20180129 Class 4:

when operating in plateau mode as a first approximation annual offtake of

: 10% of TRR for oil field

TRR: Total recoverable reserves

$$q_p = \frac{0.1\ N_{pu}}{\text{producing Nr. days in a year}}$$

N_{pu} ultimate annulative oil production

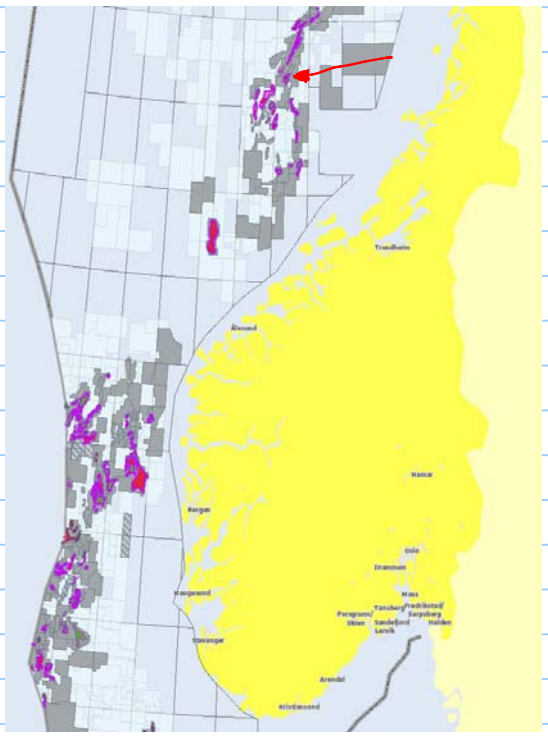
$$\text{uptime} = \frac{\text{Producing Nr. days per year} \cdot 100\%}{\text{Nr. days per year}}$$

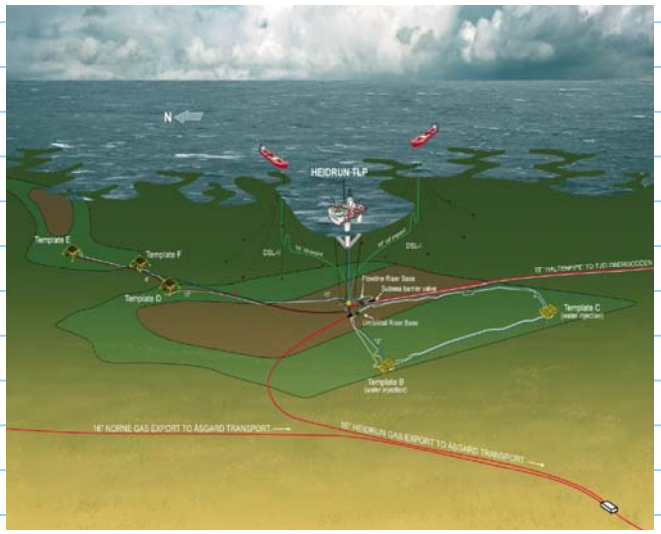
G_{pu}

: 2 - 5% of TRR

$$q_p = \frac{(0.02 - 0.05)\ G_{pu}}{\text{Producing Nr. days per year}}$$

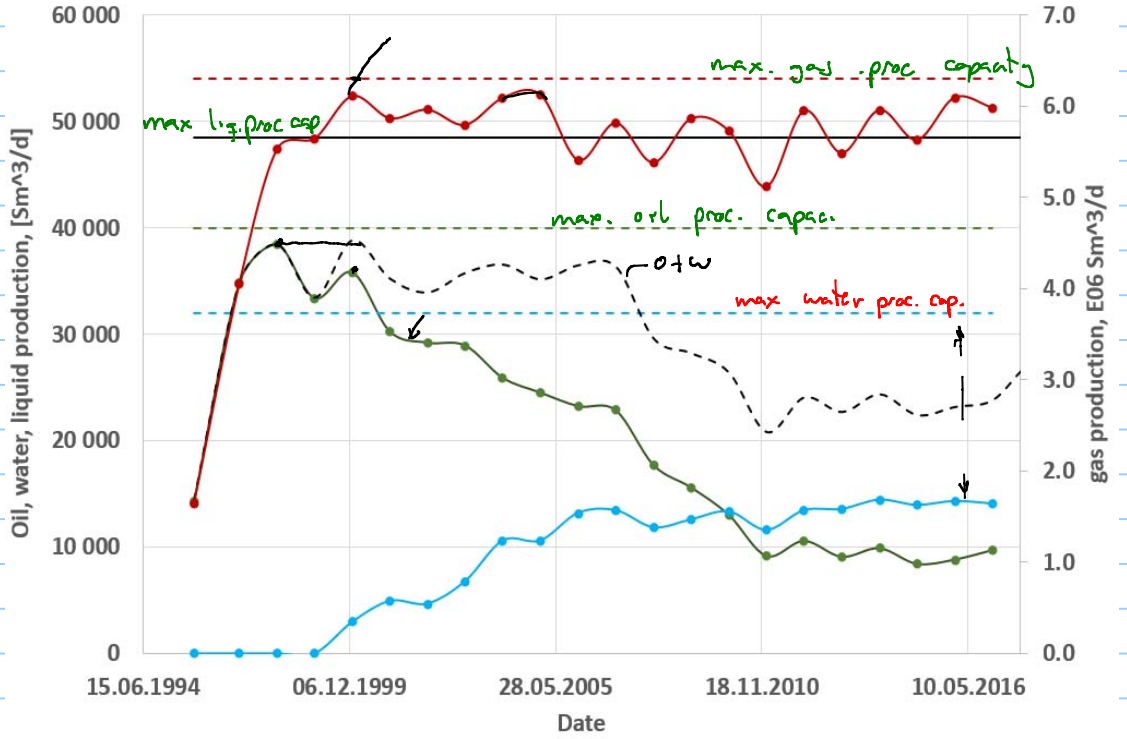
- Production limited by capacity of processing facilities - Heidrun

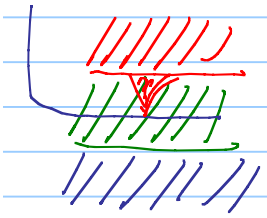


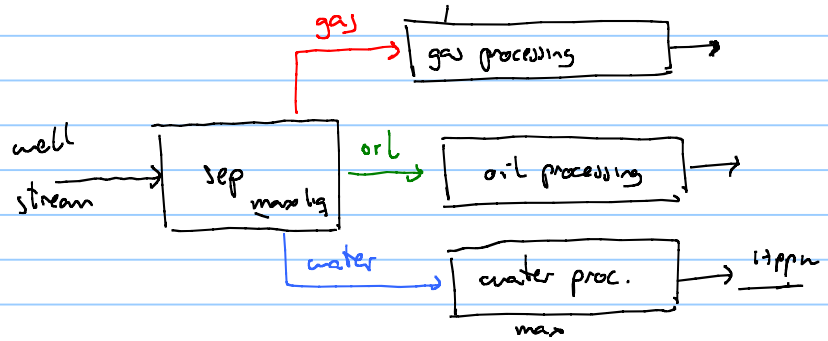


Description

Type	Text
Development	The Heidrun field is located on Haltenbanken in the Norwegian Sea. The water depth is about 350 metres. The field has been developed with a floating concrete tension leg platform, installed over a subsea template with 56 well slots. Production started in 1995. The northern part of the field is developed with subsea facilities. The plan for development and operation (PDO) for the Heidrun northern flank was approved in 2000.
Reservoir	The reservoir consists of Lower and Middle Jurassic sandstone in the Åre, Tilje, Ile and Garn Formations. The reservoir is heavily faulted. The Ile and Garn Formations have good reservoir quality, while the Åre and Tilje Formations are more complex. The reservoir depth is about 2,300 metres.
Recovery	The recovery strategy for the field is pressure maintenance using water and gas injection in the Ile and Garn Formations. In the more complex parts of the reservoir, in the Åre and Tilje Formations, the main recovery strategy is water injection. Some segments are also produced by pressure depletion.
Transport	The oil is transferred to tankers and shipped to Mongstad in Norway and Tetney in the UK. The gas can be transported by pipeline to Tjeldbergodden and/or via the Åsgard Transport System (ÅTS) to Kårstø.
Status	Several methods are evaluated to improve recovery and prolong the lifetime of the field, including infill wells, possible implementation of new drilling technology and methods for enhanced oil recovery (EOR). Maria und Dvalin are planned third party tie-ins to Heidrun. The Maria field will receive water for injection from Heidrun, and gas from Dvalin will be sent for processing and export via a new pipeline to Polarled.

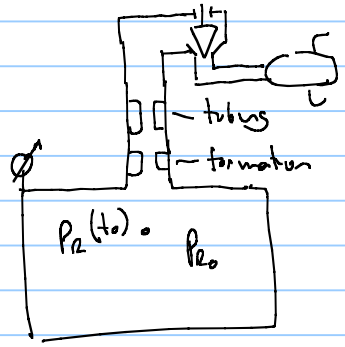


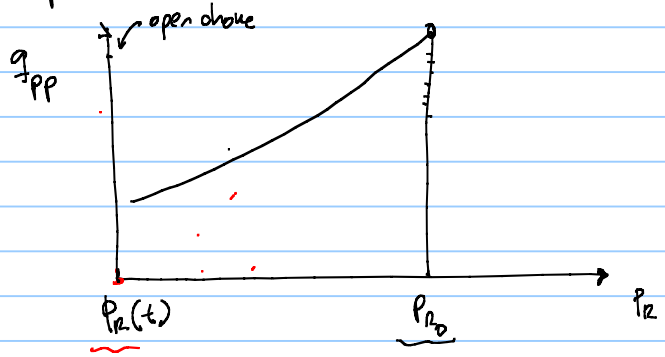




- Production potential

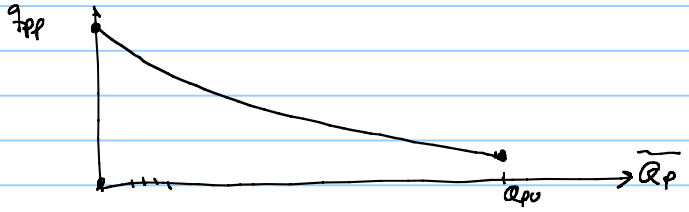
max production that can be obtained from my production system





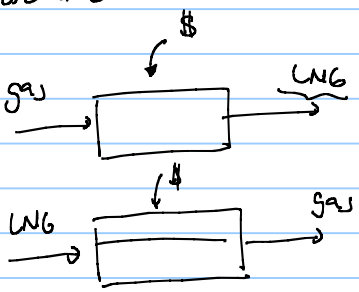
$$p_R = f(Q_p)$$

$$Q_p = \int_0^t q(t)\,dt \begin{cases} N_p \\ G_p \end{cases}$$



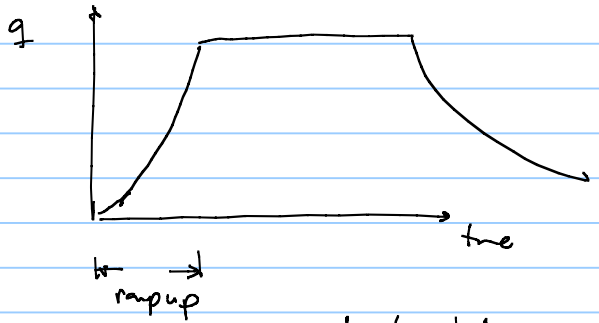
- Difference between oil / gas development.
  - transportability { • oil tanker
    • gas relies on transportation by pipeline { an infrastructure / a customer
  - in gas one has to have a sales contract / agreement { 5 - 30 years }
    DCQ { daily contract quantity
    swing factor { 20% - 40%
    penalty clause }

LNG liquified natural gas tries to make gas more like oil



one still needs an LNG plant and a LNG terminal

Onshore vs offshore



- long ramp-up / long and detailed appraisal
- produce with few wells to neighbouring facilities
- gather better information about the reservoir and make a better planning
- plan water / gas injection at a later stage
- fine tune reservoir models and use them for planning

- short ramp-up → get revenue back as quick as possible → and limited appraisal

during exploration and appraisal the information gathered about the reservoir is limited and static { hydraulic connectivity
• productivity of wells
• type of aquifer
• sealing mechanism
↳ extension
↳ depth
↳ k
↳ φ

- take big decisions with limited information
- plan water injection / gas injection from beginning

- Very uncertain reservoir models

- Remote onshore field { desert / jungle } behaves like offshore field

- Value chain model of asset / field