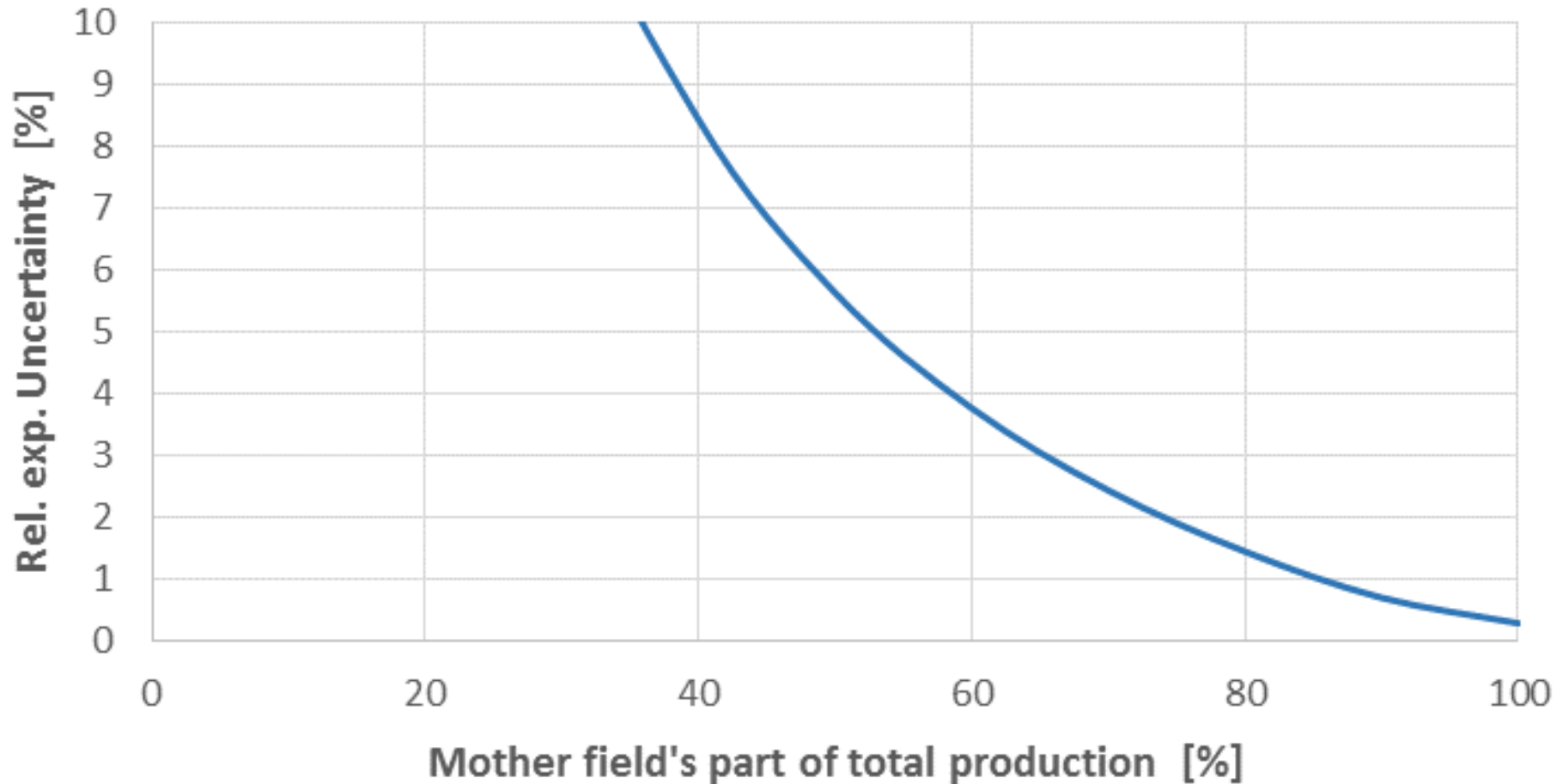
Uncertainty contributions



Allocated money

– «by difference» allocation

Mother field allocation

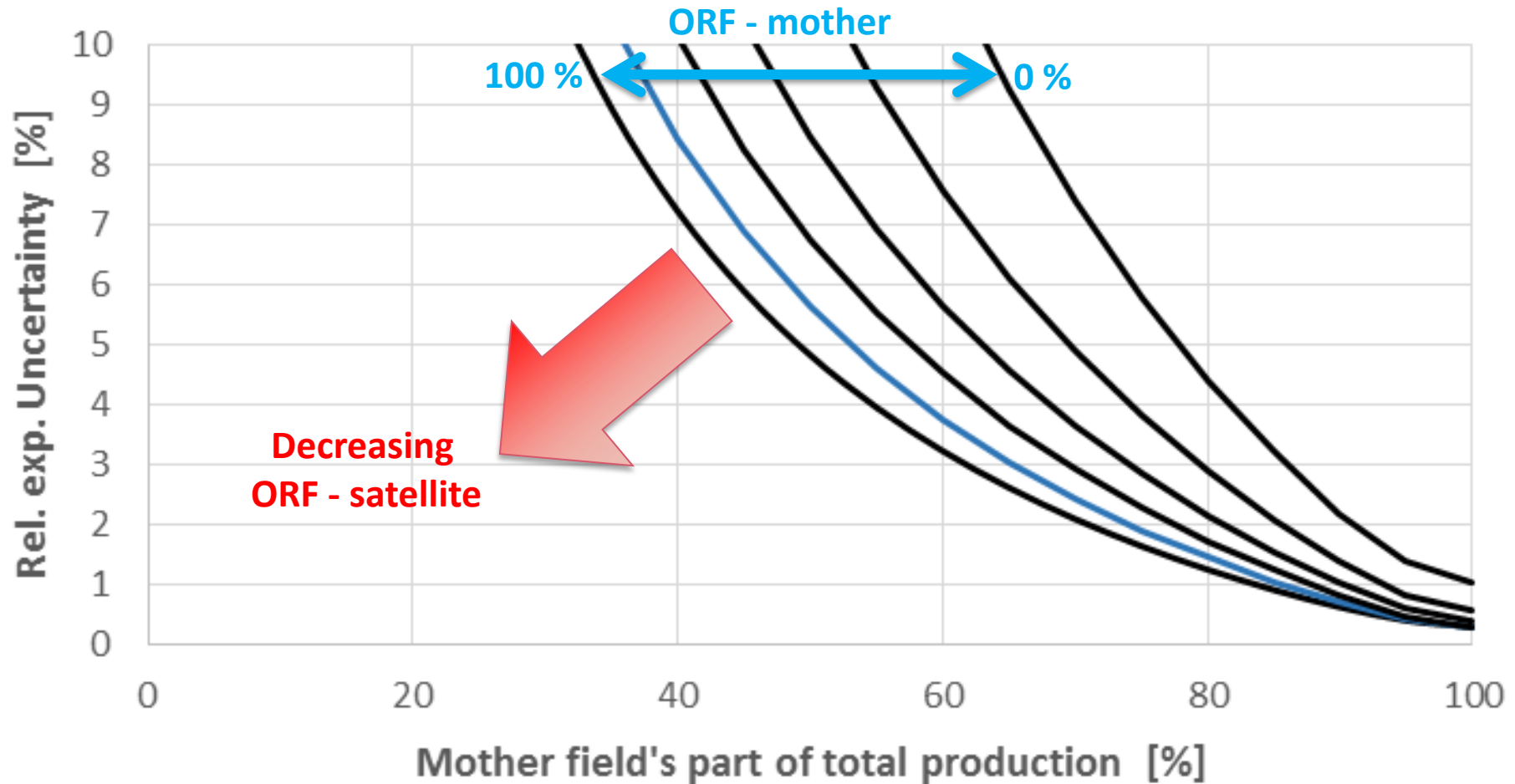


Allocated money

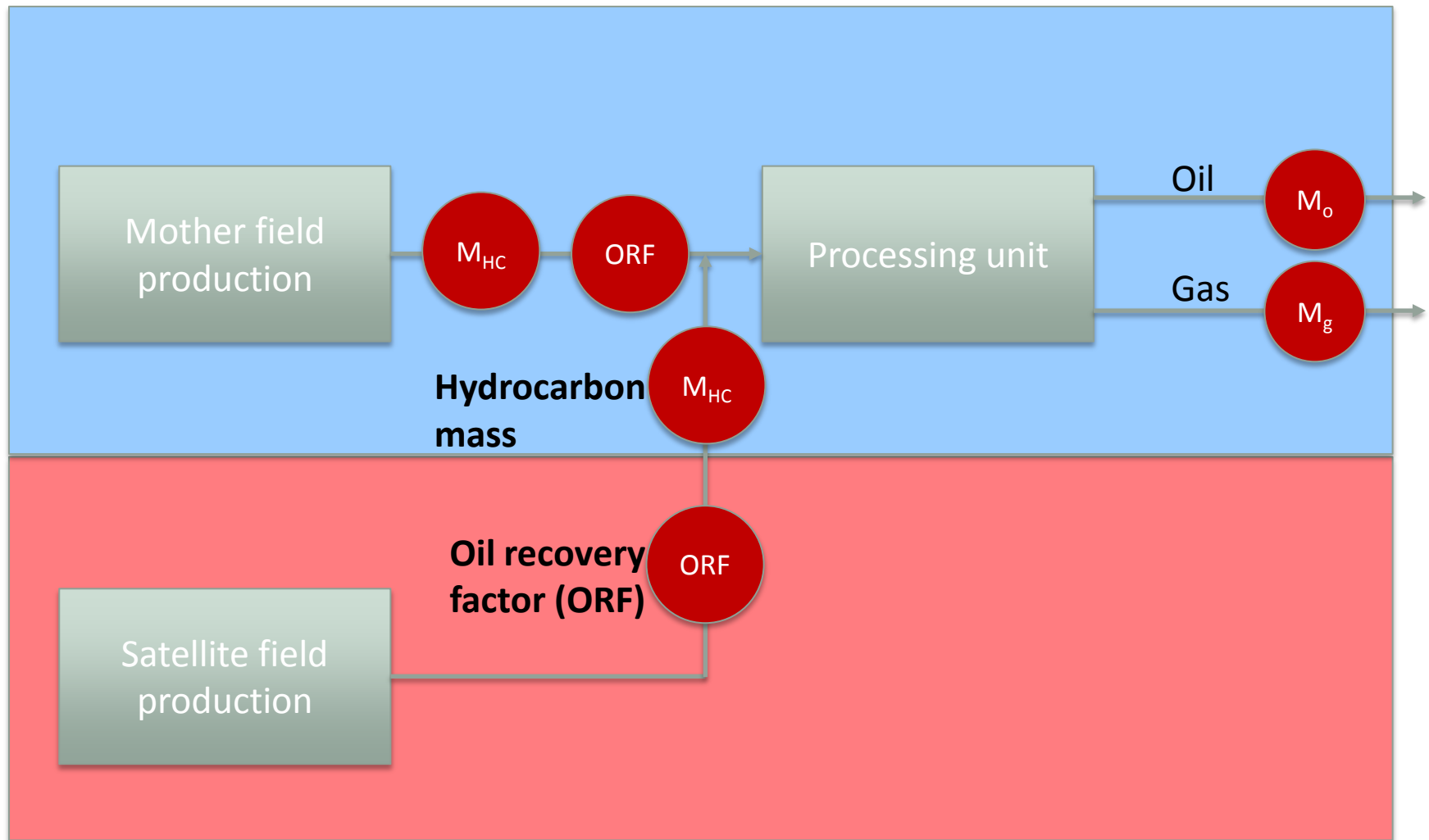
– «by difference» allocation

Mother field allocation

ORF – satellite = 80 %



«Pro rata»-allocation



Allocated money

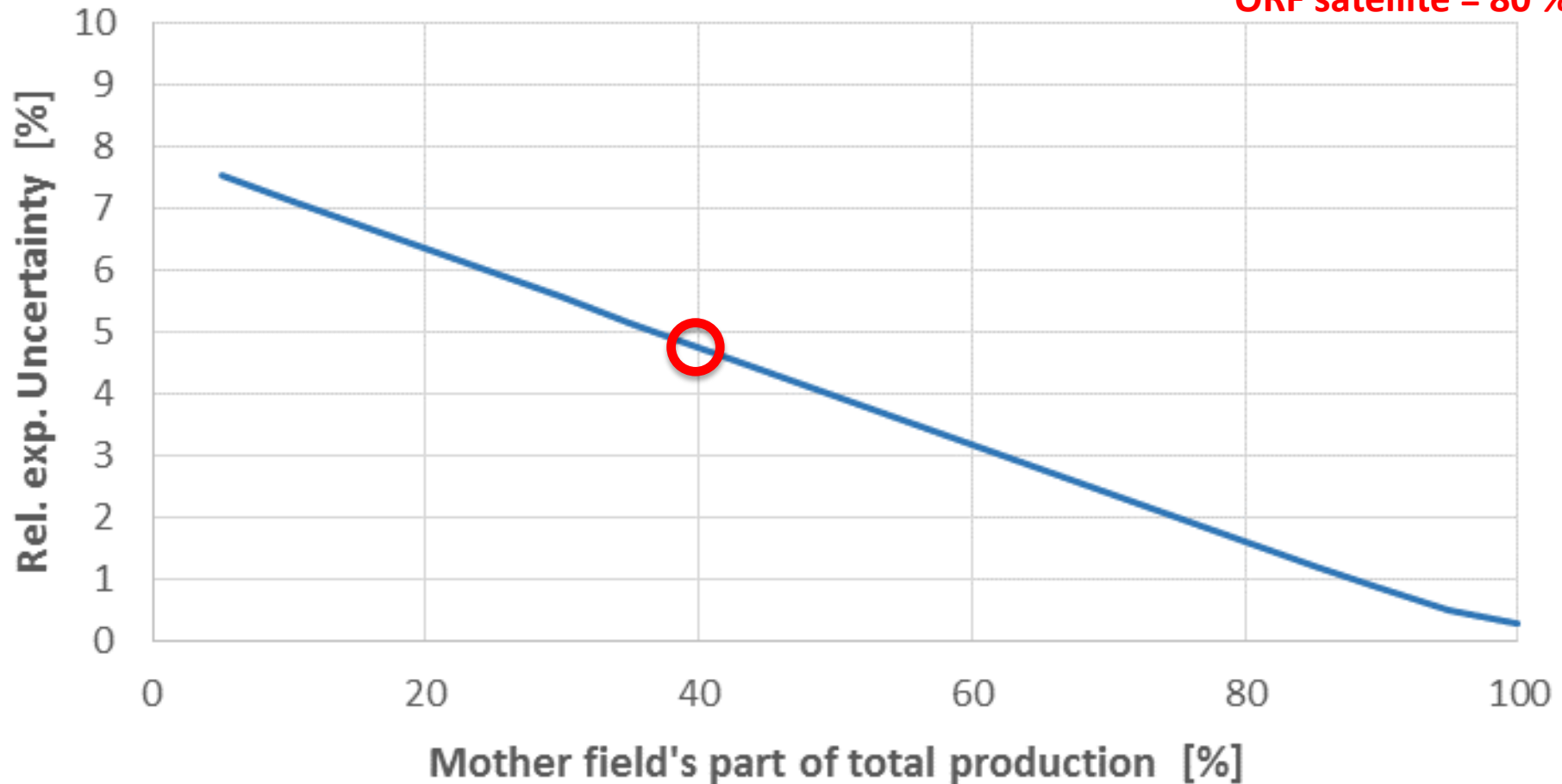
– «pro rata» allocation



Mother field allocation

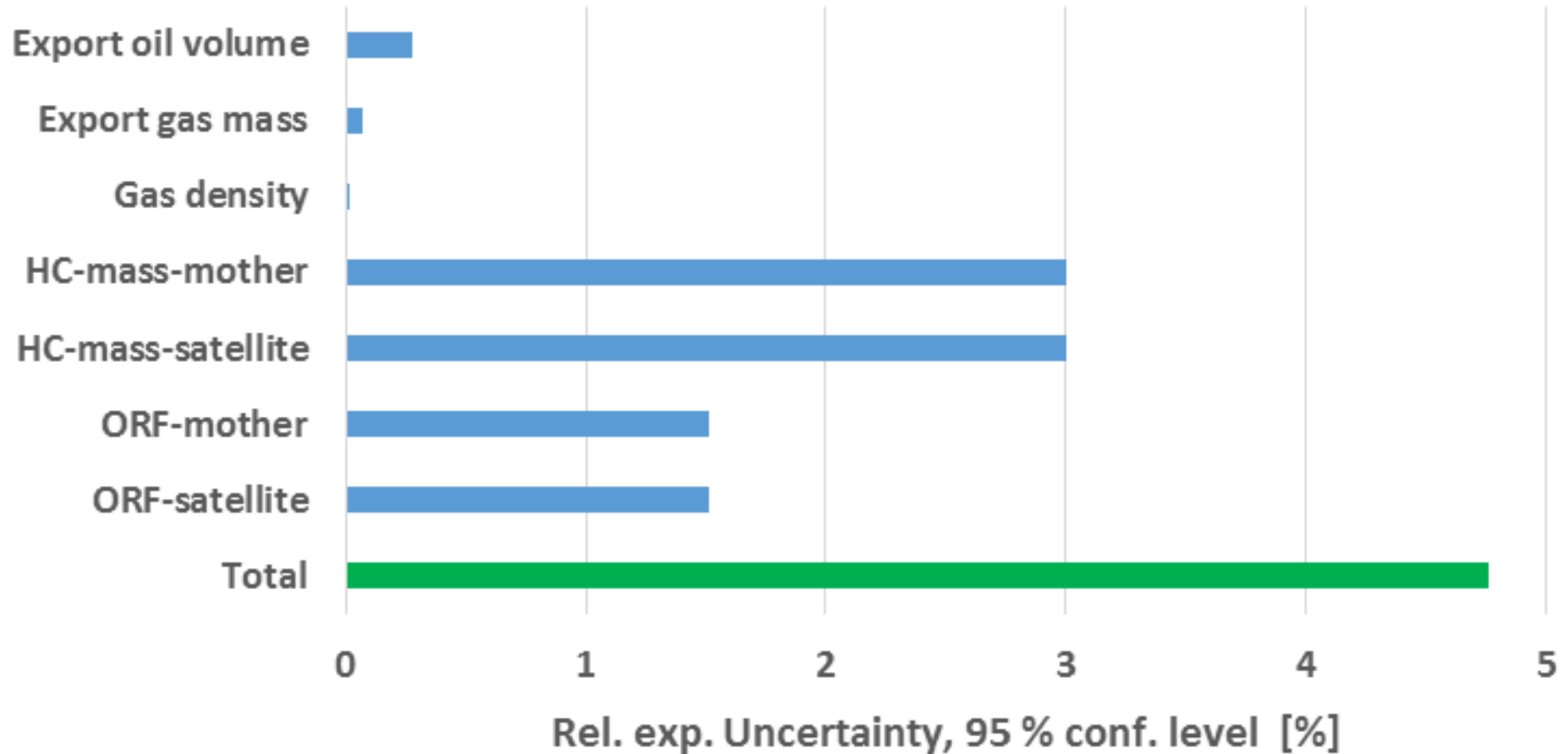
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ORF – mother = 80 %; ORF – satellite = 80 %;
Mother field: 40 % of total hydrocarbon production

Uncertainty contributions



Allocated money

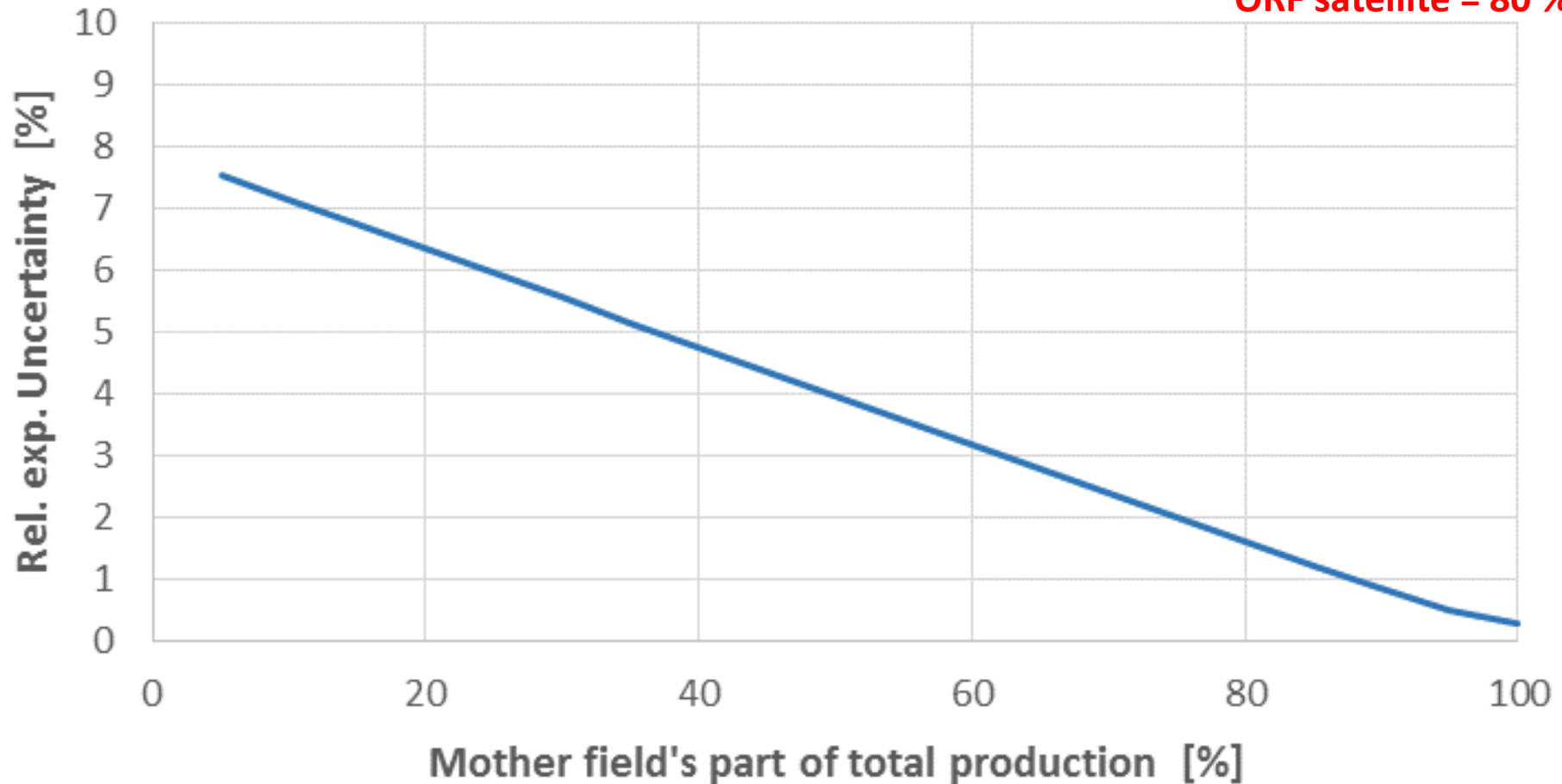
– «pro rata» allocation



Mother field allocation

ORF mother = 80 %

ORF satellite = 80 %

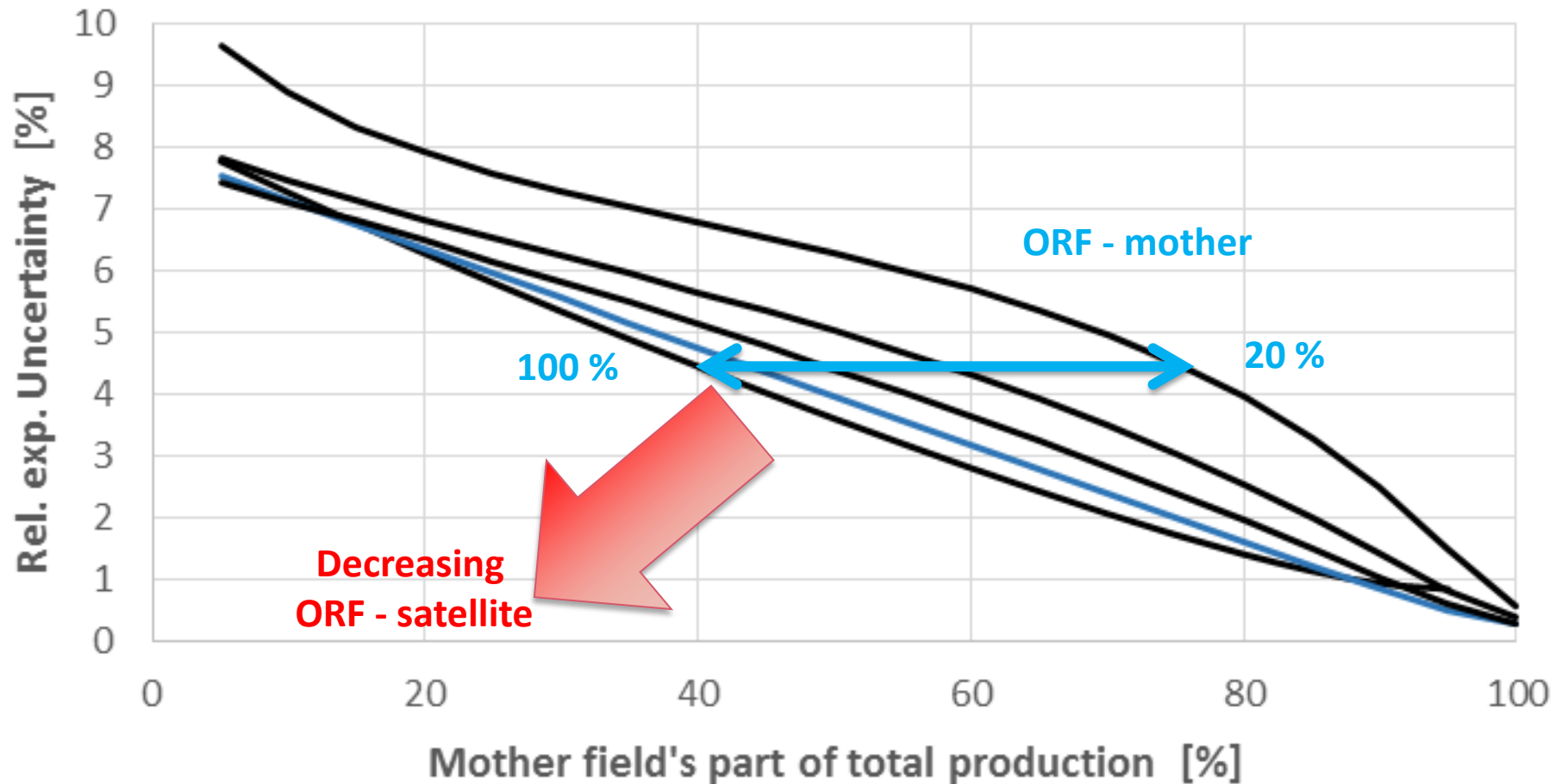


Allocated money

– «by difference» allocation

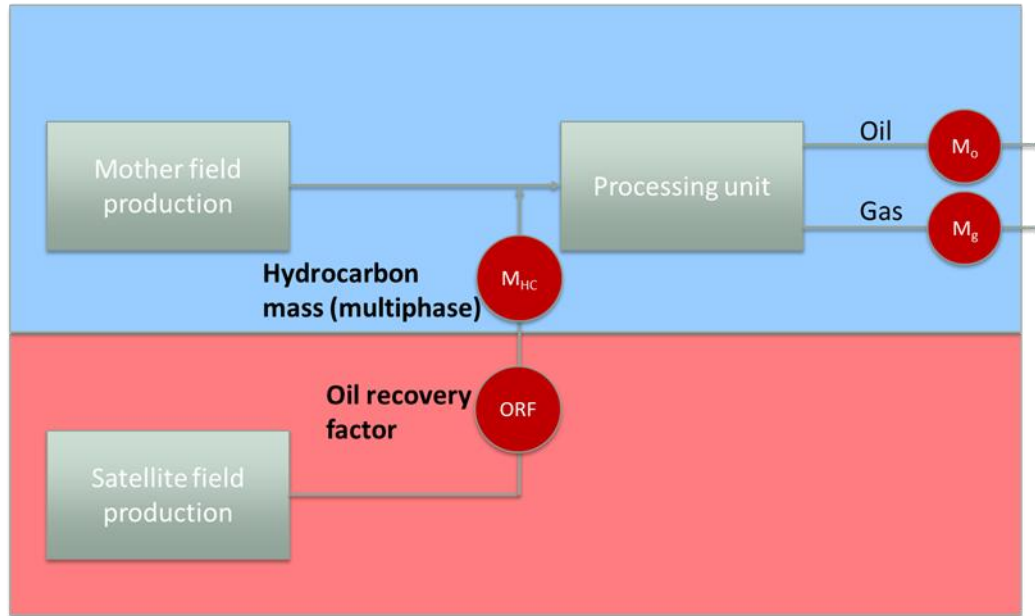
Mother field allocation

ORF – satellite = 80 %



Ownership allocation

Ownership allocation



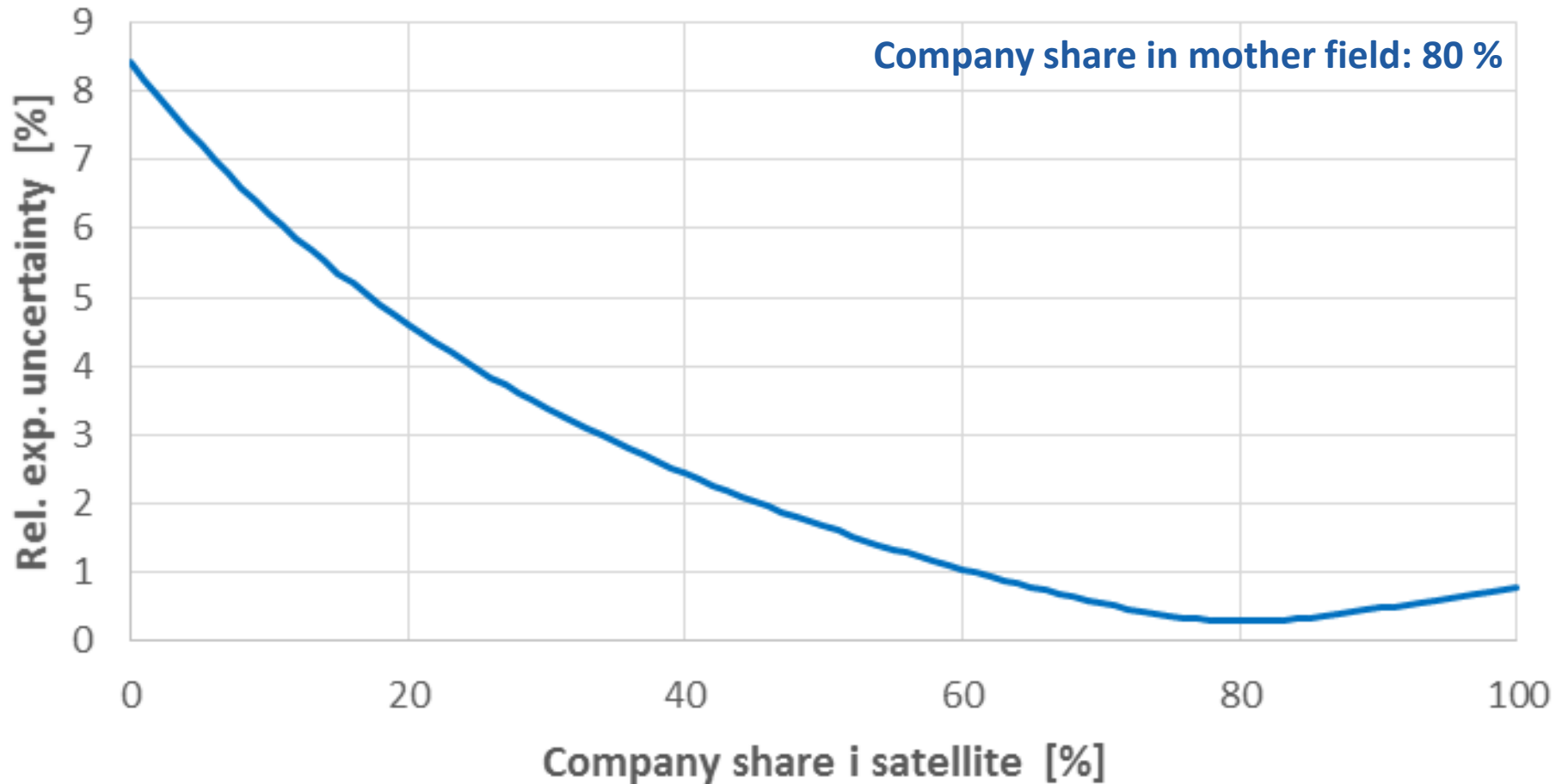
Uncertainty in allocated money to company with ownership in both fields

Example:

- ORF = 80 % for both fields
- Mother field 40 % of total production
- «By difference» - allocation

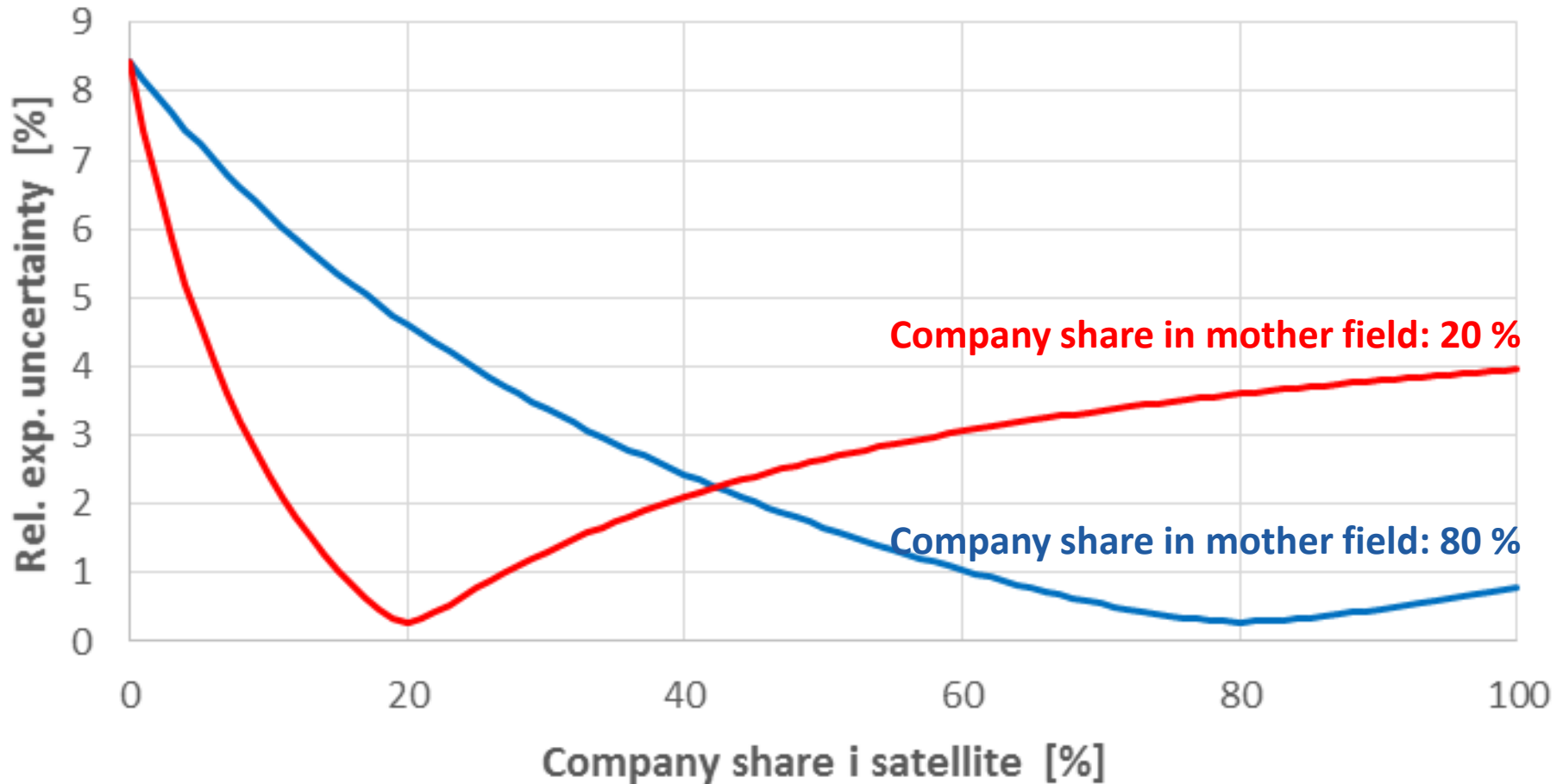
ORF – mother = 80 %; ORF – satellite = 80 %;
Mother field: 40 % of total hydrocarbon production

"By difference" -allocation



ORF – mother = 80 %; ORF – satellite = 80 %;
Mother field: 40 % of total hydrocarbon production

"By difference" -allocation



Summary

- **Allocation principle:** «by difference» generally (but not always) gives higher uncertainty in allocated value
- **Uncertainty in Oil Recovery Factor** (or similar) of importance due to price difference between oil and gas
- **Production profile**, including rates and oil recovery factors affect uncertainty in allocated value
- **Company shares** in the various fields highly influence the uncertainty of the ownership allocation