Stranded Fields in the Netherlands-
Opportunities for New Development

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Outline

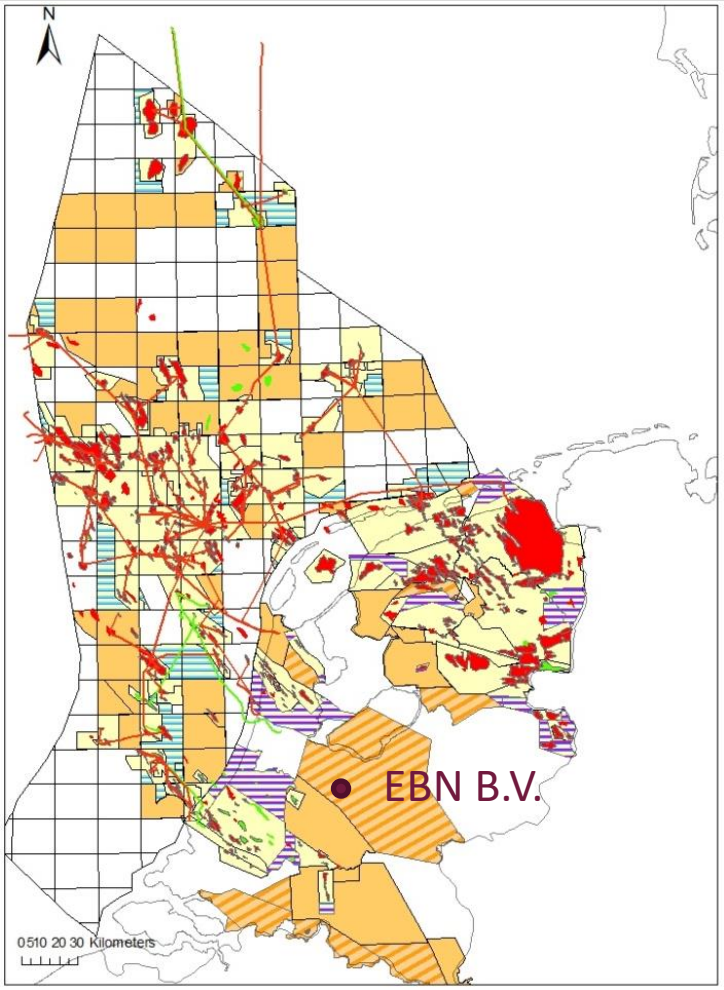
1. EBN B.V.
2. Stranded fields in the Netherlands - why are they of interest?
3. Portfolio analysis
4. Inventory: main blockers
5. Tight fields
6. Opportunities in open acreage, an example
7. Summary

EBN B.V. (Booth # 1826)

EBN B.V. State participant (~40%) in exploration & production in the Netherlands

Key Numbers 2012

- 0.5 mln BOE/day
- 265 natural gas fields & 4 oil fields
- 187 participations as of 1st of December
- 33 wells drilled
- 11 new fields under development



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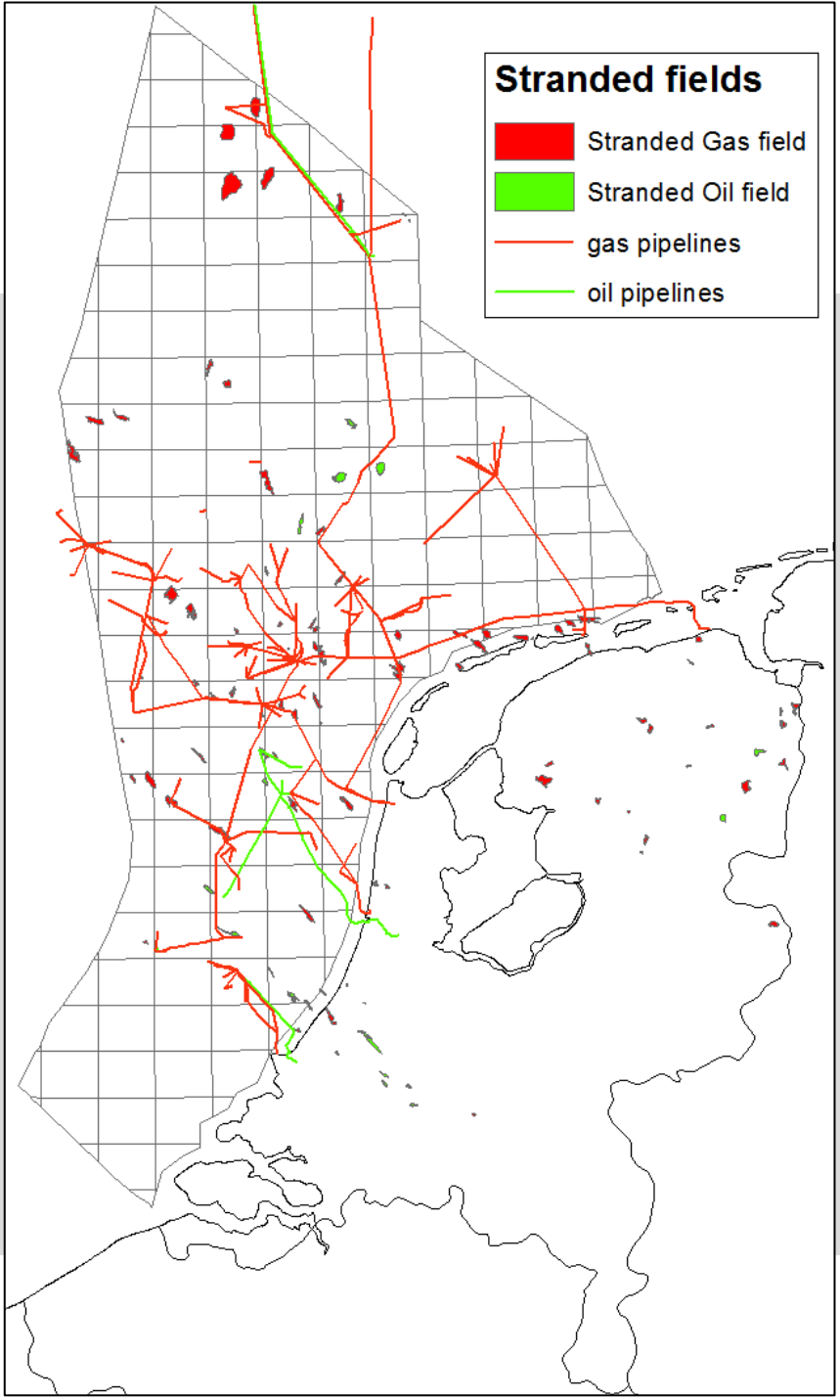


Stranded fields in the Netherlands - why are they of interest?

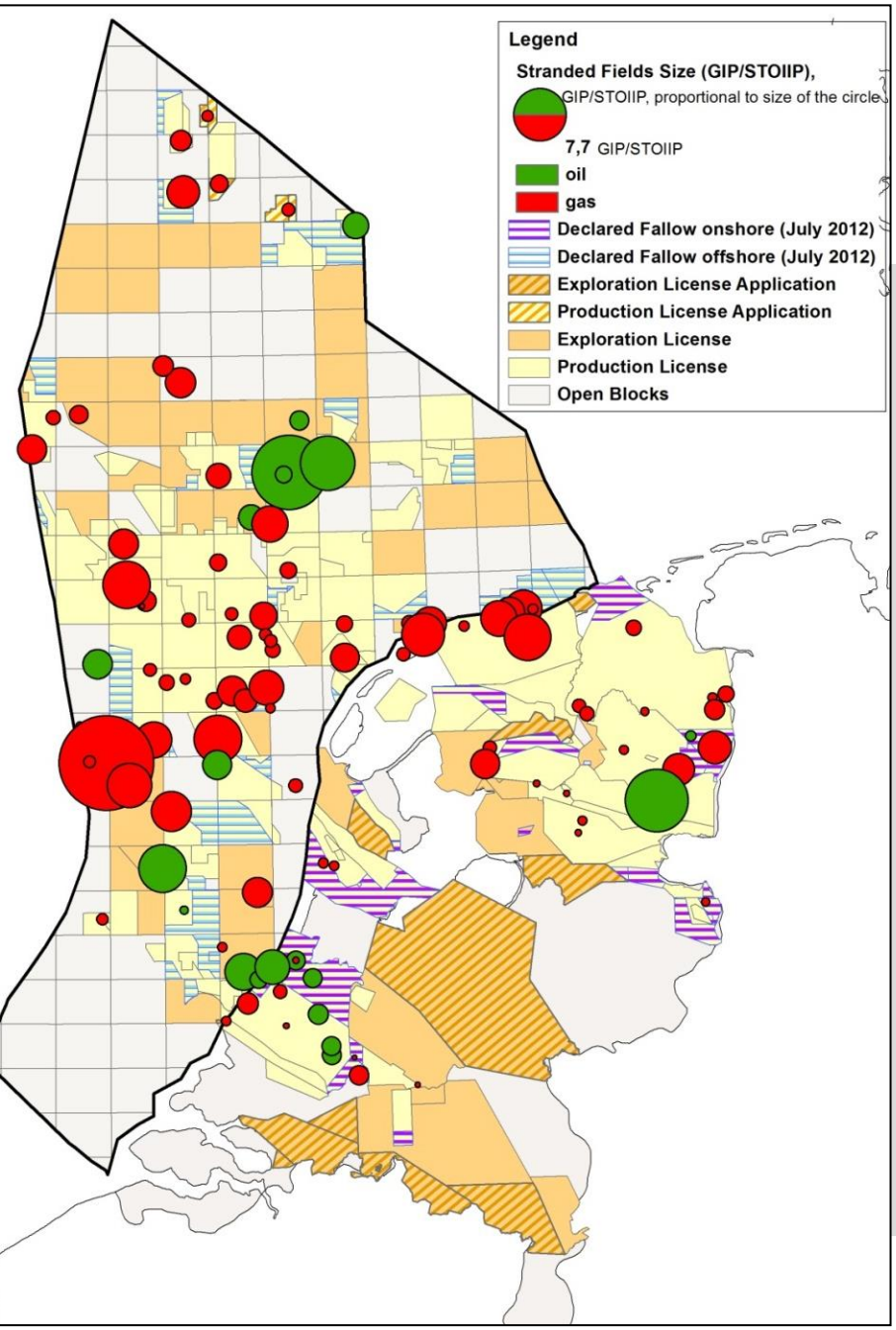
- **Stranded fields are proven hydrocarbon accumulations that have not been developed for a variety of reasons.**
- **Proven means: hydrocarbons flowed to surface**
- **Significant volumes**

Stranded fields in the Netherlands - why are they of interest?

Portfolio analysis is necessary to understand what is holding back the development of this class of assets.

- **Technical improvements**
- **Change in economics/ commercial climate E&P**

-> factors that can get a stranded field to become commercially interesting to develop.



Stranded fields in the Netherlands
Size of the portfolio

~ 120 stranded fields

- 22 oil fields, ~ 55 mln m^3 (STOIIP)
- 95 gas fields, ~ 180 BCM* (GIIP)
- 2.2 BCM: average size offshore gas field
- 1 BCM: ” ” onshore ” ”

status per: 2013		# Stranded Fields	
		Gas	Oil
Licensed	Offshore	52	9
	Onshore	24	8
Fallow	Offshore	-	1
	Onshore	11	2
Open	Offshore	6	2
	Onshore	2	-

* 180 BCM ≈ 6.5 TCF

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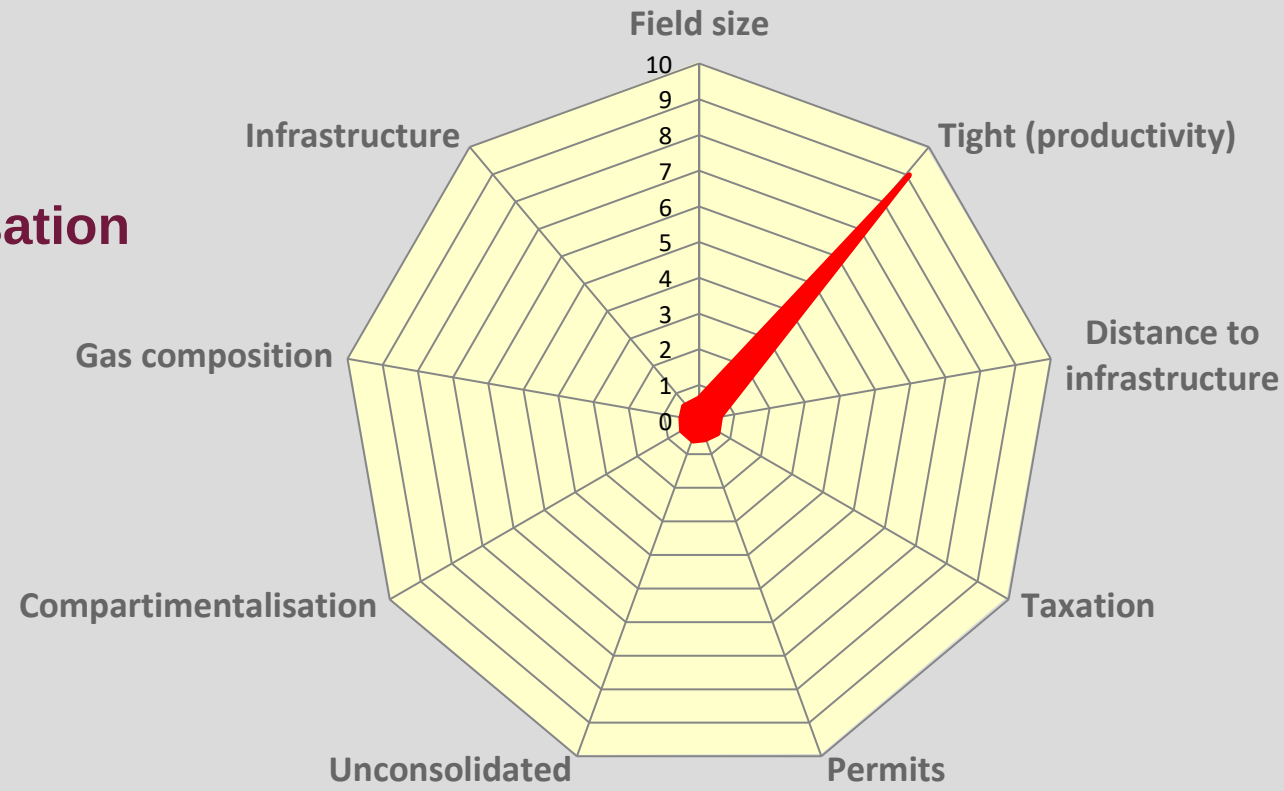
Portfolio analysis - blockers

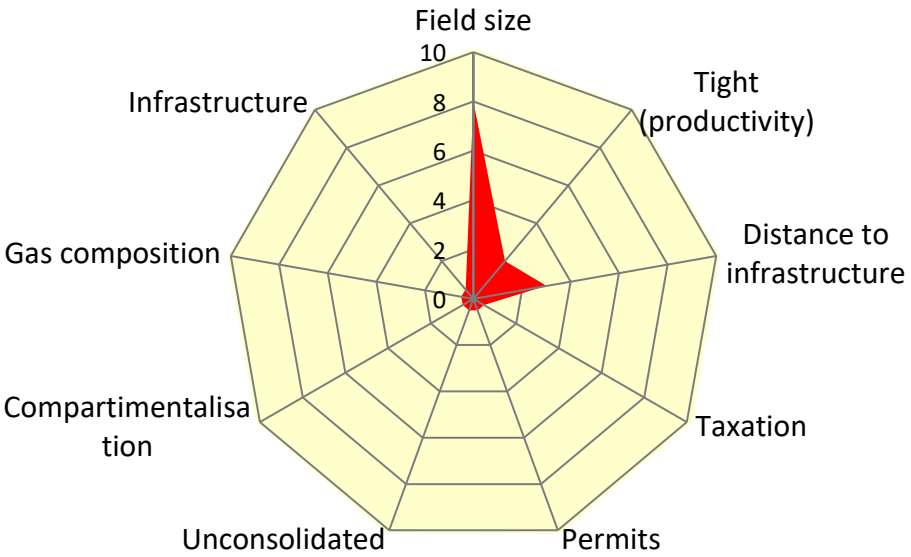
1. Fieldsize
2. Productivity
3. Compartimentalisation
4. Unconsolidated
5. Gas composition
6. Distance
7. Infrastructure
8. Taxation
9. Permitting



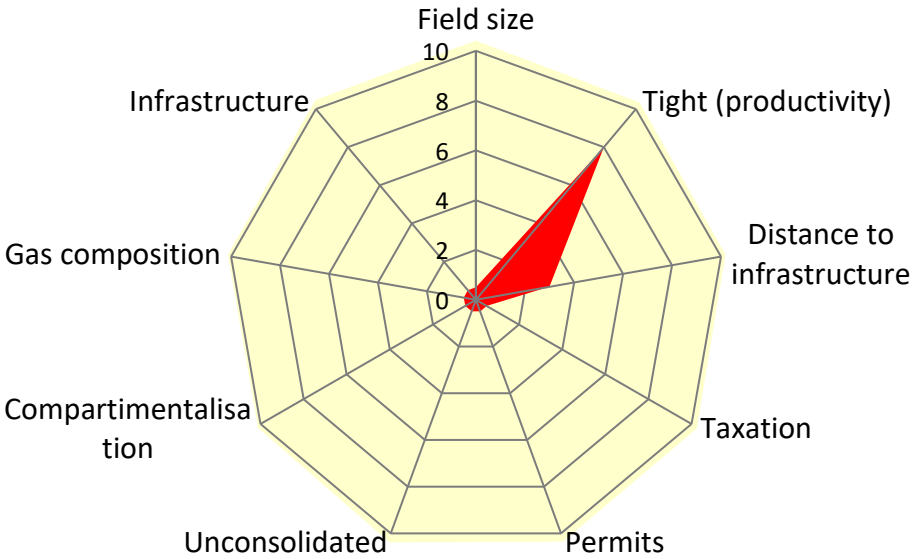
Portfolio analysis - blockers

Scaling Factor	0	1	2	3	4	5	6	7	8	9	10
1) Size Field, offshore, BCM (GIIP)	> 3										<0,1
2) Tight (productivity, m^3/day) Offshore	Non Tight										Tight<10000
3) Distance to infrastructure (km)	< 1 km										> 30
4) Taxation	Not MOR										MOR
5) Permits	Non wadden										Wadden
6) Unconsolidated	Consolidated										Unconsolidated
7) Compartimentalisation	Comp. Not an issue										Highly compart.
8) Gas composition	No problems										High levels of problemgas
9) Quality of Infrastructure EOFL →	2021										2013
Capacity →	Yes										No capacity

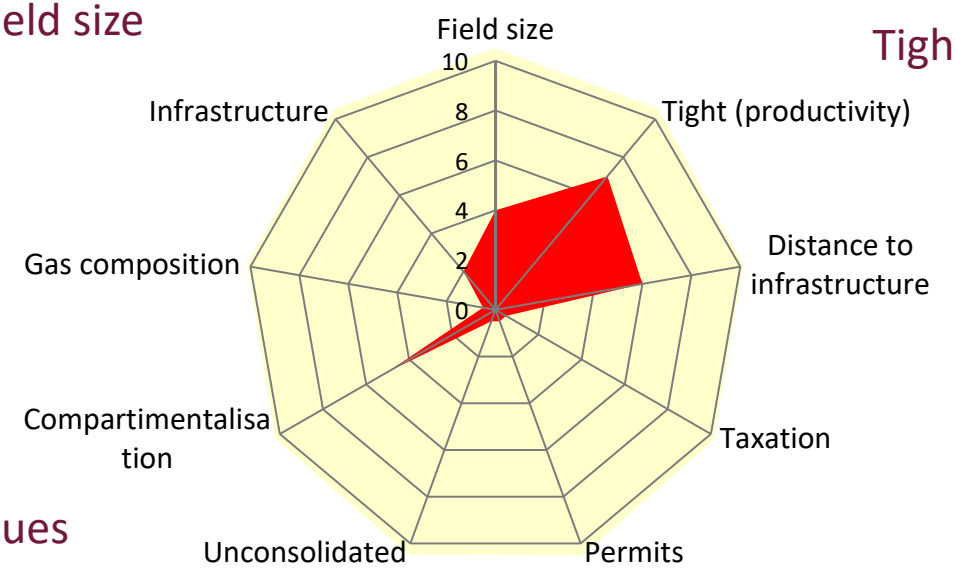
Portfolio analysis - examples



Small Field size



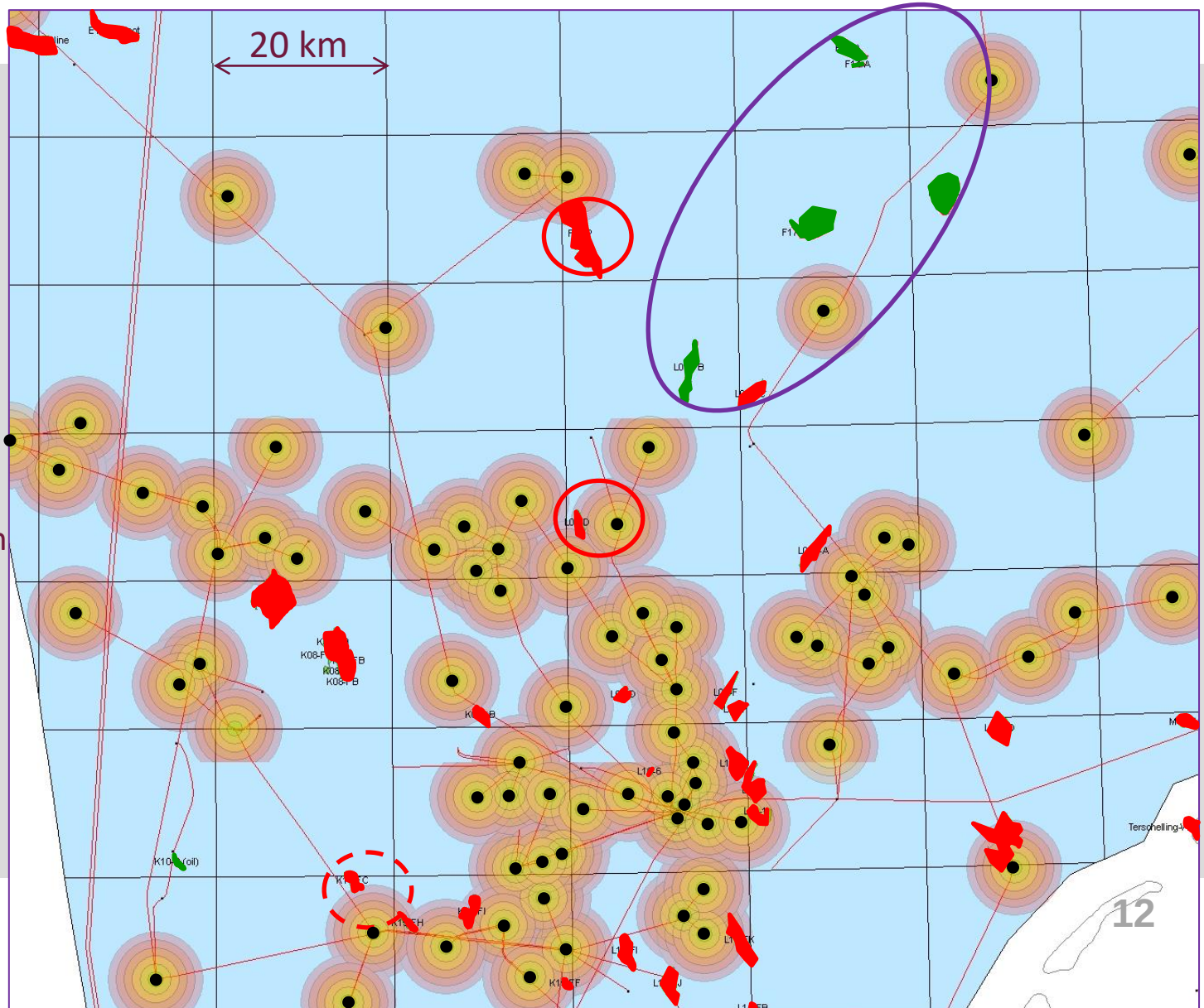
Tight Field



Field with several issues

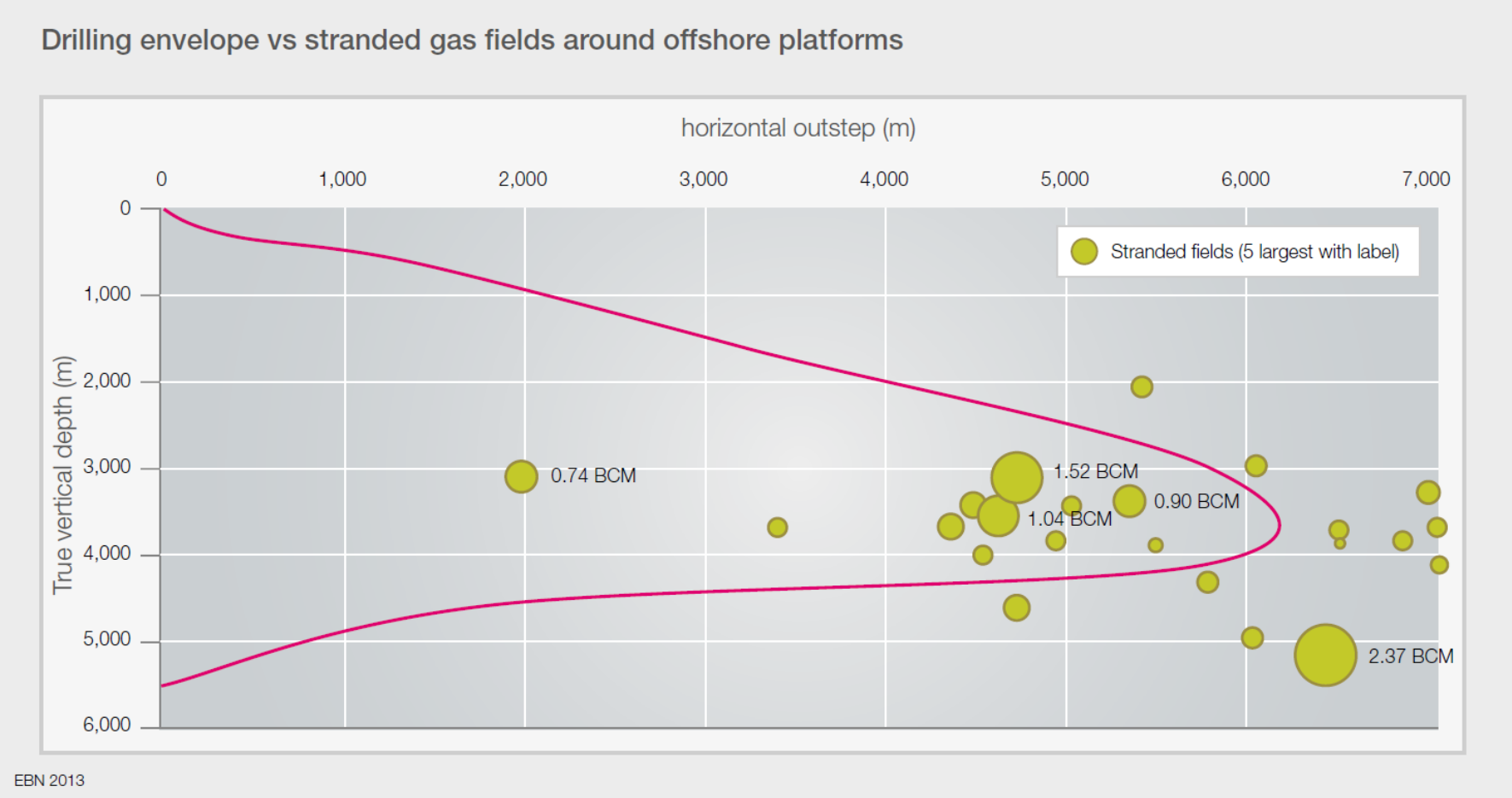
Blocker Analysis

Examples How to Deal With Small Field Size



- Platform
- Each circle represents 1 km (6 km)
- ERD
- Cluster development

Blocker analysis



Source: Focus on Dutch Oil & Gas 2013

Stranded fields are moving indeed

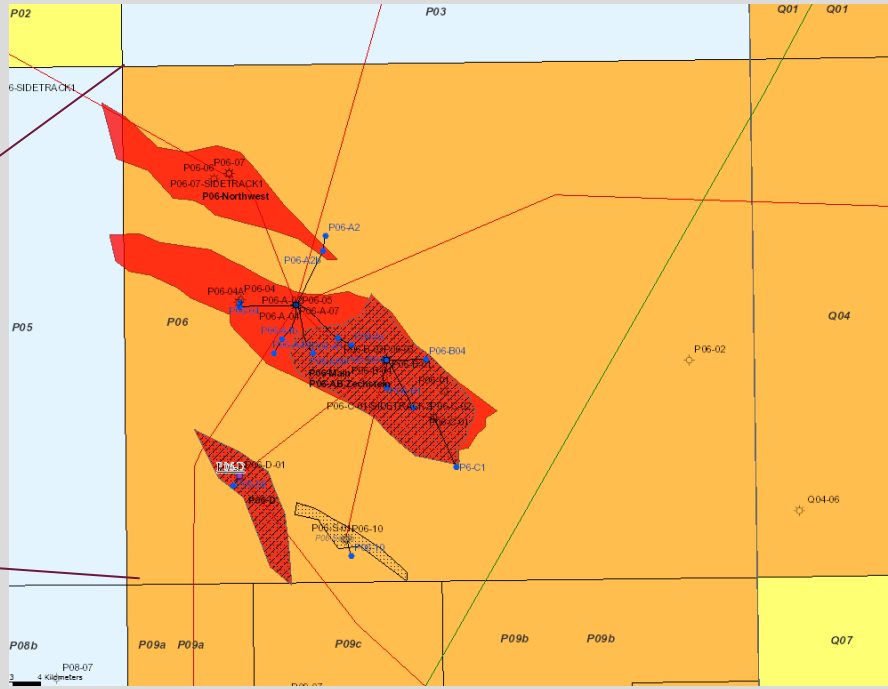
Field name	Discovery year	In production	Comments
L4-D	1981	2012	ERD
B13	1987	2011	Shallow gas field (unconsolidated)
D18-A	1997	Under development	Cross border field
Q13-A	1962	Under development	Oil
K4a-Z	1974	Under development	Marginal field allowance
A18-A	1987	Under development	Shallow gas field
P6-A	**1968**	**Under development**	**Tight gas field**

Tight Gas is moving…

P6-A

- Discovered in 1968 (tested in 1997)
- One of the largest stranded fields
- Well test showed tight reservoir

- -> Stranded field
- Operations are taking place right now



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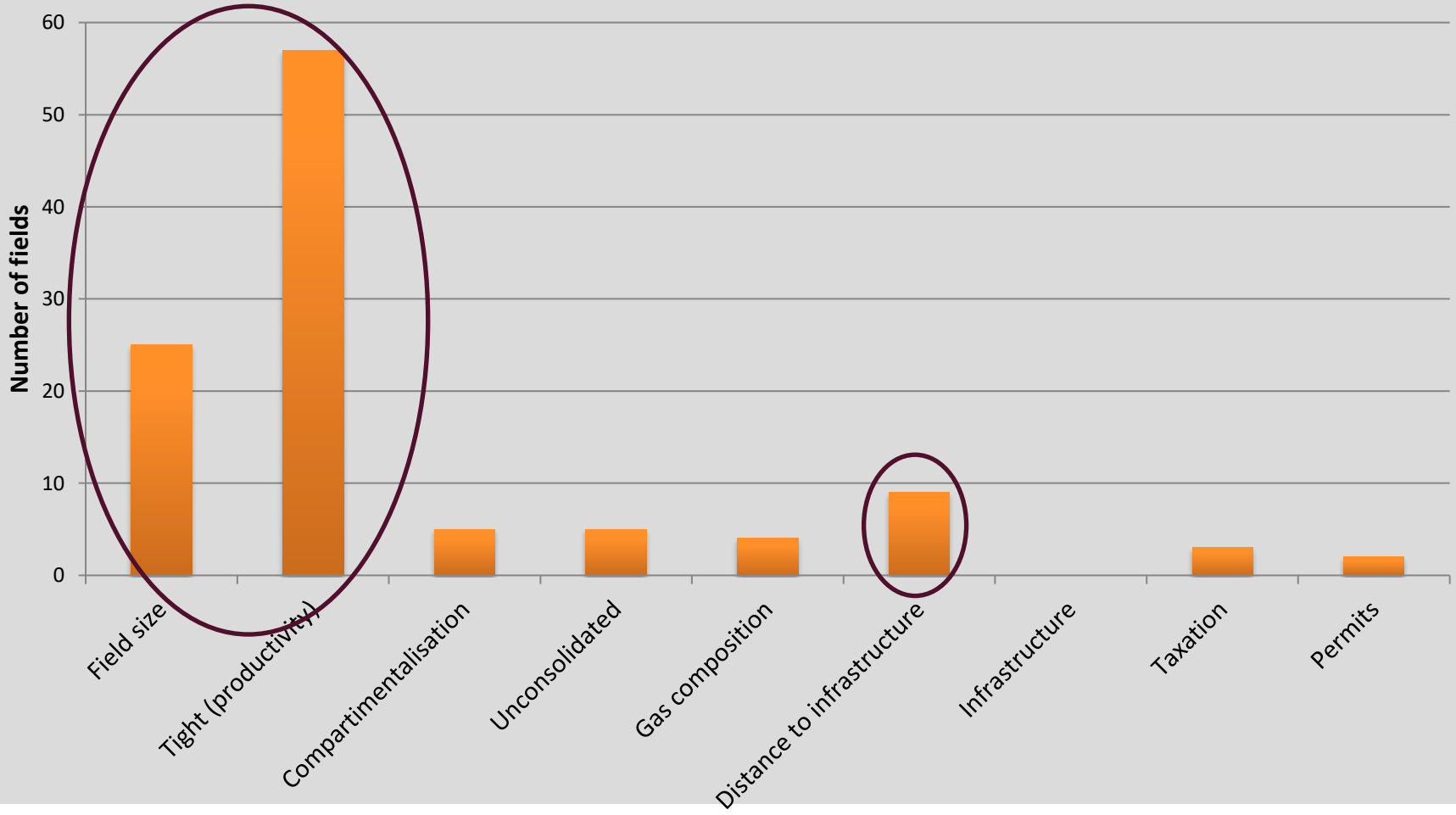
Inventory: Main Blockers



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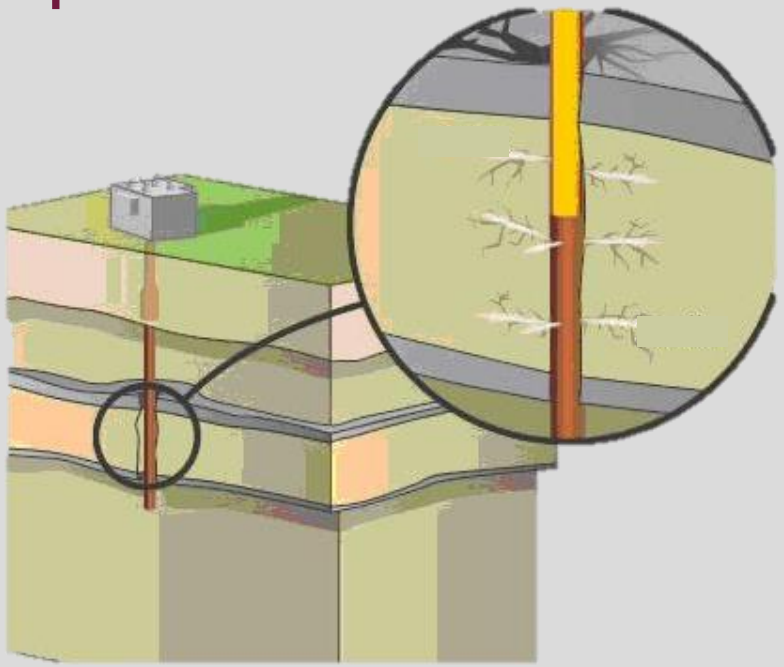
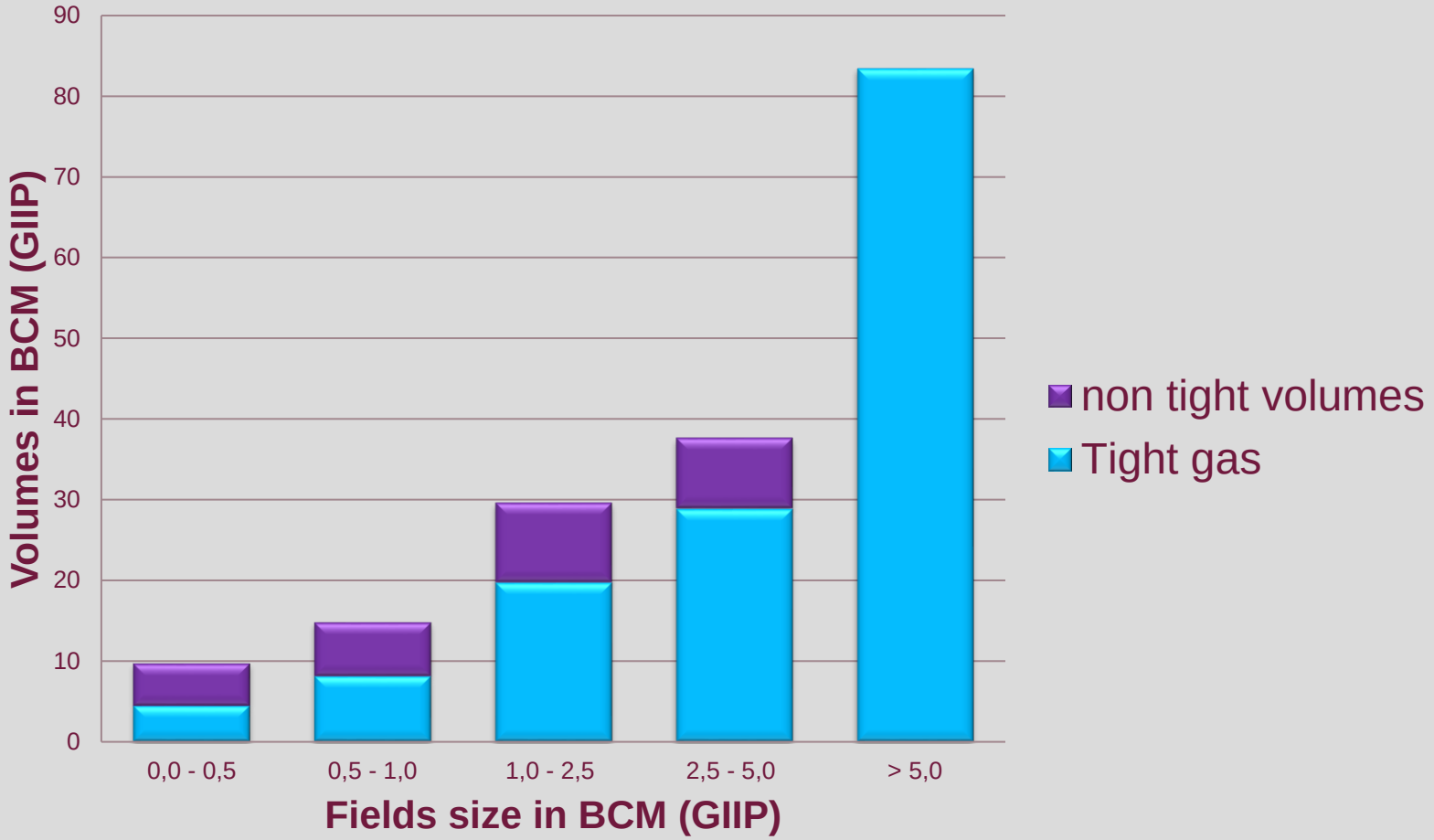
Tight Fields

Definition *tight field:*

Reservoir with reduced productivity due to low permeability, such that it cannot be economically developed without applying stimulation techniques



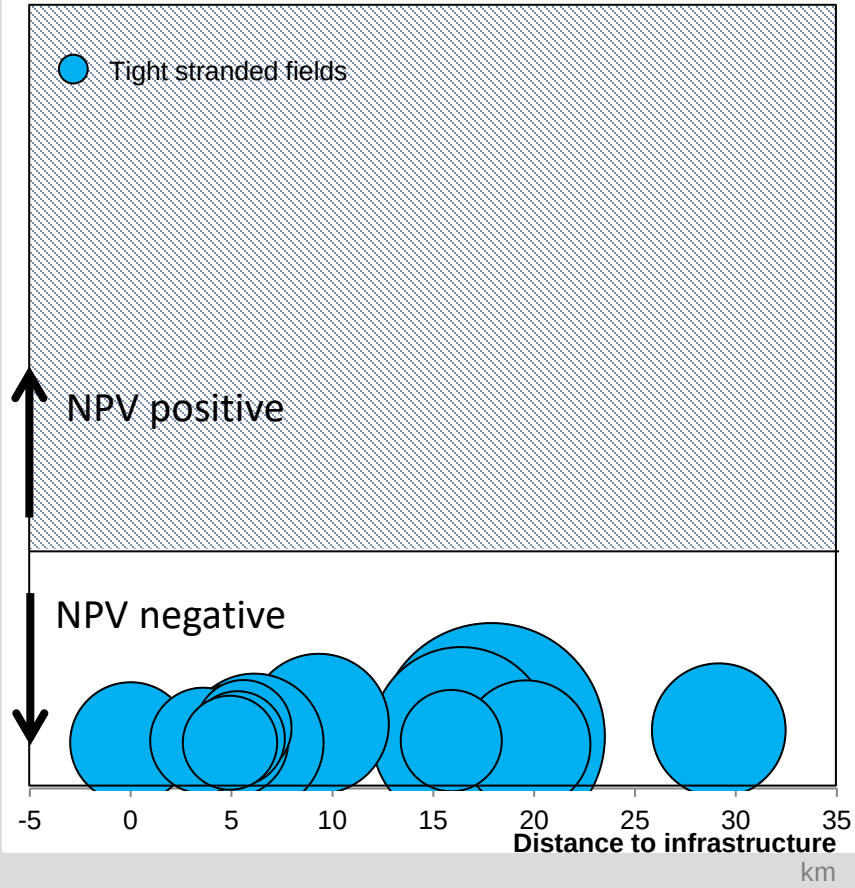
Big stranded fields are often tight



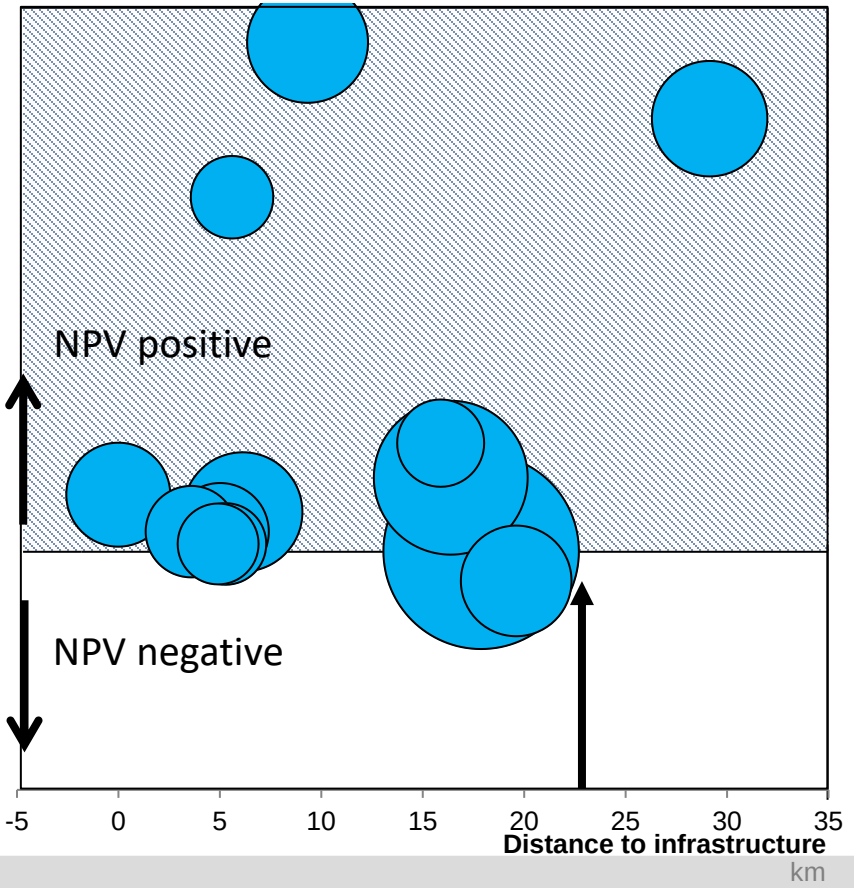
145 BCM Tight, 30 BCM other

Tight fields

Without fraccing – assuming low productivity for tight fields



After fraccing – assuming increased productivity for tight fields



Economic screening of offshore stranded fields (MSV > 1 BCM)\

EBN sponsors Joint Industry Projects Tight Fields

Since tight gas is often at the dominant factor holding back development, EBN facilitates Joint industry projects around tight gas.

Studies tight reservoirs:

• *ITF Petgas- I* en *II*.	Petrophysics of tight gas
• *ITF FracGas*	Frac modeling & microseismic monitoring
• *EBN Frac Forum*	Fraccing status and knowledge sharing
• *Delft University*	Uyuni Bolivia – Ten Boer potential evaluation
• *Fracture technologies*	Frac-cleanup phase-III, improved understanding of clean-up process

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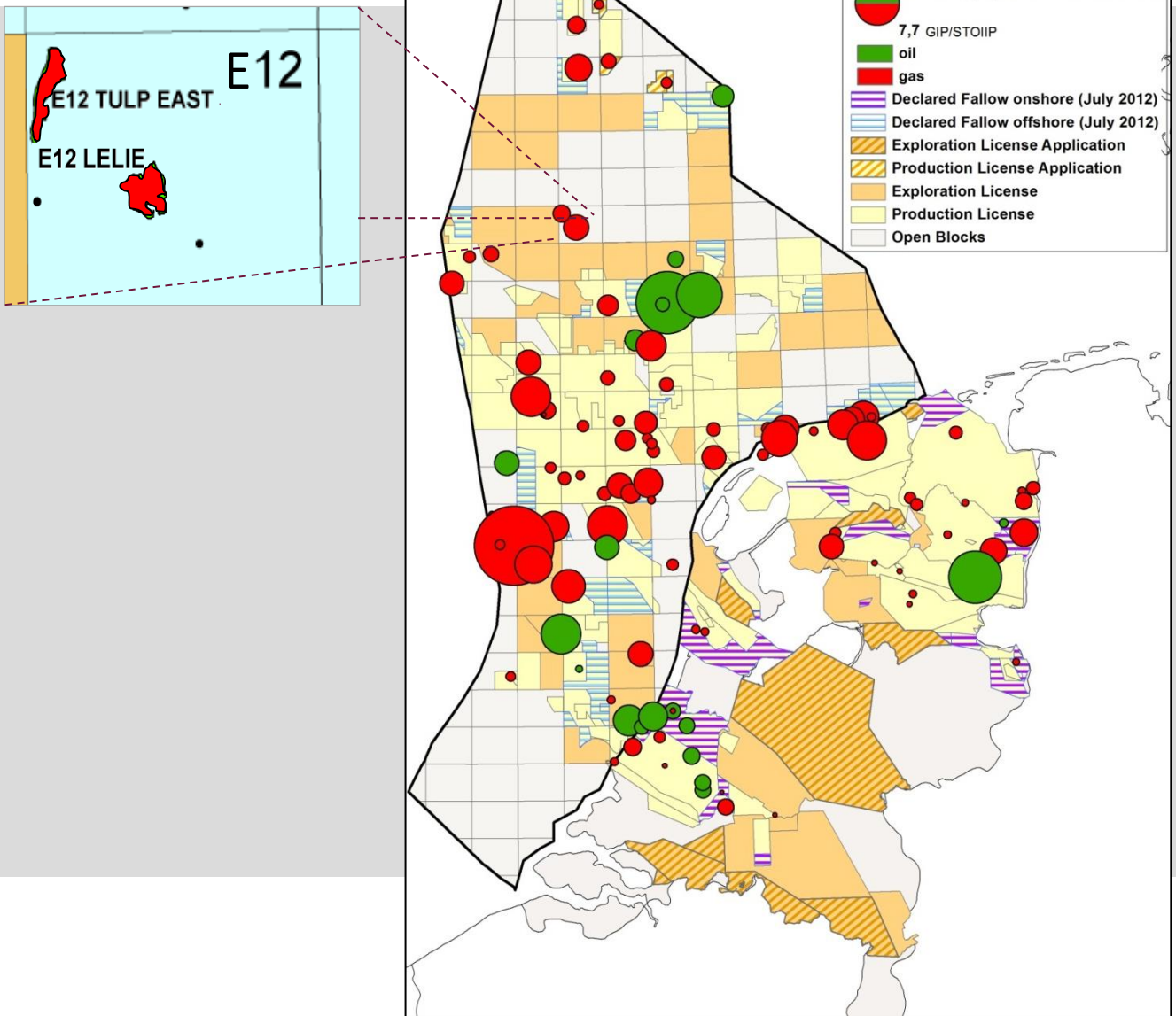
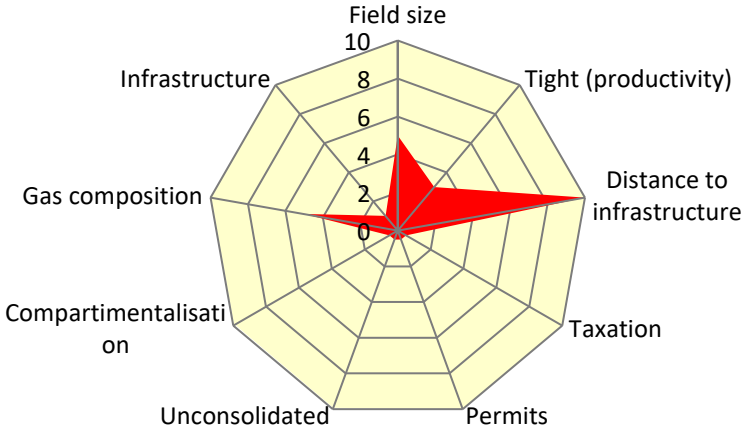
Opportunities for new development – an example

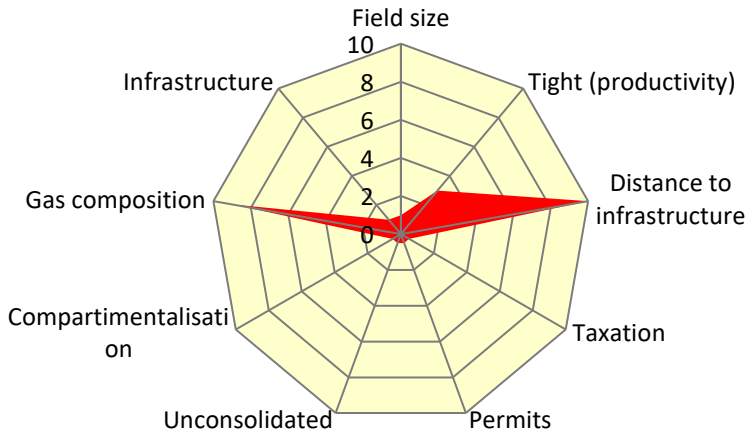


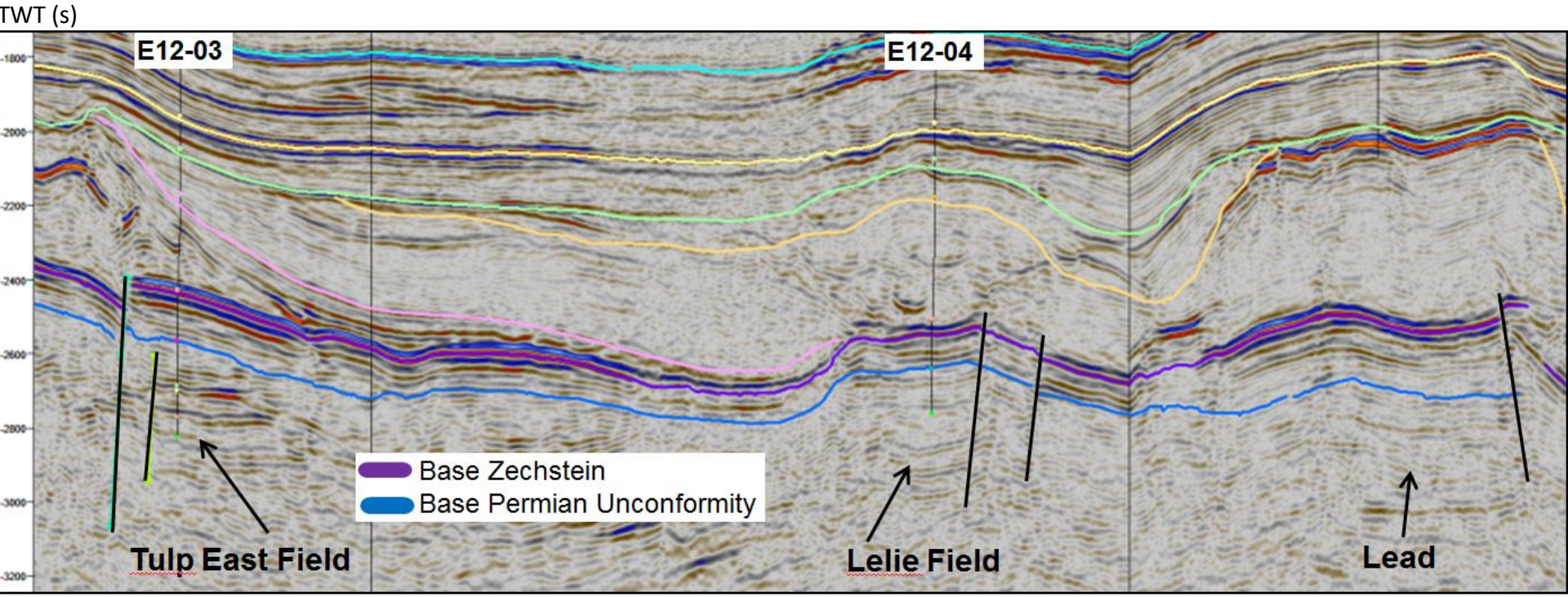
Opportunities in open acreage – an example

E12 Tulp East

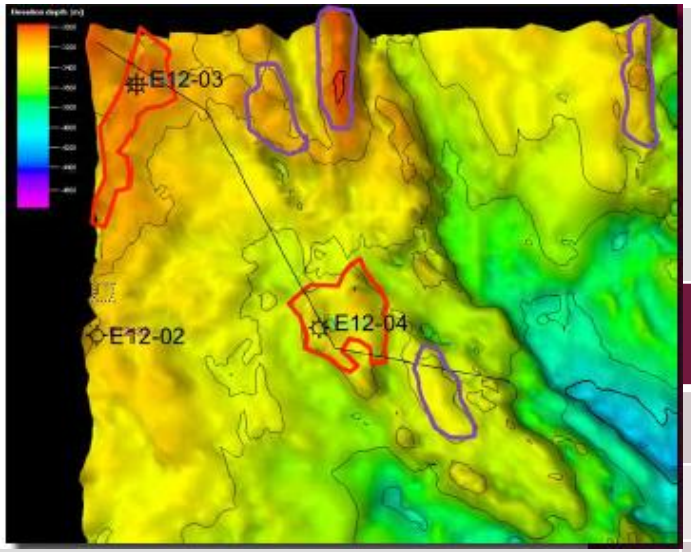


E12 Lelie





Opportunities in open acreage – an example



Fields	Lelie	Tulp East
Well	E12-4	E12-3
Exp. GIIP	2.54 BCM	1.17 BCM
UR	1.91 BCM	0.68 BCM
Reservoir	Slochteren Fm? / Millstone Grit Fm	Millstone Grit Fm
Porosity	11.5%	9-13 %
Hydrocarbon specifications	CH_4: 32% CO_2: 3% *N_2: 65%*	CH_4: 64% CO_2: 3% *N_2: 33%*

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Summary

- **Classification methodology has been developed to help understanding the Stranded Fields portfolio.**
- **Tight fields represent the largest part of the stranded fields portfolio**
- **Understanding tight reservoirs is essential**
  - Tight gas reservoir research is expected to help future development, i.e. Joint Industry Projects
- **The stranded fields await creative solutions for development**