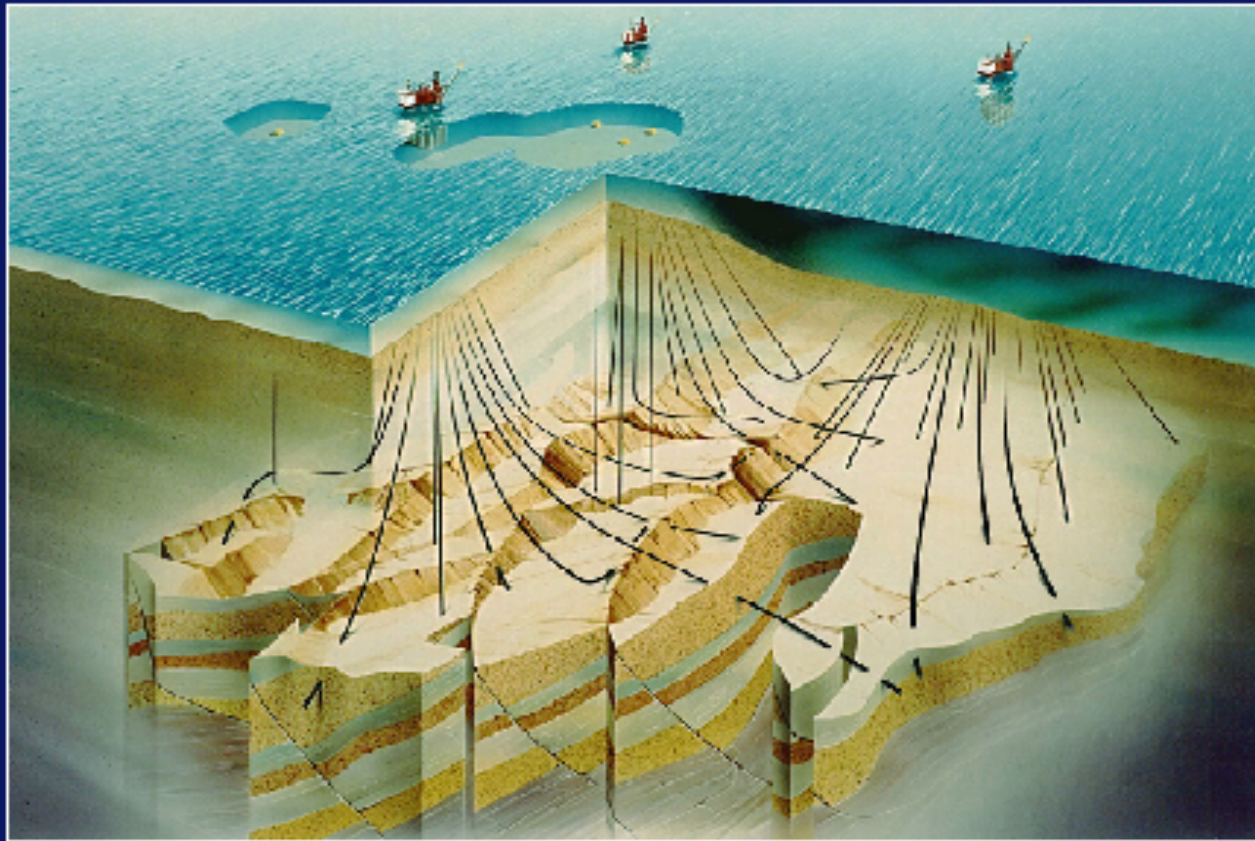


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Gullfaks Field



Overall objective

*How to extract 10% more oil
from the Gullfaks Field*

External partner

*The Gullfaks license in Bergen
(Statoil)*

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Students

last name	first name	study program	mobile	email	Norwegian	sex
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GULLFAKS VILLAGE₂₀₁₃

Village Leader/Assistant Leader

- ❖ *Jon Kleppe*
- ❖ *Jan Ivar Jensen*

Learning Assistants

- ❖ *Hennige Bie*
- ❖ *Simon Fjeldvær*

Additional key advisors at NTNU

- ❖ *Prof. Michael Golan*
- ❖ *Ph.D. candidates*

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Project advisors at Statoil (preliminary)

- ❖ Petter Eltvik
 - ❖ Hallstein Ånes
 - ❖ Roger Oen Jensen
- (+ FRAMO Engineering staff)

GULLFAKS VILLAGE₂₀₁₃

Agenda 16.1.13

0900 Coffee

0915 Welcome by the Village Leader Jon Kleppe

- ❖ **Introduction to the Gullfaks Village, presentation of the involved staff , "rules of the Village", milestones, etc.**

**1000 Introduction to group processes by the Learning Assistants
Hennige and Simon**

1100 Short break

**1115 First description of Gullfaks projects by Prof. Michael Golan and
Ph.D students**

1200 Common lunch

GULLFAKS VILLAGE₂₀₁₃

Agenda 16.1.13 (cont'd)

- 1300** **Definition of groups**
- 1310** **More teambuilding activities**
- 1515** **Writing of log for the day**
- 1530** ***Bus to Heimdal***
 - ❖ ***Team-building (Bowling/GoCart)***
- 1930** ***Bus to Mikrobryggeriet***
 - ❖ ***Team-building***

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Second Village Day 23.1.13

- 0900 Statoil presents challenges related to the Gullfaks South segment**
- 1200 Common lunch**
- 1300 Group discussions**
- 1430 Writing of logs**
- 1500 Short Courses (?)**
- 1700 End**

GULLFAKS VILLAGE₂₀₁₃

Typical Village Day (Wednesday)

09⁰⁰	Morning Meeting (mandatory) ❖ <i>Info, common issues, status reports by groups</i>
09³⁰ - 11³⁰	Project meetings in groups ❖ <i>LA & LL will visit groups</i>
11³⁰ - 12⁰⁰	Writing of logs
12⁰⁰ - 12³⁰	Lunch
12³⁰ - 14⁰⁰	Group work
14⁰⁰ - 15⁰⁰	Plenum session
15⁰⁰ - 19⁰⁰	More group work?

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Preliminary milestones

Each group will develop its own milestones, however, a few common milestones are:

January 16: Introduction, teambuilding

January 23: Statoil presents group projects in Trondheim

February 20: Visit to Statoil/Framo Engineering in Bergen

April 24: Final presentations

May 2: Deadline for reports

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Group projects

Details will be presented by Prof. Michael Golan today at 1115, and by Statoil next week

GULLFAKS VILLAGE₂₀₁₃

Group projects

Part A (identical for all groups)

For the first weeks all groups will work on identical projects, with an objective of getting acquainted with common methods for recovery calculations and to establish well models in the program PROSPER

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Group projects

Part B (different for the groups)

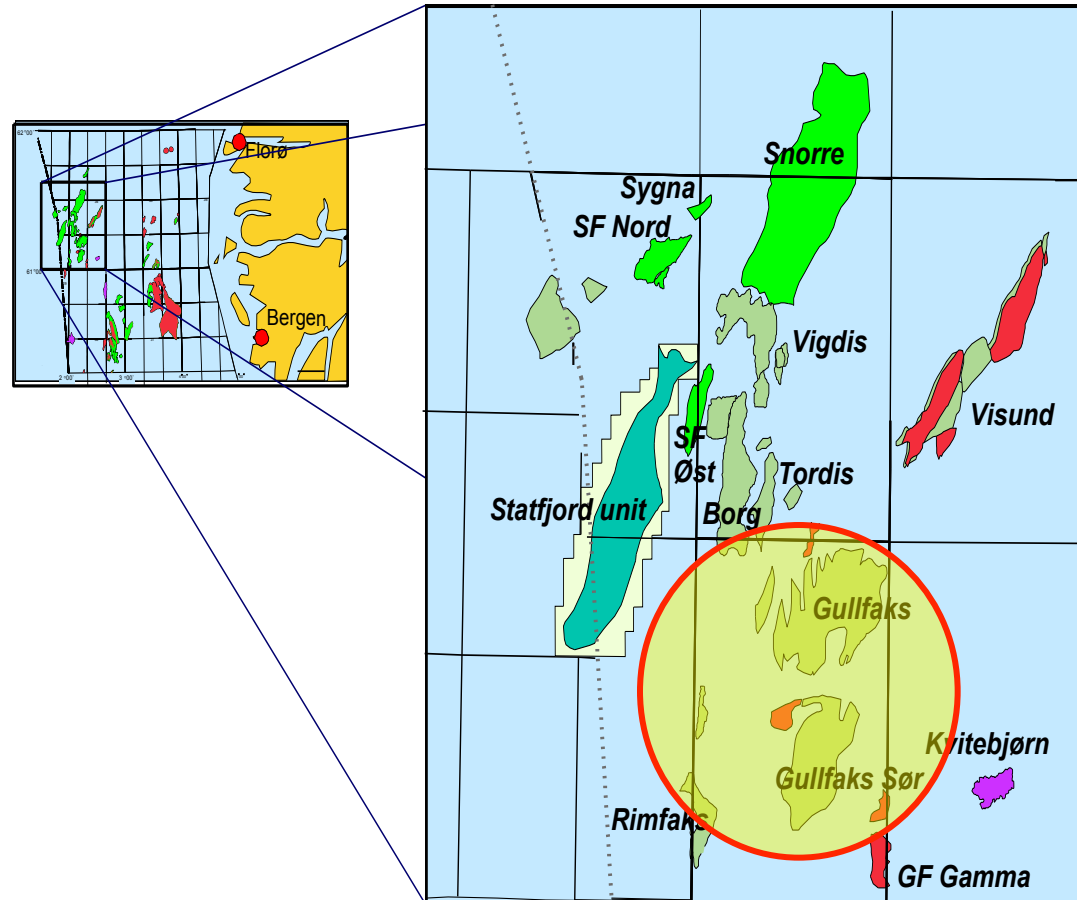
The group projects will be discussed more next week, but some of the key issues are:

- Optimization of production strategy
- Comparison of sea floor compression with topside precompression
- Sensitivity analysis for the sea floor compressor

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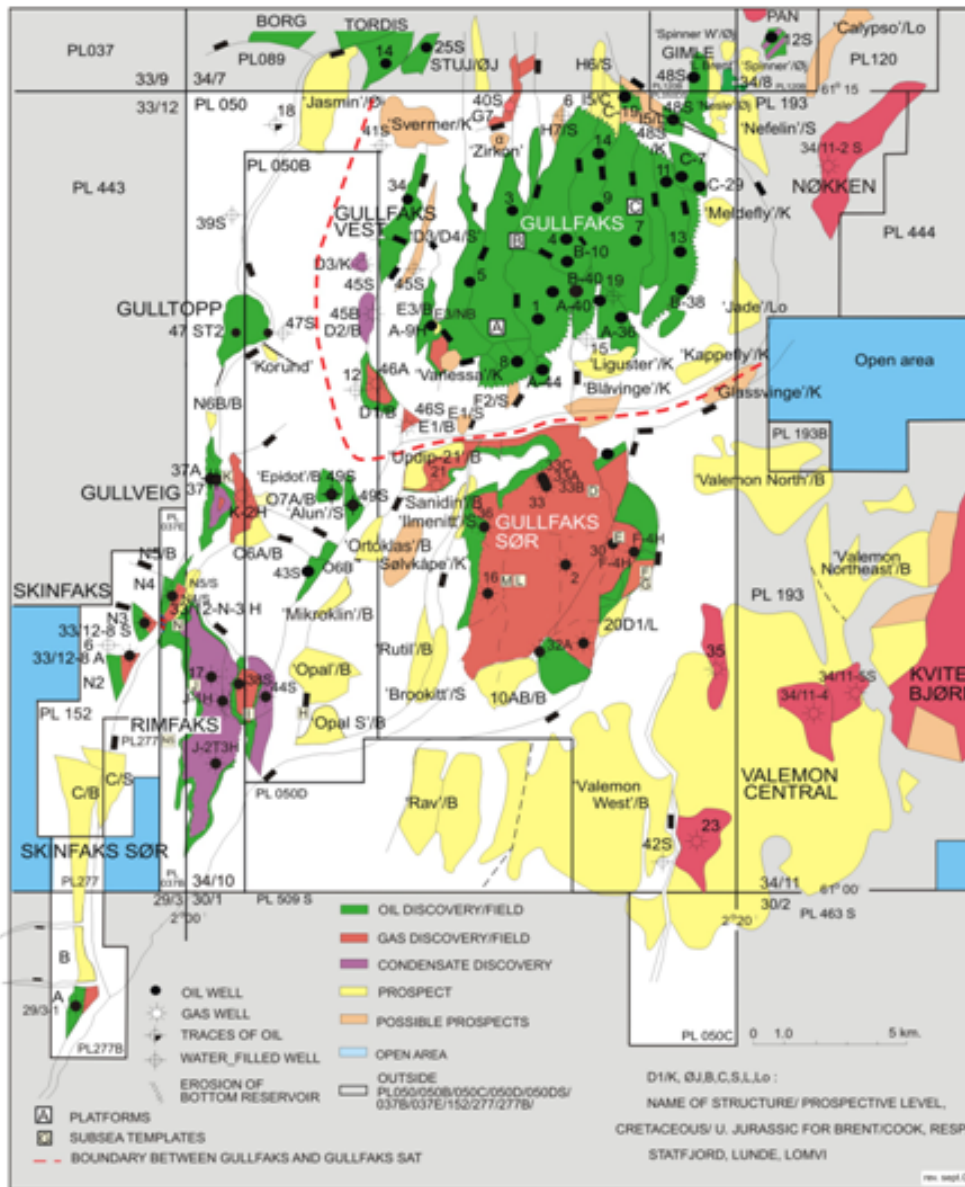
Groups will be presented later today

Introduction to the Gullfaks area

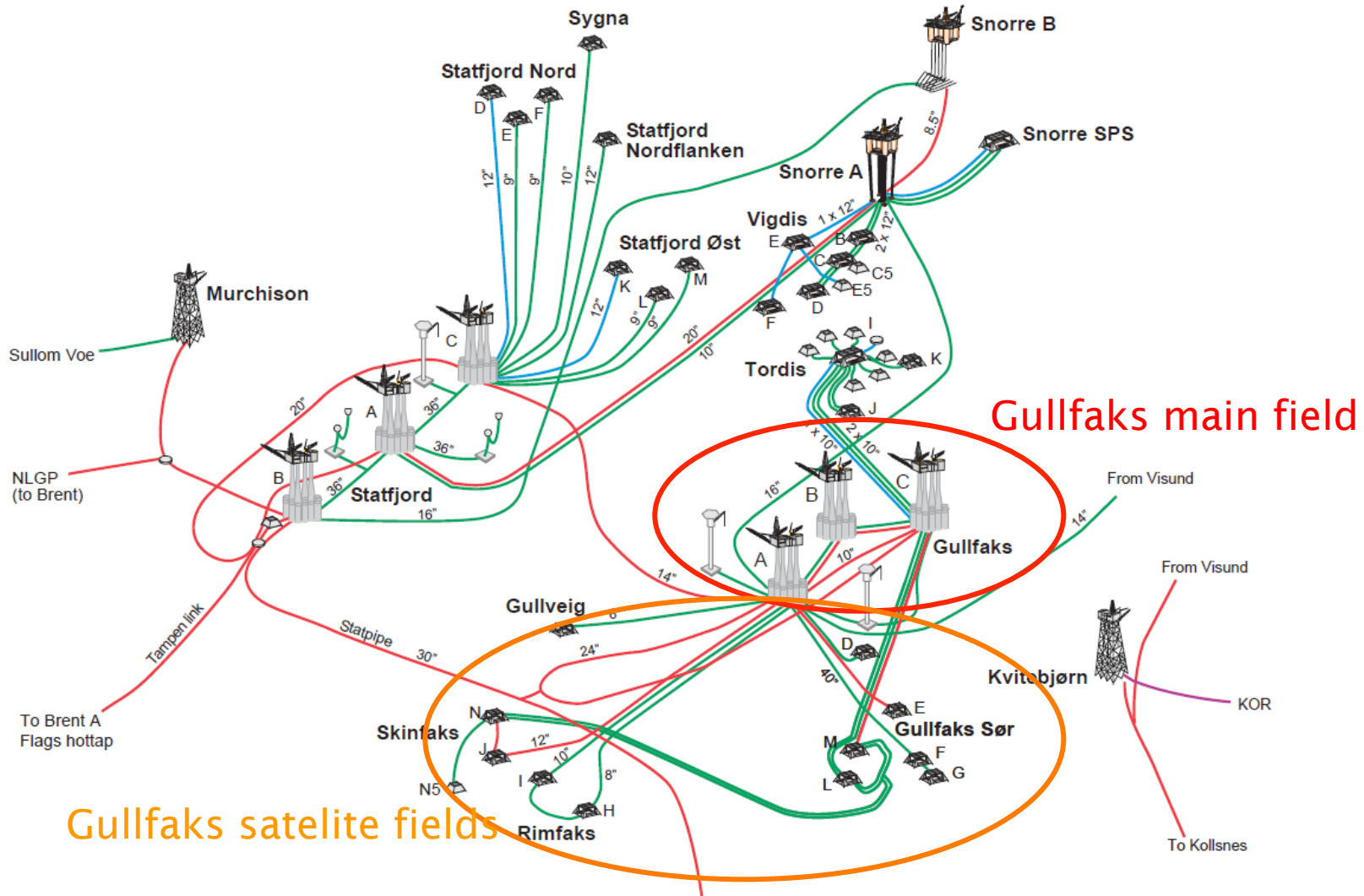


Gulfaks facts

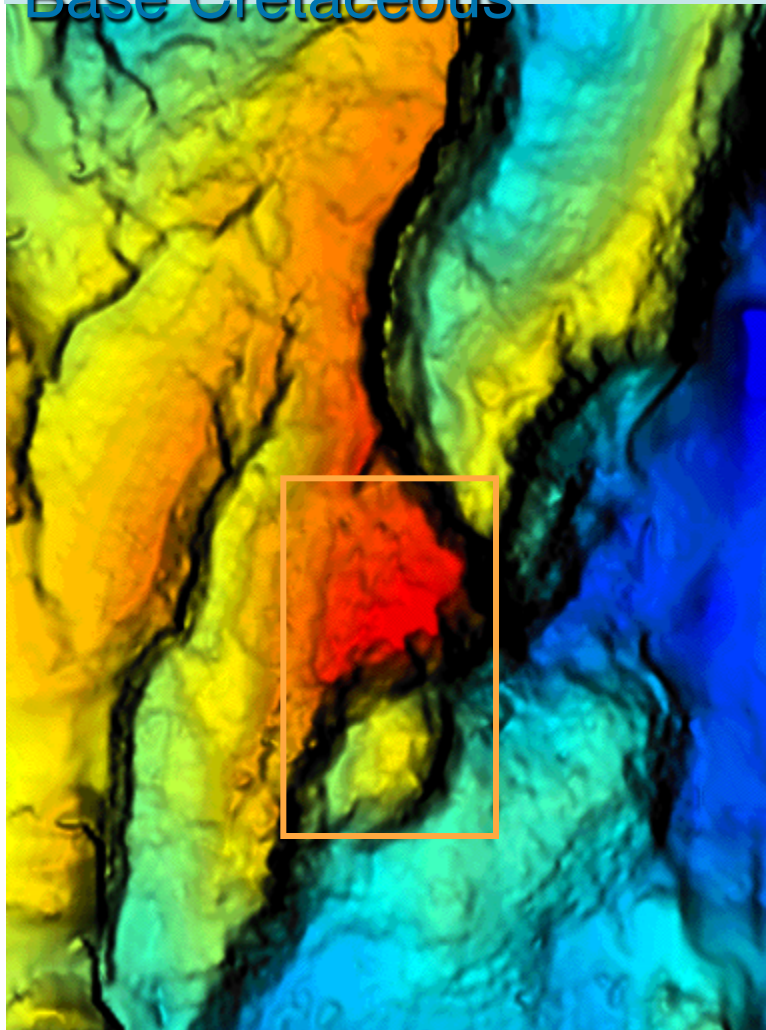
- Block 34/10 – the Golden block
- Only Norwegian partners
- Current owners:
 - Statoil: 70 % (Operator)
 - Petoro: 30 %
- Field discovered: 1978
- Main field developed by three concrete platforms
 - Production start: 1986
- Production start GFSAT: 1998
 - Production start: 1999
- Production from GFMAIN exceed 2 billion barrels



Gulfaks area - installations



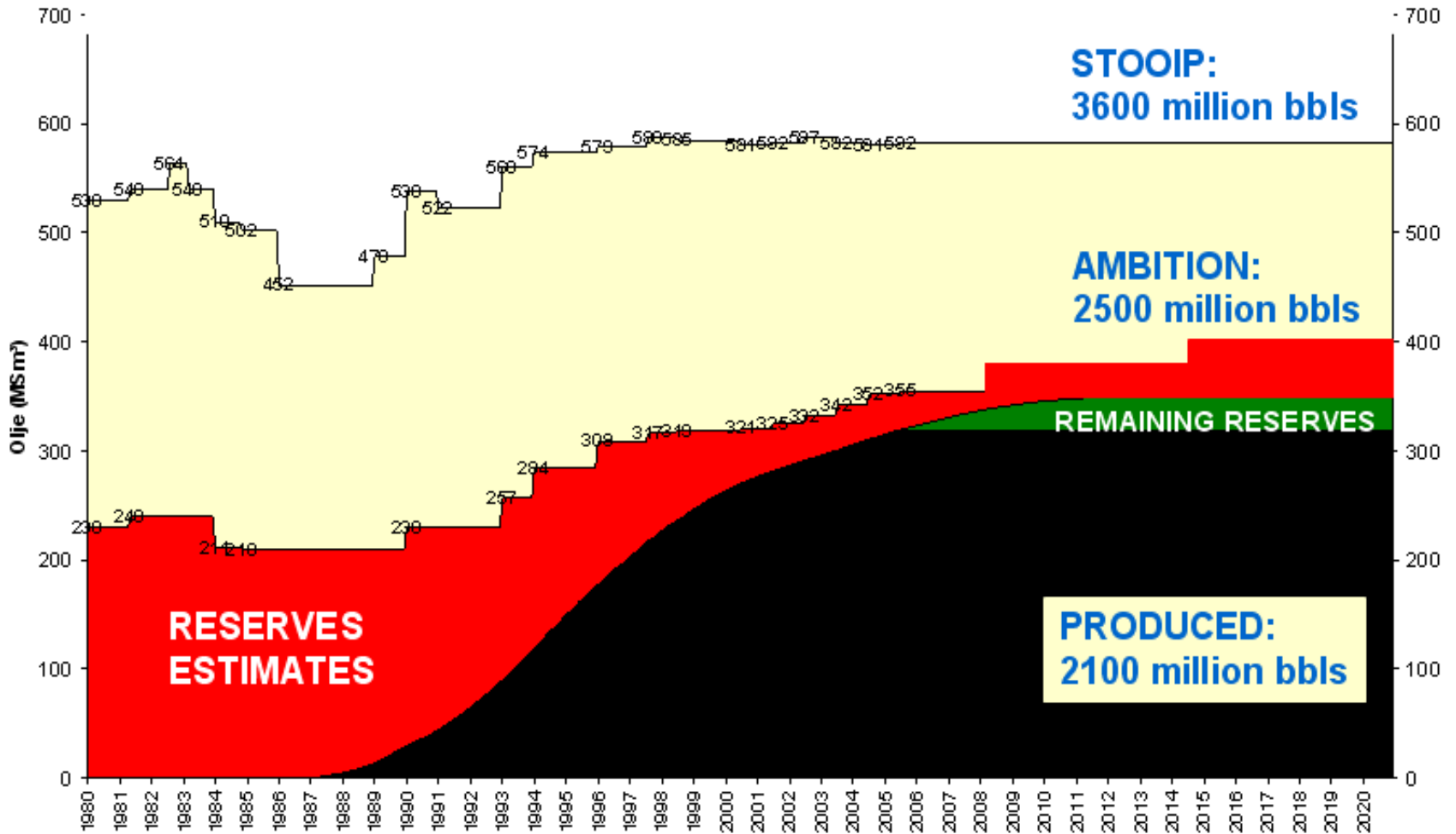
Structural Depthmap – Base Cretaceous



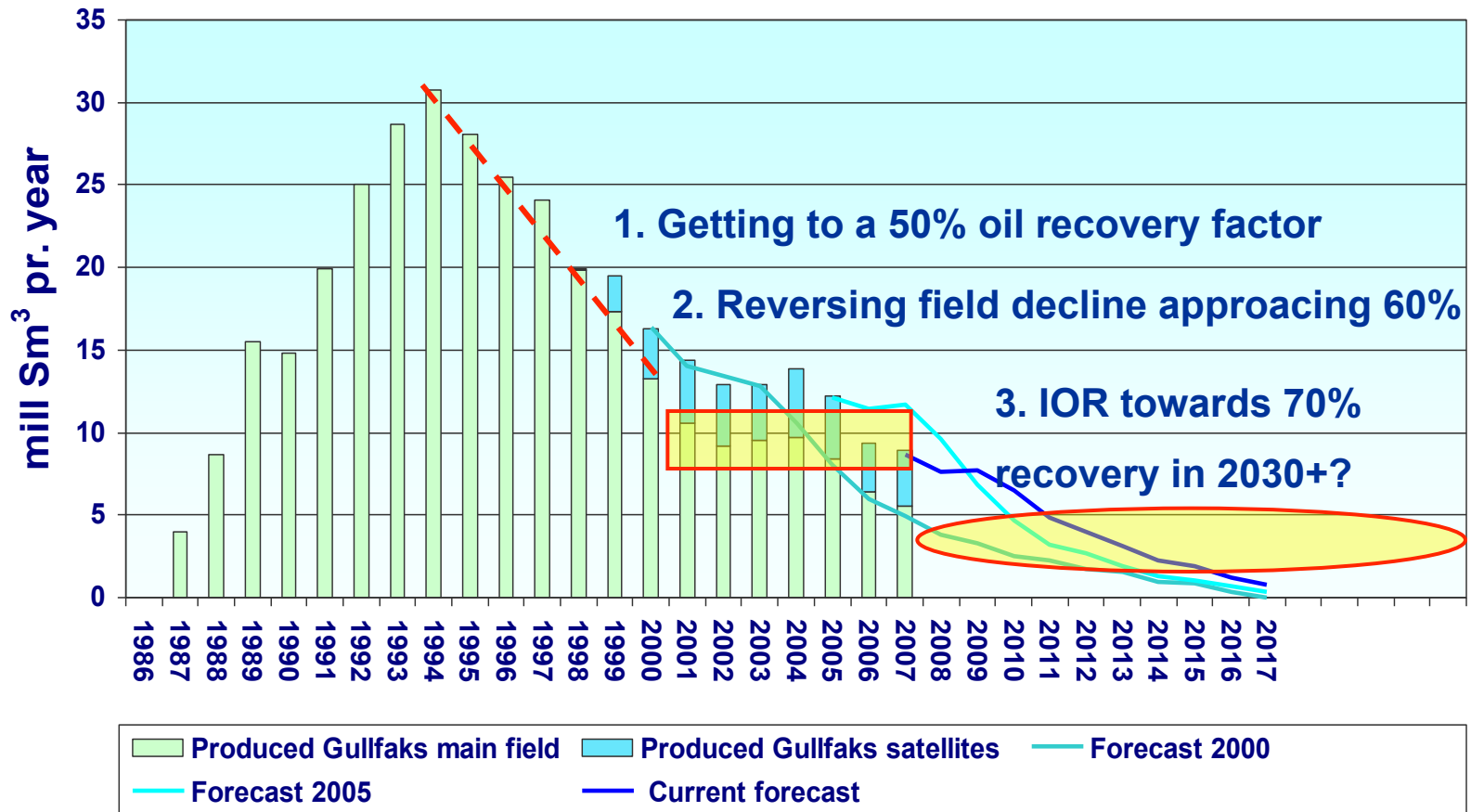
Gulfaks main field data

Area	: 50 km ²
Top Structure	: 1700 m TVD
Dipping	: 0-20 West
Oil-water contact	: 1947 m TVD
Initial pressure	: 310 bar
Bubblepoint pressure	: 220 bar
Initial temperature	: 72 deg C
Formation volume factor	: 1,2
Oil viscosity	: 1.2 cp
Oil gravity	: 36.9 API

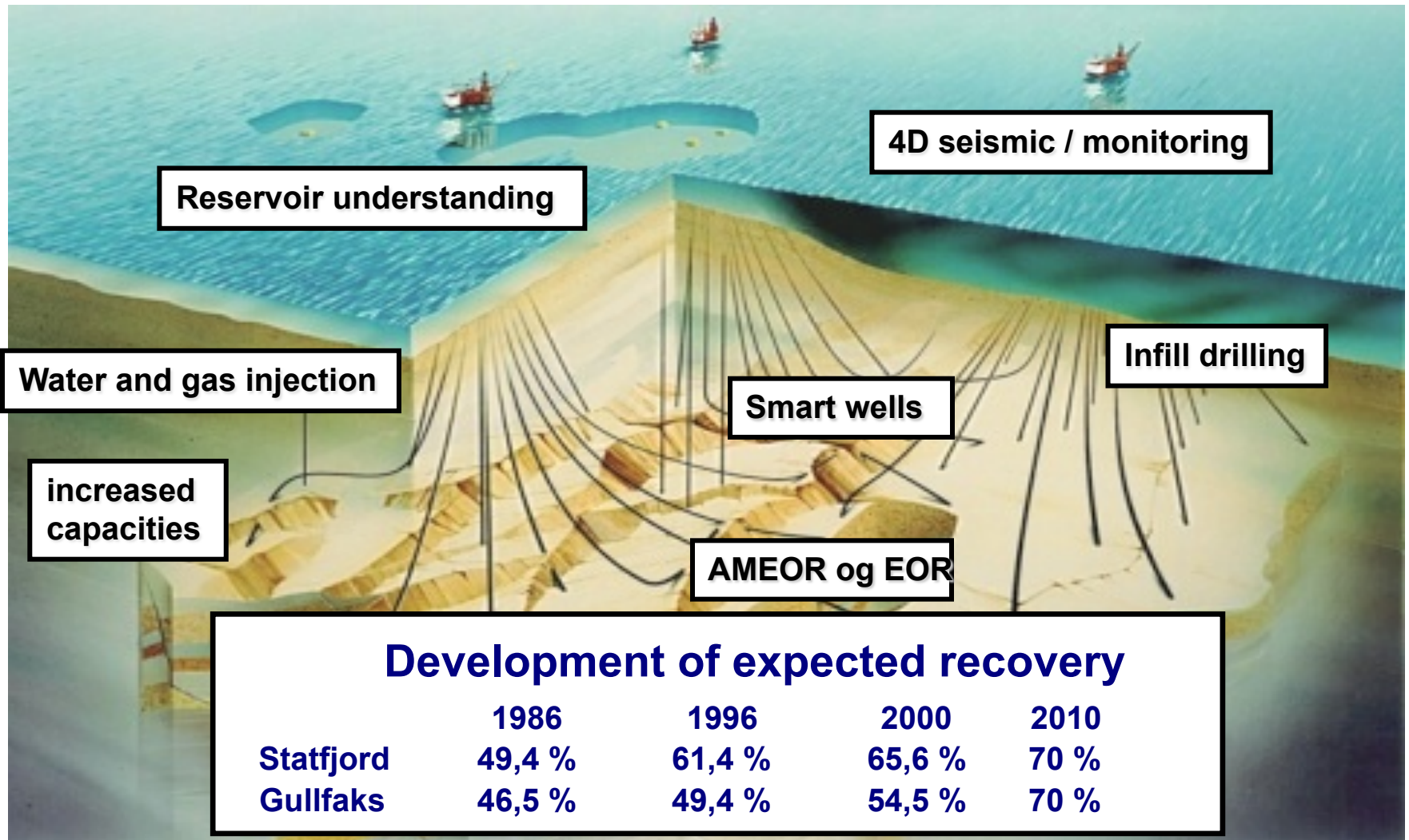
Gulfaks Reserves Estimates through time



Best Practices in Reservoir Management and Production Optimisation at Gullfaks, North Sea



Improved Oil Recovery is a team effort



IOR Measures at Gullfaks

- Water injection from start
- Upgrading of water injection capacities
- 4D seismic and inversion
- Tracers
- Hydraulic fracturing in low perm reservoirs
- WAG (Water alternating gas) injection
- "Huff and puff" gas injection
- Extensive exploration activity within drilling reach from platforms => new volumes

- Sand control in most wells
- "Designer wells" (horizontal, 3D)
- Extended reach drilling (10 km)
- Monobore completions
- DIACS - "Smart wells"
- Multilateral wells (ML)
- Coiled Tubing drilling (CT)
- Through tubing drilling (TTRD)
- Rig assisted snubbing (RAS)
- Underbalanced drilling (UBD)
- Expandable liners

Gullfaks Village 2013

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Pawlikowska	Joanna	MSBIOTECH	96689203	joannapa@stud.ntnu.no
Majzoub	Mohamad	MSGASTECH	45170712	mohamadm@stud.ntnu.no

Not present first day

Vange	Tor-Henrik Wiland	MTMART	93257695	torhenva@stud.ntnu.no
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