Inventory Unconventional Hydrocarbons
in the Netherlands

Introduction

There is hardly any production from unconventional resources in the Netherlands. With declining production and aging infrastructure these resources can help to soften the decline in production from conventional resources.
Unconventional production: In recent years a few tight reservoirs and shallow gas were developed.
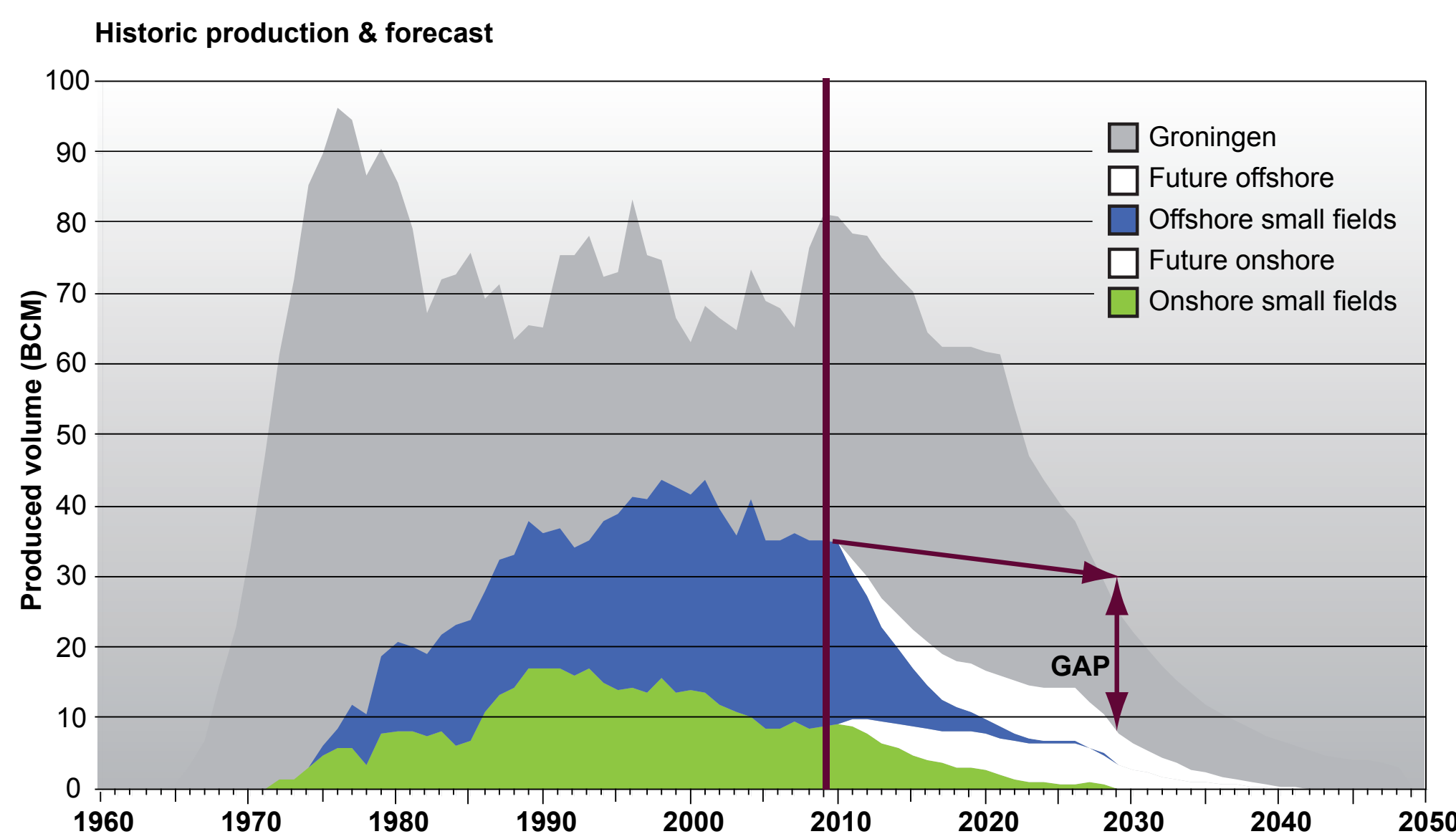**In order to unlock these resources an inventory is necessary.**

What is unconventional about unconventional resources?
1) Conventional trap but only producible if unconventional production methods are used (shallow gas, tight gas)
2) Unconventional trap, the trapping is not gravity driven (Coal Bed Methane, Shale Gas, Basin Centred Gas).

In the Netherlands unconventional type 1 has progressed from study into (low activity) development in the last decade.
Type 2 is still unexplored. In this poster the potential for these resources in the Netherlands is identified, including a first attempt to calculate unrisked in place gas volumes.

Historic production & forecast

Legend: Groningen, Future offshore, Offshore small fields, Future onshore, Onshore small fields
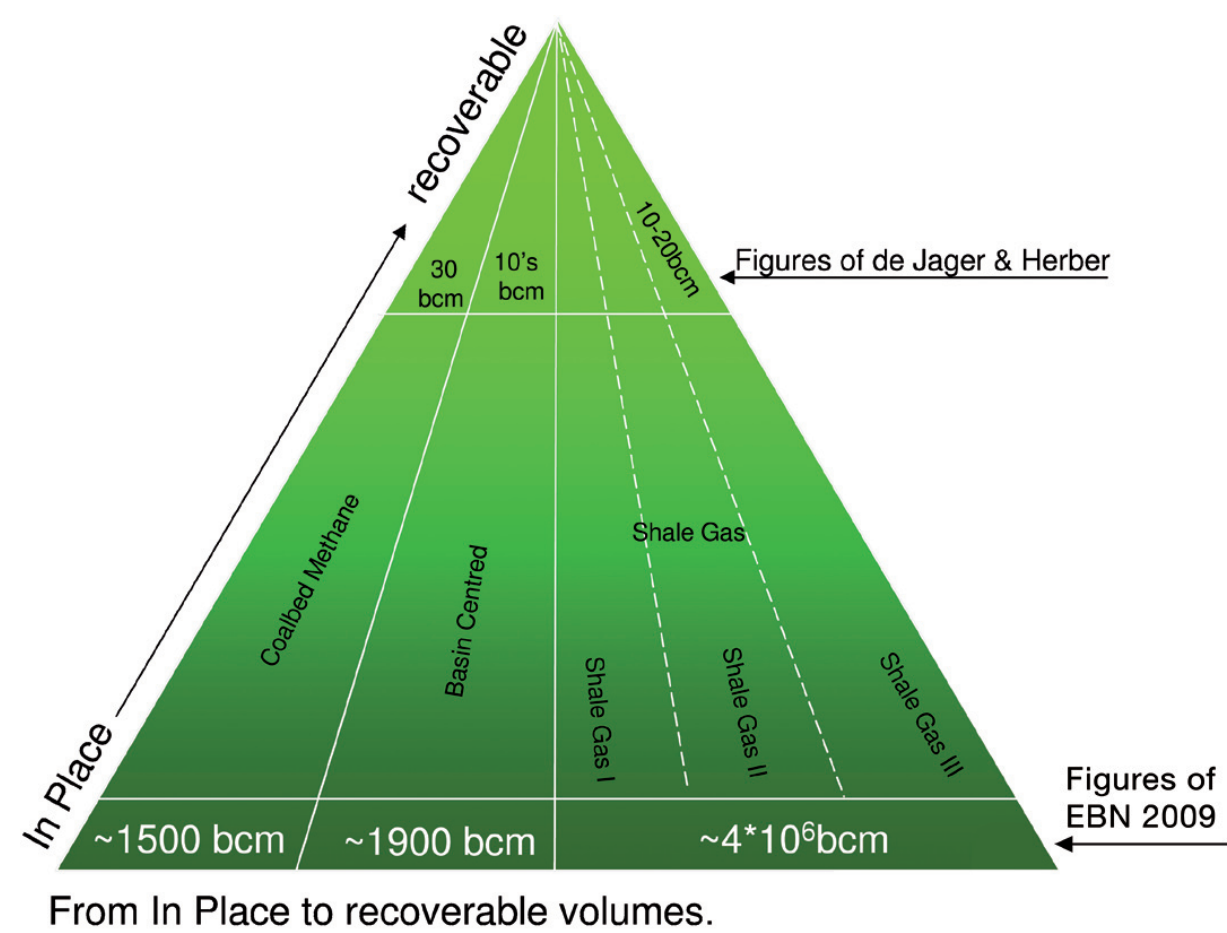
GAP

The presentation is based on the study 'Inventory non conventional gas', of the Dutch TNO research institute. Parameters (split by geological formation), crucial for the estimation of the possible (unrisked) in-place volumes, are estimated for the various categories of unconventional resources. These calculations are based on best estimates of the parameters from regional (public) information. For some resources very little data is available. All the calculated volumes are unrisked, which means that no chance is given to 'failure' of one of the resource defining parameters. At this stage data and experience is not sufficient for a good estimate of the risks involved.
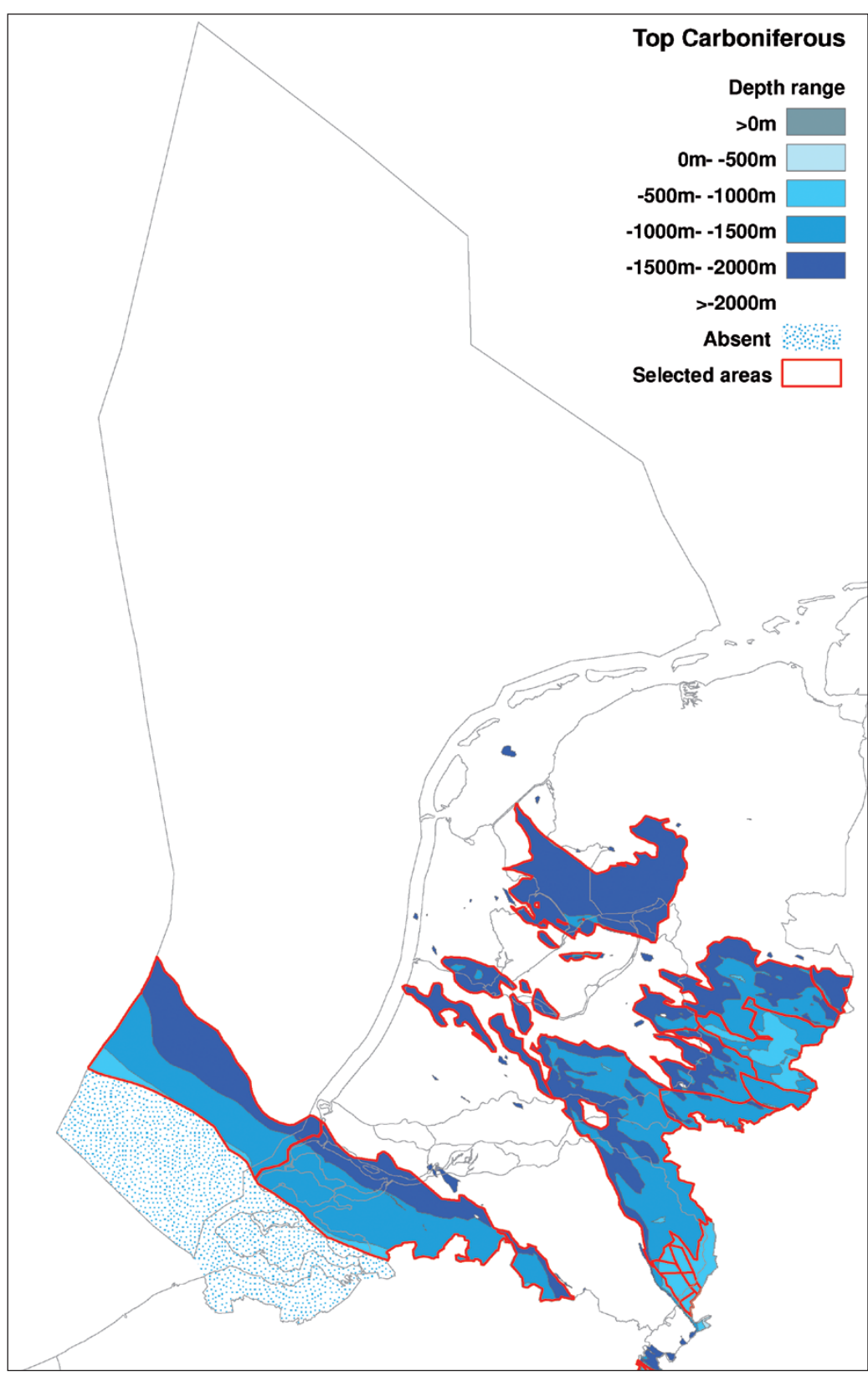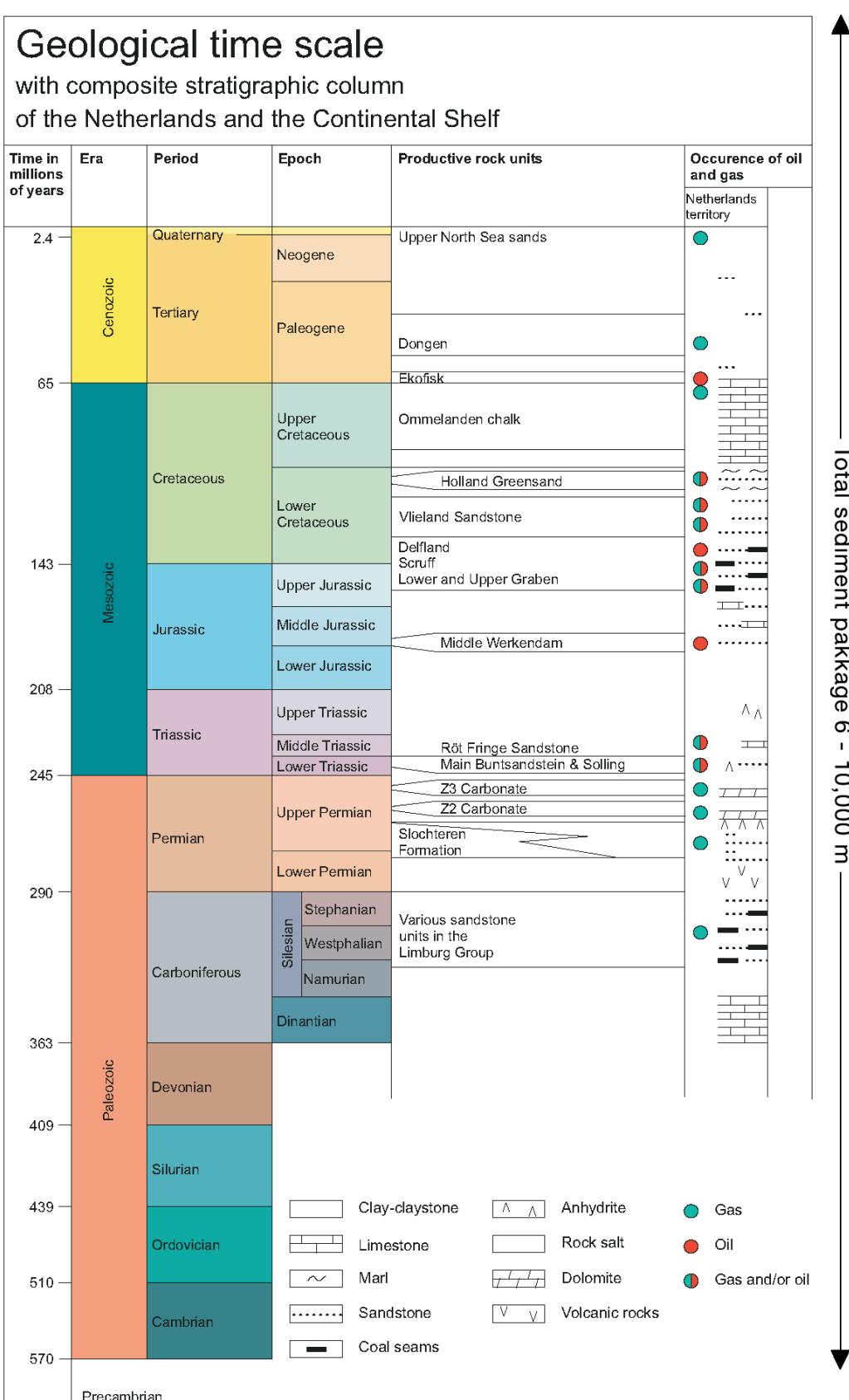
Unconventional resources from concept to volumes
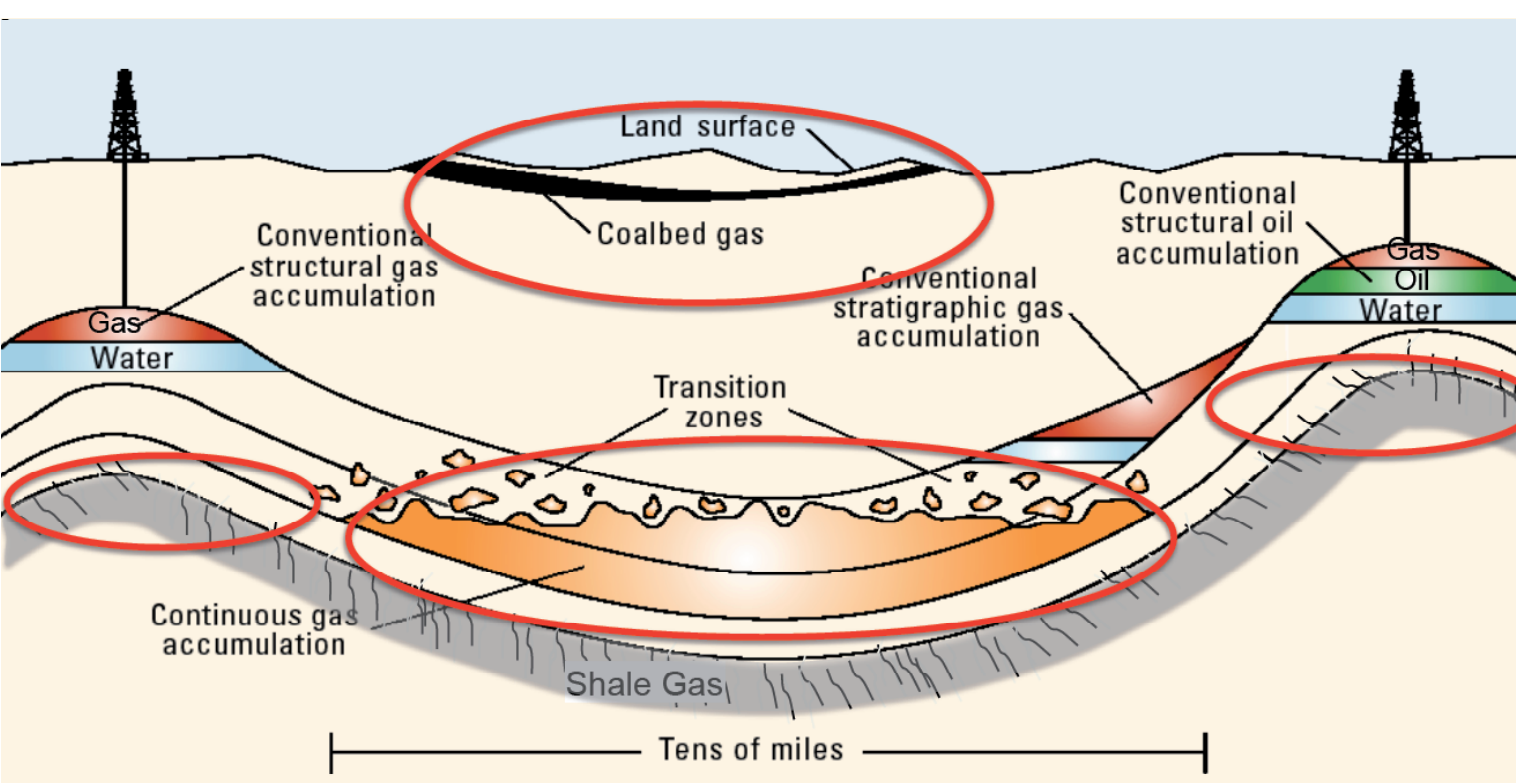
Total Petroleum initially in place (PIIP)	Discovered PIIP	Commercial	Production	Project Maturity Sub-classes	
			Reserves	On Production	
				Approved for Developmet	
				Justified for Development	
		Sub-commercial	Contingent Resources	Development Pending	
				Development Unclarified or On Hold	
				Development not Viable	
			Unrecoverable		
	Undiscovered PIIP	Prospective Resources	Prospect	Shallow Gas	
			Lead		
			Play	Tight, CBM, Shale & BC Gas	
		Unrecoverable			

Figures of de Jager & Herber

Figures of EBN 2009

~1500 bcm   ~1900 bcm   ~4*10⁶bcm

From In Place to recoverable volumes.

Coal Bed areas Methane (CBM) and Shale Gas high potential

Geological time scale with composite stratigraphic column of the Netherlands and the Continental Shelf

Top Carboniferous

Depth range
>0m
0m -500m
-500m -1000m
-1000m -1500m
-1500m -2000m
>2000m
Absent
Selected areas

Coal Bed Methane
- Gas adsorbed on coals and as free gas in cleats.
- Coals are source and reservoir.
- Thick Carboniferous present under NL, individual coals seems thin (<10 m).
- Fraccing to create sufficient drainage and depressurizing.
- Enhanced recovery methods by injecting N_2 or CO_2.

Potential areas for Shale Gas

High Potential
Medium Potential
Unknown Potential
No Potential
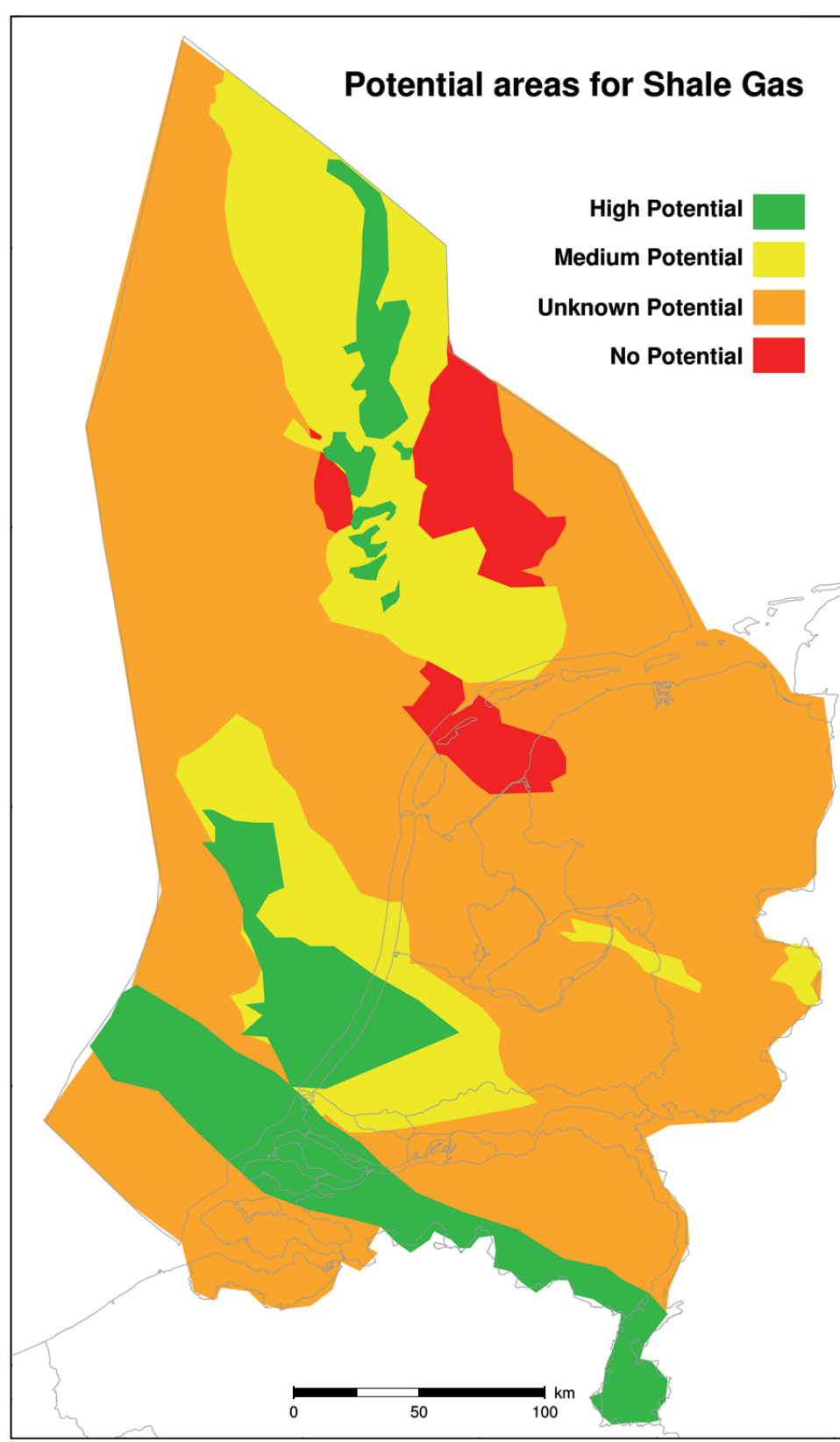
Shale Gas
- Organic rich shale acts as source and reservoir and sometimes as seal.
- Gas adsorbed on clay particles, dissolved in kerogen or bitumen, or in pores or fractures.
- Hydraulic fracturing, high well density.
- Offshore unlikely to be produced because of high cost of drilling/ production.
- Low Recovery Factor.

Thick (over 1000 m)Carboniferous is present underneath most of the Netherlands. Not just the coals but also the Lower Carboniferous shale has high TOC values. The Carboniferous Geverik Hot shales drilled in a few places in the south may be present over larger parts of the country but are undrilled.
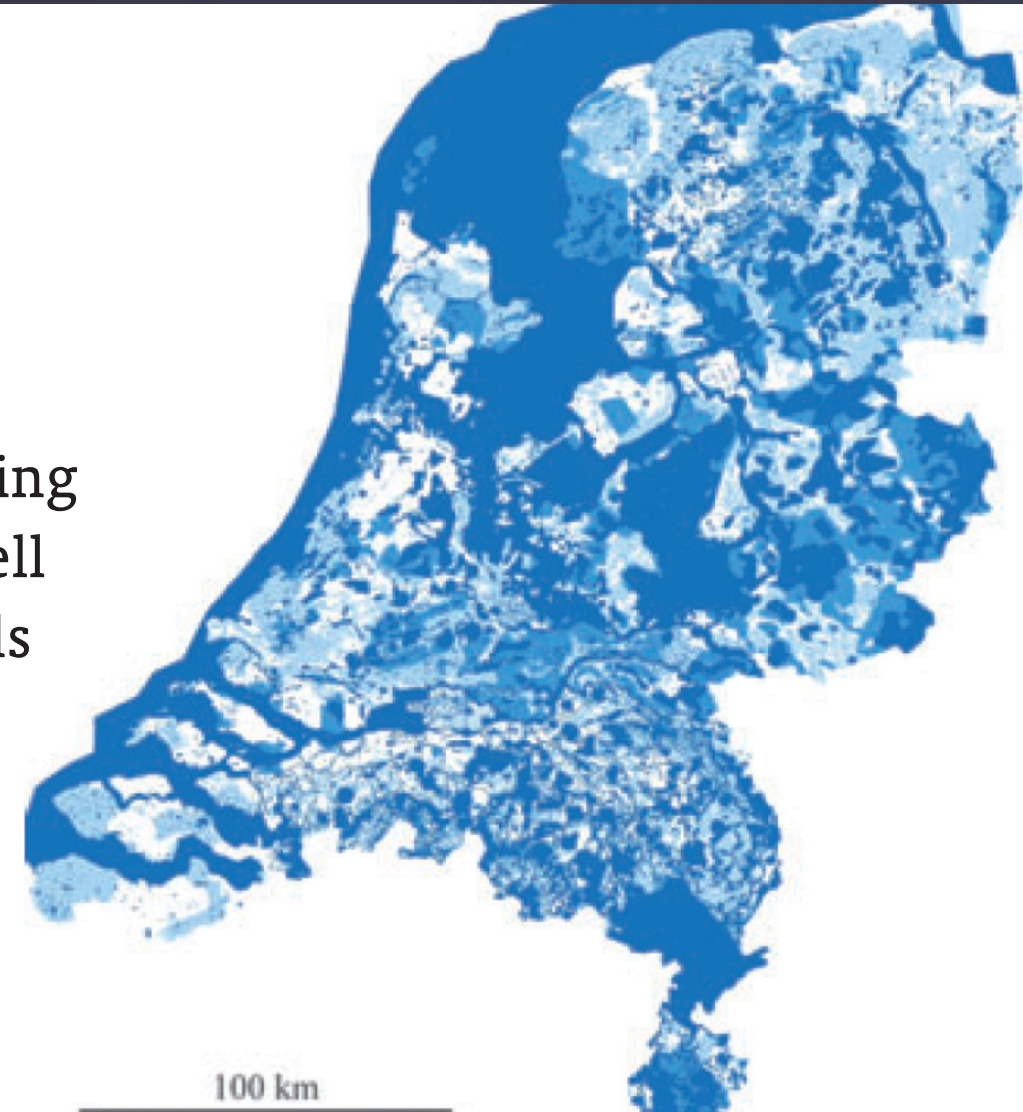
High potential areas accessible?

www.statoil.com
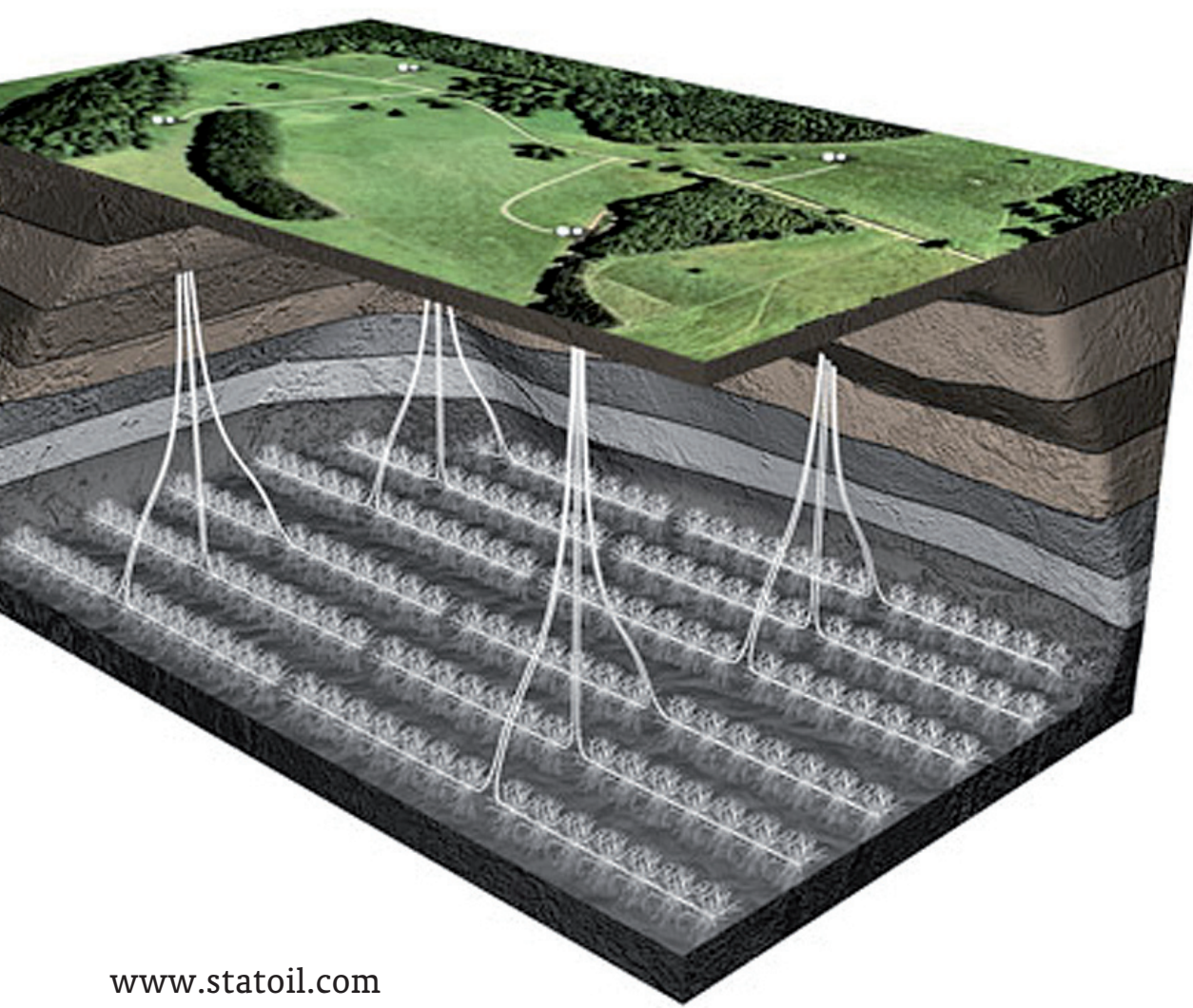
Drilling deviated multiwells from wellpads with downhole multifracs is the most likely concept of developing unconventional resources

NAM Schoonebeek redevelopment (oil) shows that embedding of closely spaced well pads with multiwells in the landscape is feasible. (NAM 2009)

100 km

(From Herber & de Jager 2010.)

Areas that qualify for these kind of developments are limited. Areal limitations for exploration are in: Nature Reserves (Dark-blue); areas of attention (medium-blue); built-up areas (light-blue). Actually, the situation is not fundamentally different from the Marcellus shale area in Pensylvania.

Basin Centred Gas

Basin Centred Gas has been described in deep parts of foreland basins (Canada: Elmworth). Below conventional gas fields gas occurs without clear gas water contact in tight reservoir. The Elmworth example shows gas over large areas with low permeability. No clear examples of Basin Centred Gas were described up to now but reservoirs in the Jurassic and Pennsylvanian part of the Carboniferous are bound to be good candidates for such resources.

Conclusions

- Potentially high unconventional gas volumes are expected to be in place in the Netherlands.
- Recovery factors most unconventional gas resources unknown for Europe.
- Coal Bed Methane, Shale Gas and Basin Centred Gas are unexplored in the Netherlands.
- Declining conventional hydrocarbon production and aging Infrastructure gives urgency to make an inventory of non-conventional resources.
- The inventory can contribute to the potential development of these resources.
- Development of these resources is successful in the USA. Maturation of opportunities in the Netherlands is crucial in the next decade to be able to maintain the "small field policy".
- It will be challenging to produce these resources technically and with the least impact on society possible.