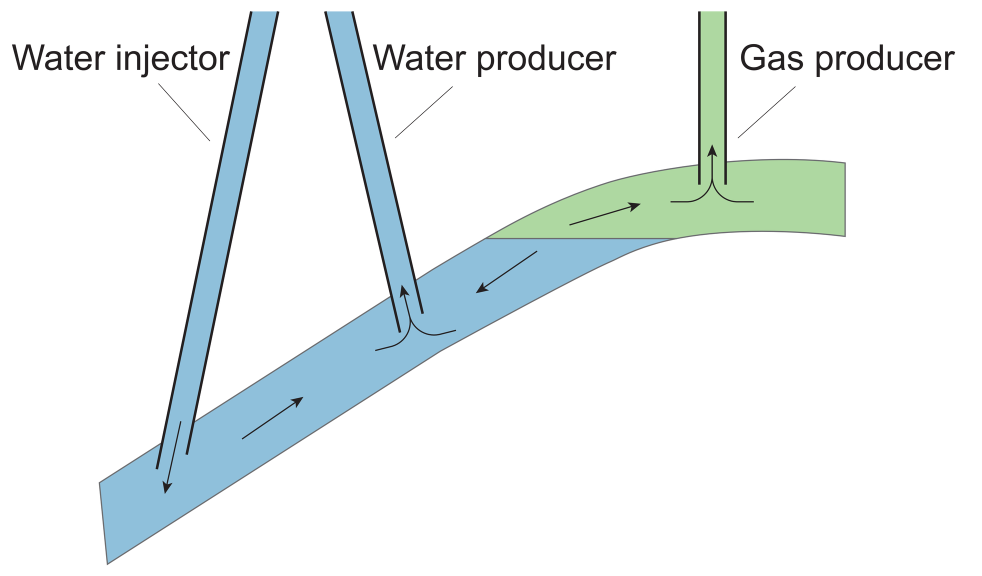
Synergy in Gas Field Development

Dual heat and gas production strategy

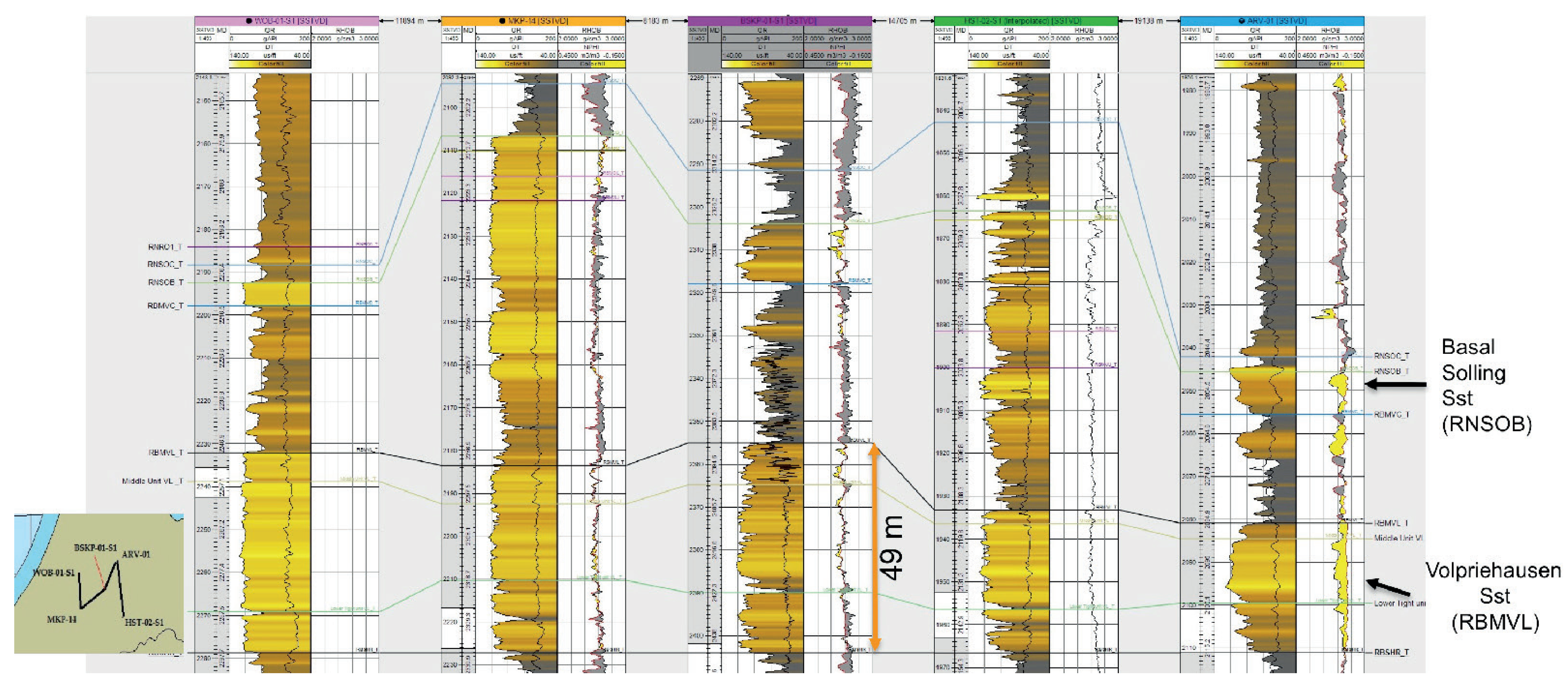


- Interference between gas- and geothermal production can occur when hydraulic communication exists.
- With clever placing of the geothermal wells with regard to the producing gas wells it is possible to create synergy between both systems.
- Water production by a geothermal doublet near the gas producers postpones water breakthrough in gas wells; the Roden study (Peters et al, 2014) showed a gas recovery factor (RF) increase of 3.3%.

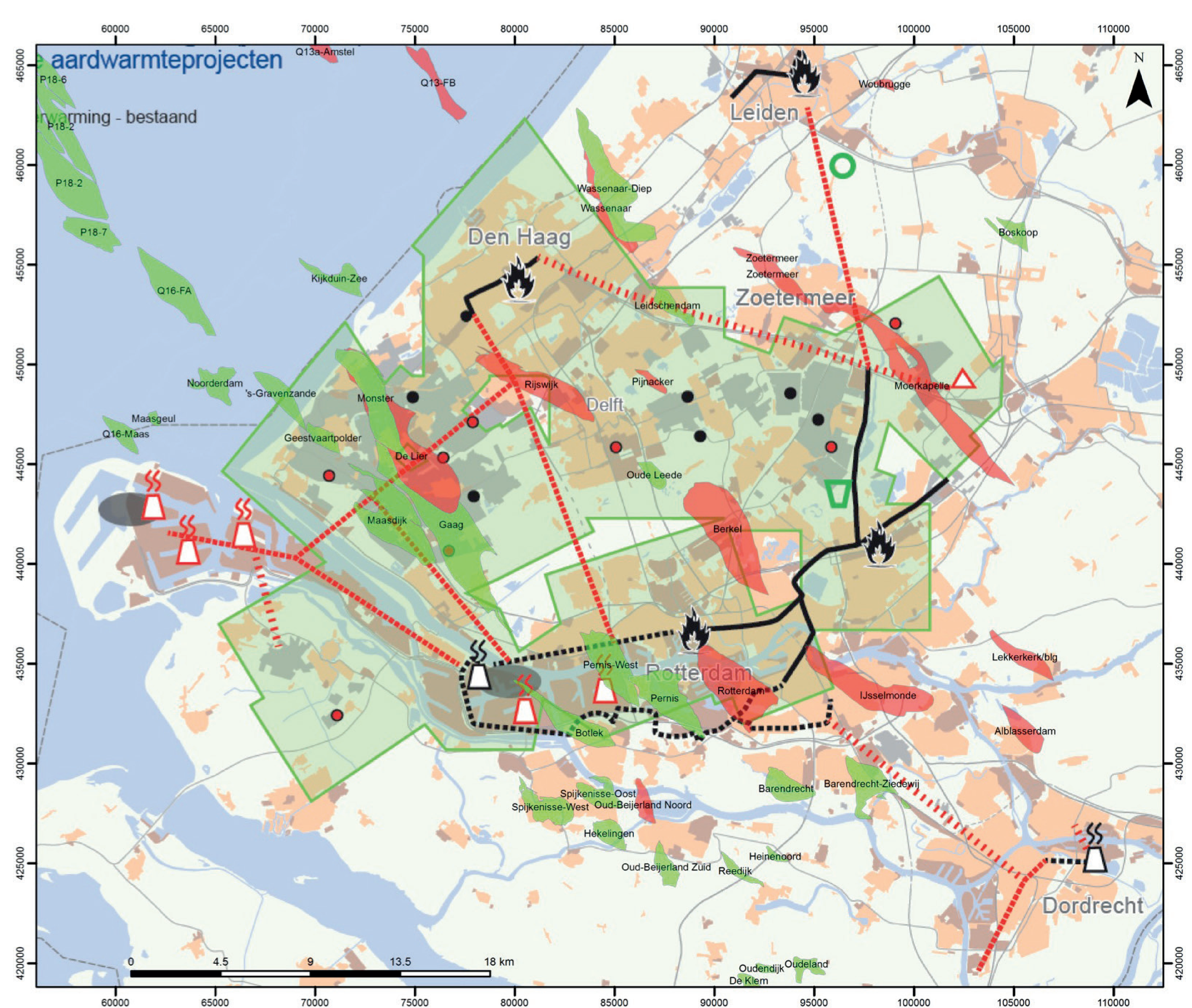
- In the western Netherlands there is a large potential for geothermal energy. A number of greenhouse farmers already have a geothermal installation in production. There is also a number of stranded gas fields in this area. To investigate the possibility of synergy between both subsurface energy resources a case study has been performed to answer the following questions:
- Is significant gas RF increase achievable elsewhere?
- Can synergy in an onshore stranded gas field trigger field development?
- What are the critical elements for synergy?

Case study

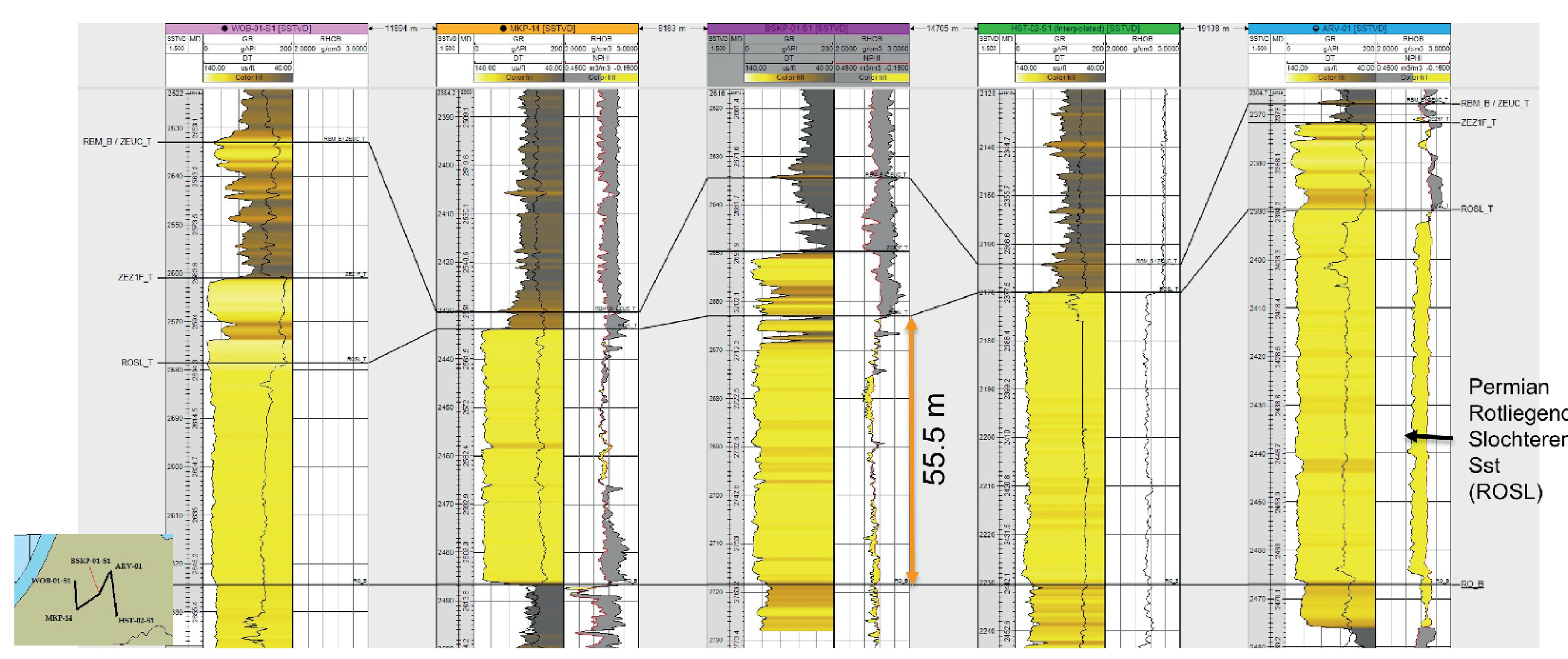
- A reservoir model was constructed for the stranded gas field and the connected geothermal reservoir.
- The well log panels on the right show multiple reservoir intervals being tested.
- Several parameters have been tested, such as the effect of permeability, the geothermal flow rate and the aquifer strength.



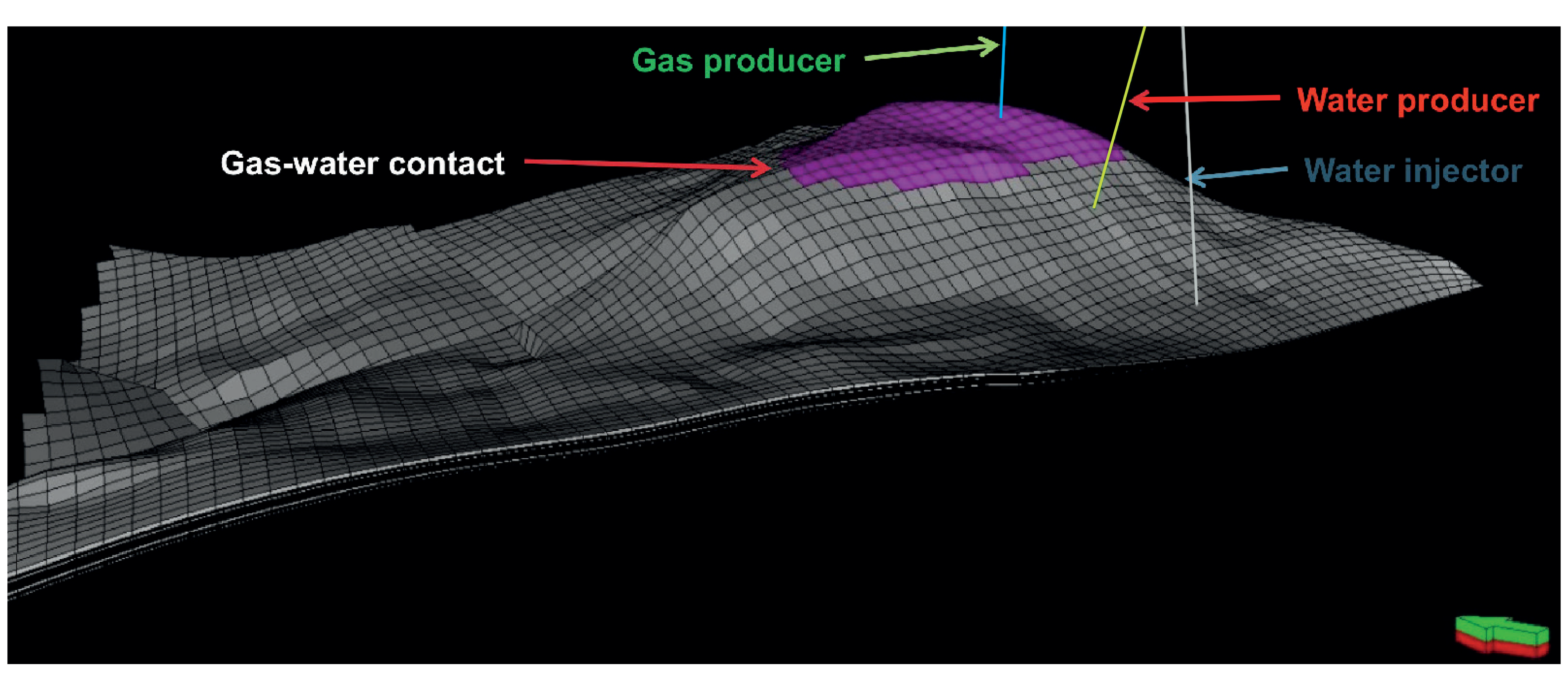
Log panel across the study area, focusing on Triassic stratigraphy.



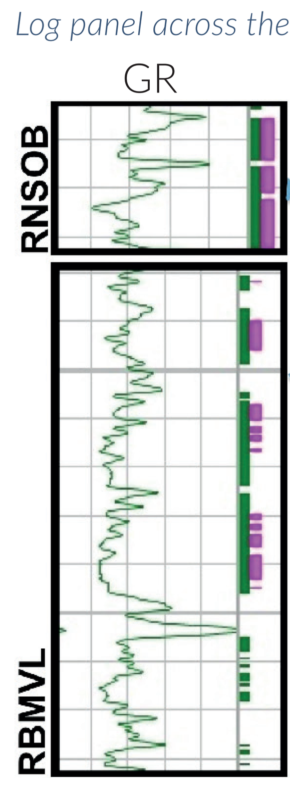
Map of the western Netherlands with its geothermal licenses and the (future) heat grid.



Log panel across the study area, focusing on Permian stratigraphy.

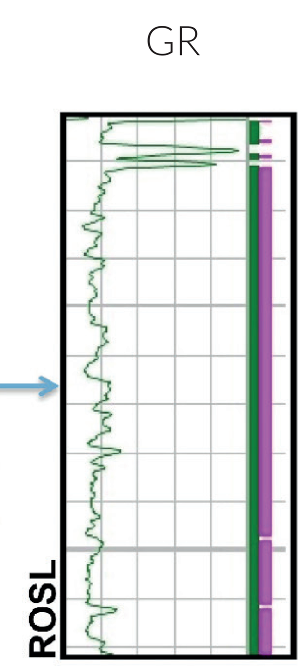


Reservoir model of the stranded gas field.



	Gas				Geothermal			
BSKP-01	Net (m)	NTG (%)	PHI (%)	Perm (mD)	Net (m)	NTG (%)	PHI (%)	Perm (mD)
RNSOB	12	80	12	6	10	77	13	8
RBMVL	30	62	10	1	11	23	13	2
ROSL	53	96	13	10	50	90	13	12

Reservoir	kH (mDm)
Solling -RNOSB	80
Volpriehausen - RBMVL	22
Slochteren - ROSL	600

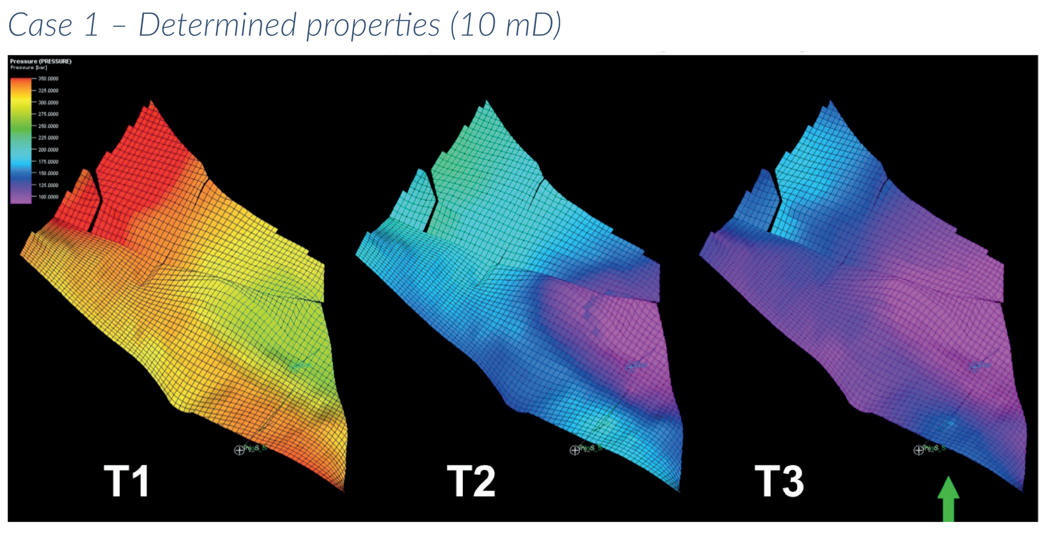


Reservoir properties.

The results of the case study are that the **critical elements** for synergy are:

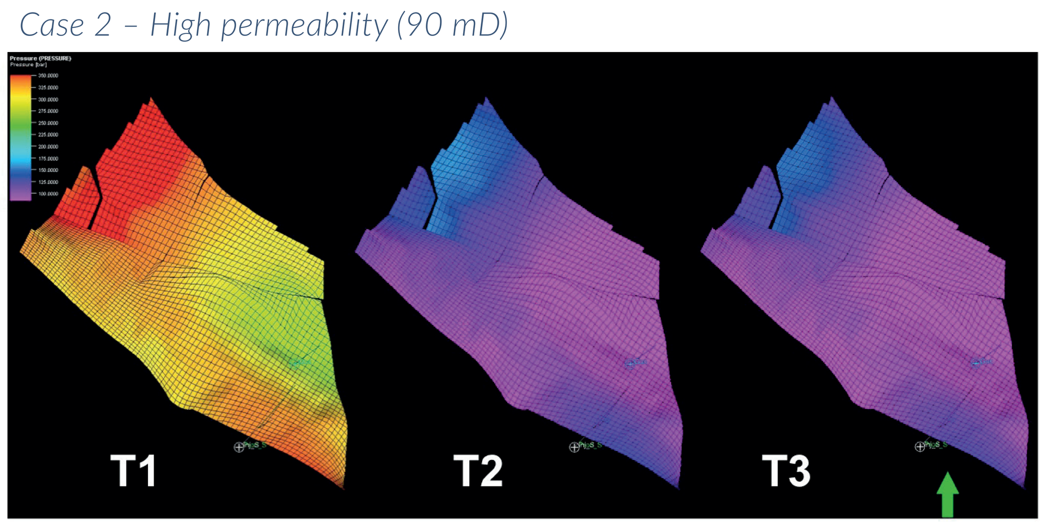
- High **permeability thickness**
- High water **flow rate** at geothermal wells
- Strong **active aquifer** for pressure support

Case 1 – Determined properties (10 mD)



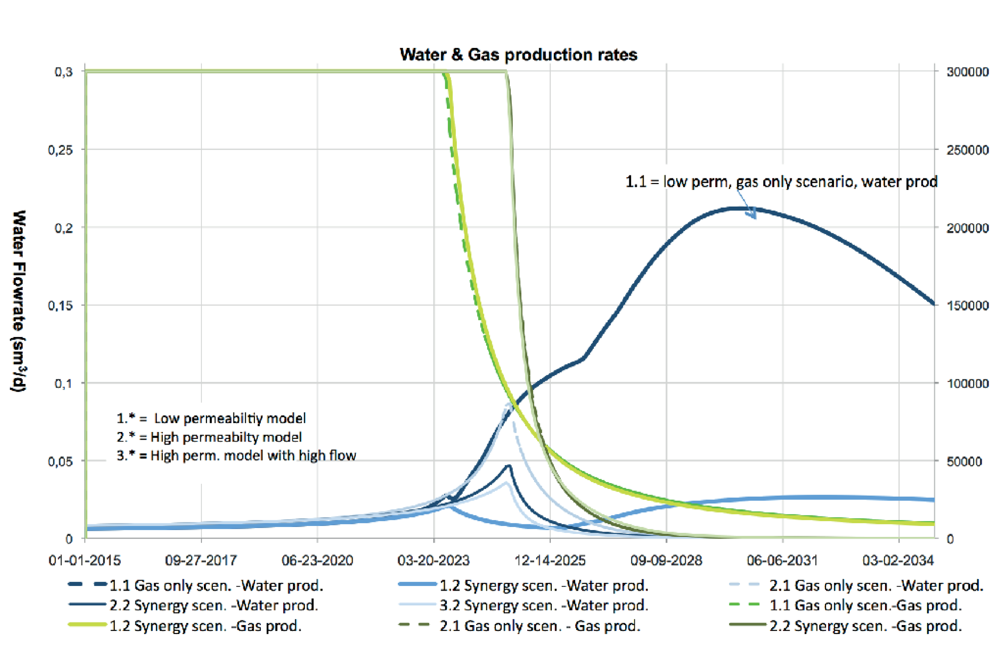
Slight recovery factor increase due to synergy at studied stranded field, but not significant due to lack of critical elements. Locations that do fit the critical elements however, will see an increase in recovery factor as the Roden study (Peters et al, 2014) demonstrated.

Case 2 – High permeability (90 mD)



Simulated pressure distribution using a low and high permeability case.

Reference: Peters et al, 2014; van der Meulen et al, 2016; van der Molen et al, in prep.



Water and gas production profiles for the synergy scenario.

For questions contact exploration@ebn.nl