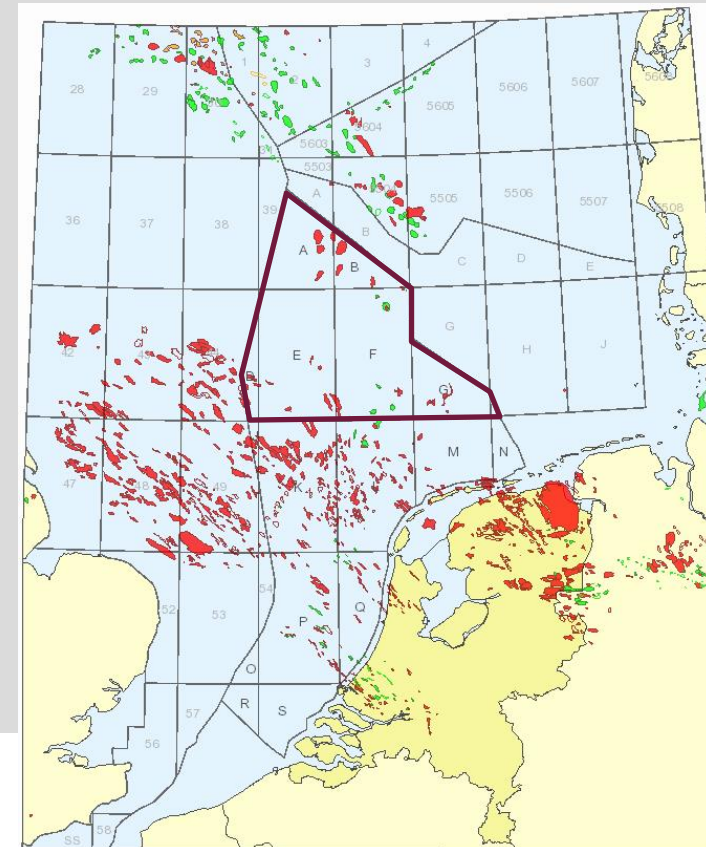


# Shallow Gas Play in The Netherlands Takes Off



Mijke van den Boogaard & Guido Hoetz  
74th EAGE Conference & Exhibition 2012 Copenhagen

1. EBN B.V.
2. Background Shallow Gas in the Dutch Offshore
  - Definition
  - Geological setting
3. Why Explore for Shallow Gas?
4. Shallow Gas Inventory EBN
5. Case Study F07/F10-P1 (Open Acreage)
6. Summary





# 1. EBN B.V. Who we are

## **EBN B.V.**

Independent company with the state as it's sole shareholder

## **Mission**

Optimally exploit subsurface & contribute to sustainable energy supply

## **Strategy**

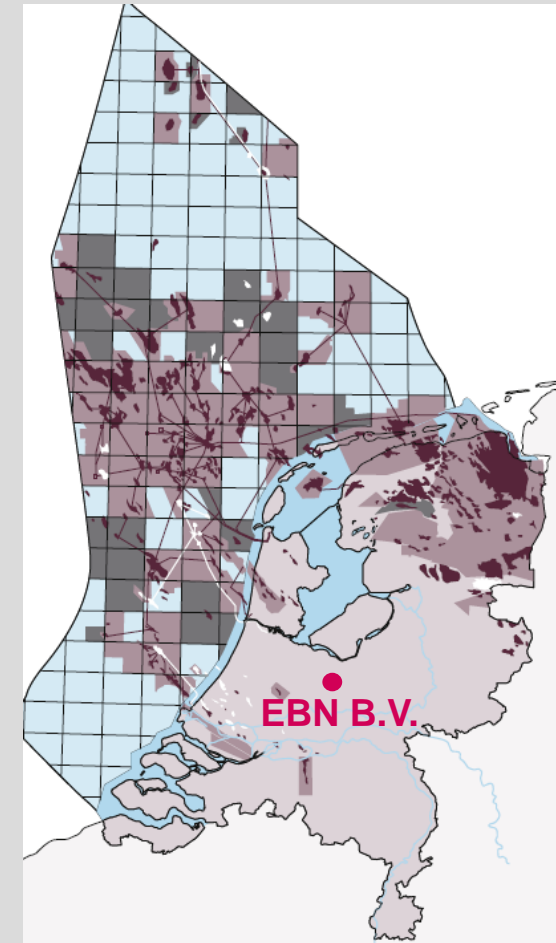
Facilitate & stimulate operators to optimize E&P

Contribute to sustainable energy management

Explore & develop new subsurface potential

# 1. EBN B.V. Key figures

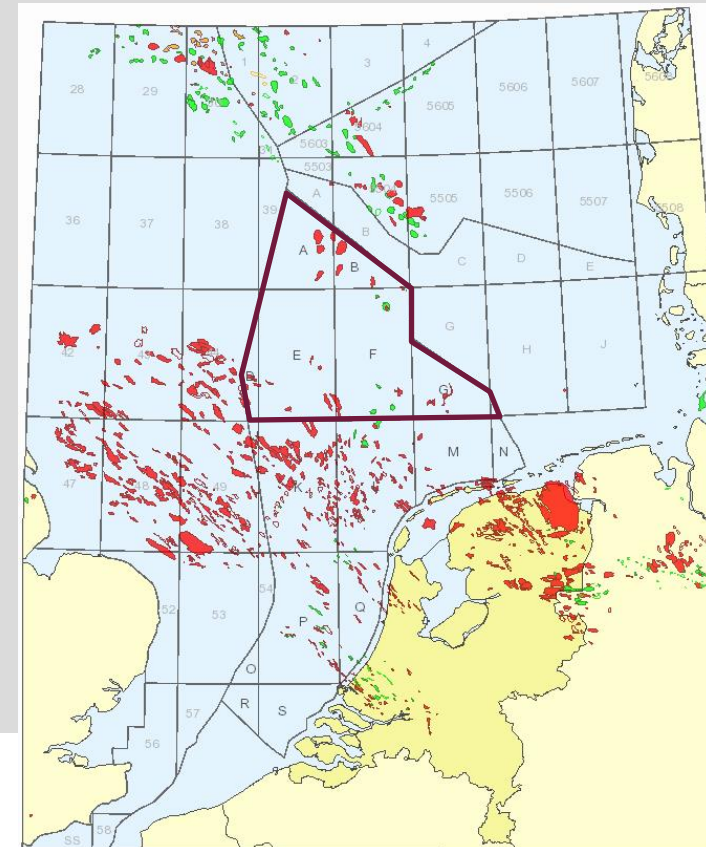
	2011
Productive fields (EBN participation)	258
Exploration participations	47
Production participation	125
Gas sales volume EBN share (bcm*)	30
Reserves EBN share (bcm)	431
Exploration wells drilled	19
Production wells drilled	38
New fields in development	12
Payments to state (billion €)	5.8



**\*1 bcm ≈ 35.3 bcf**

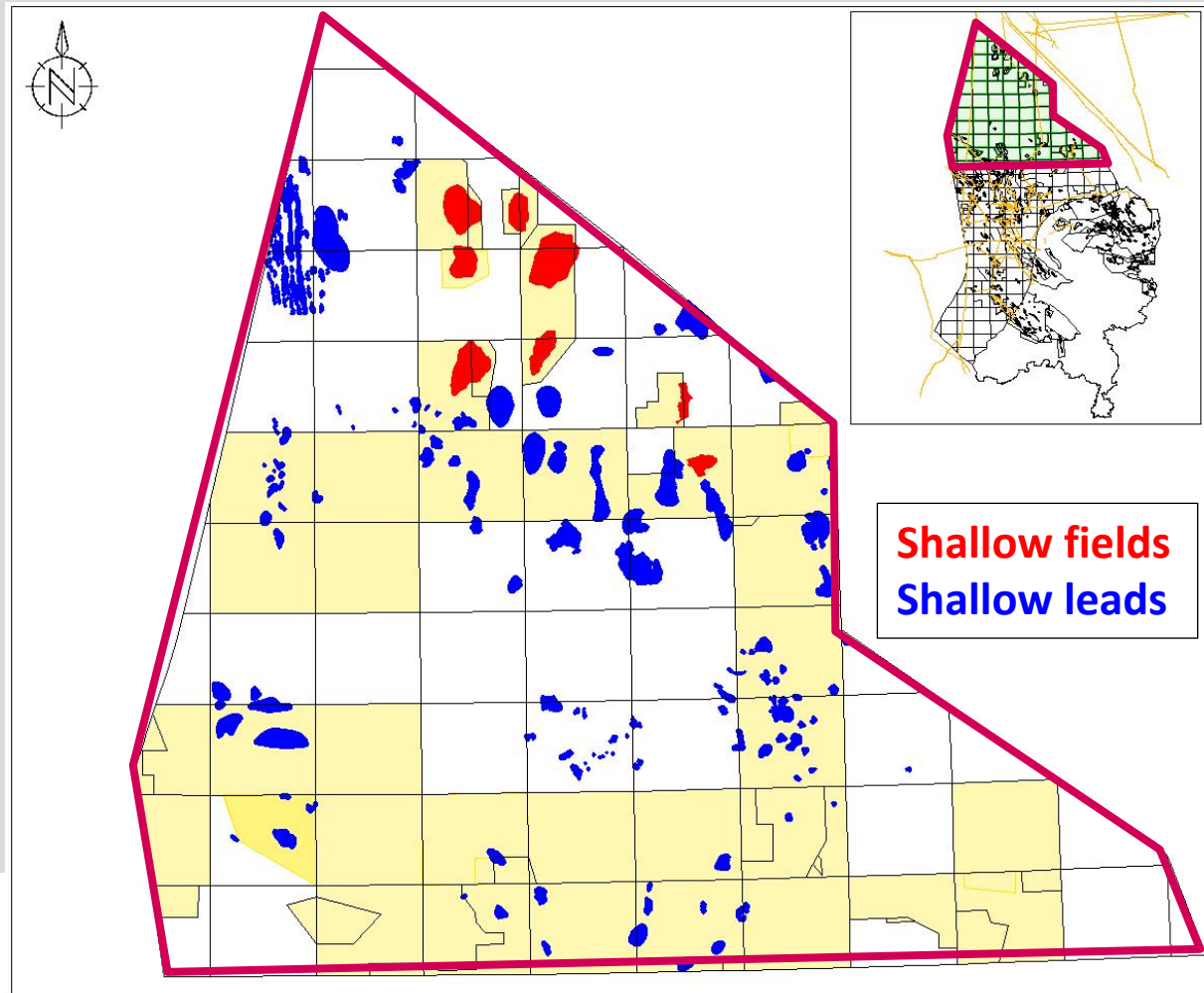
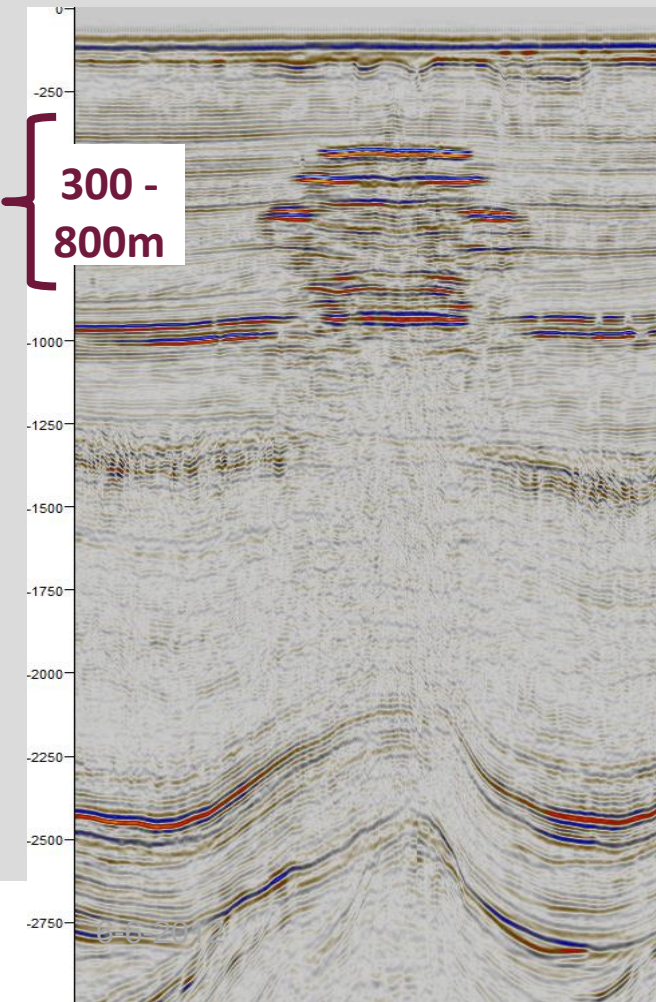


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# 2. Background Shallow Gas in the Dutch Offshore Definition

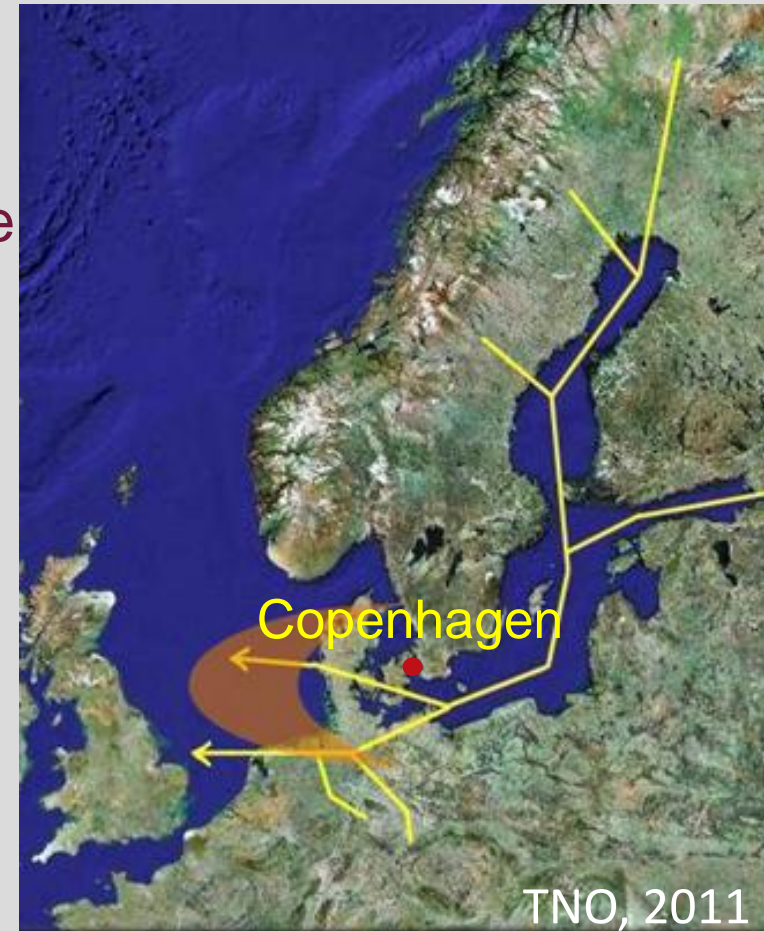
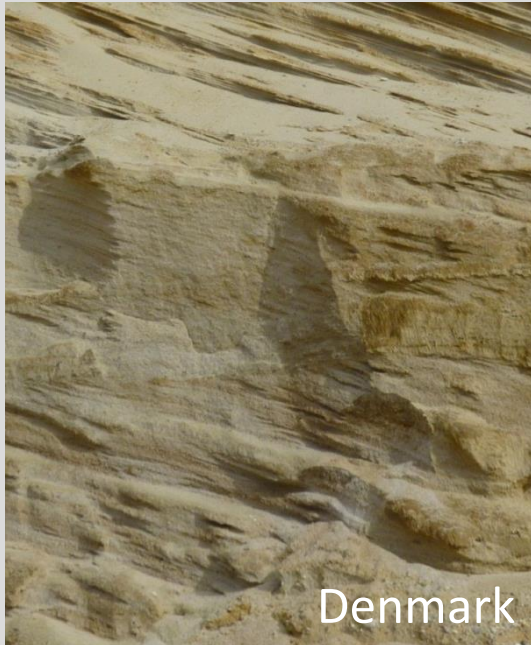
Shallow Gas (SG) = gas in unconsolidated sands, Miocene-Pleistocene



## 2. Background Shallow Gas in the Dutch Offshore Geological Setting

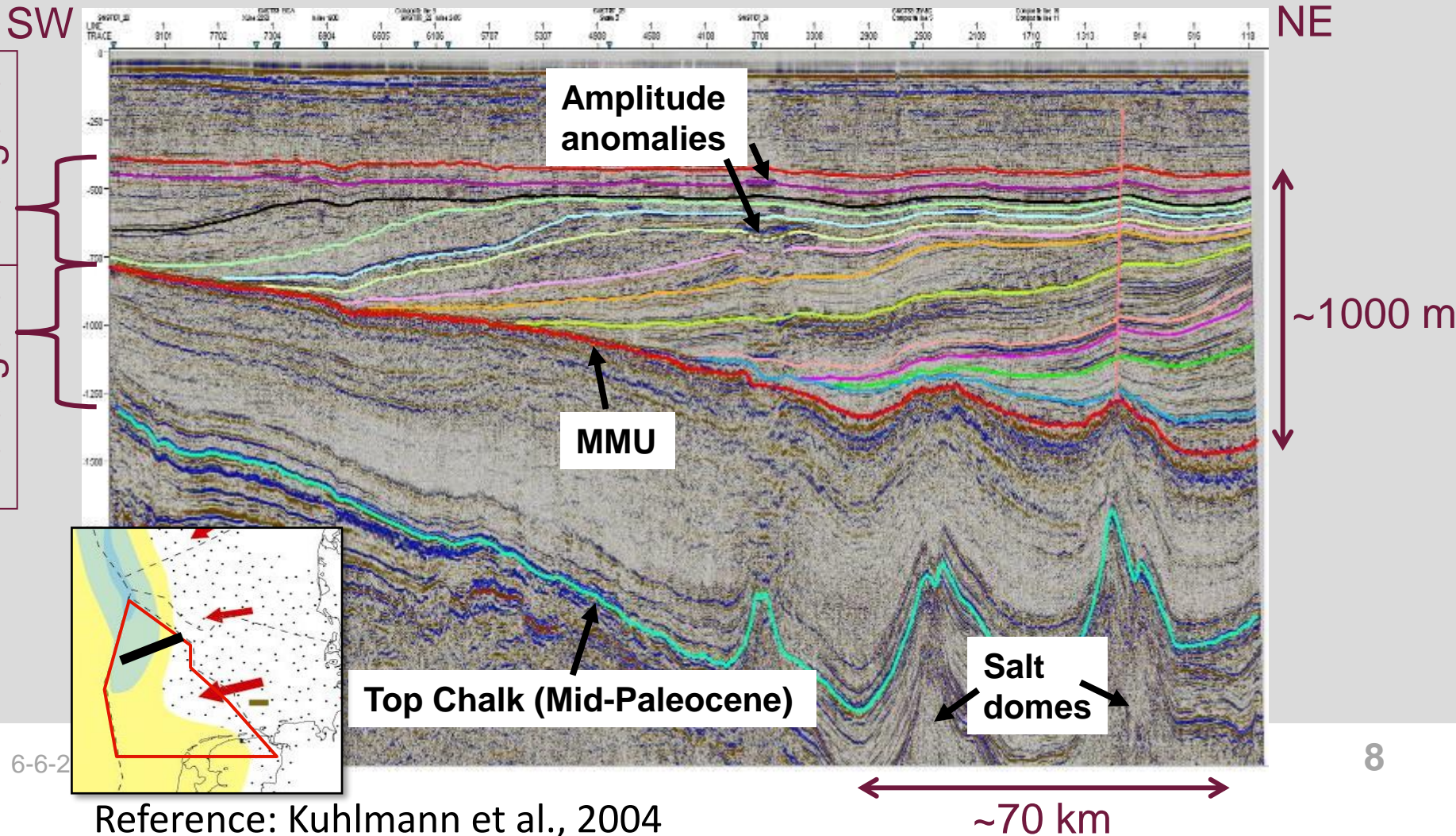
Eridanos delta:

- Late-Cenozoic river delta system
- In NL: Late Miocene – Early Pleistocene



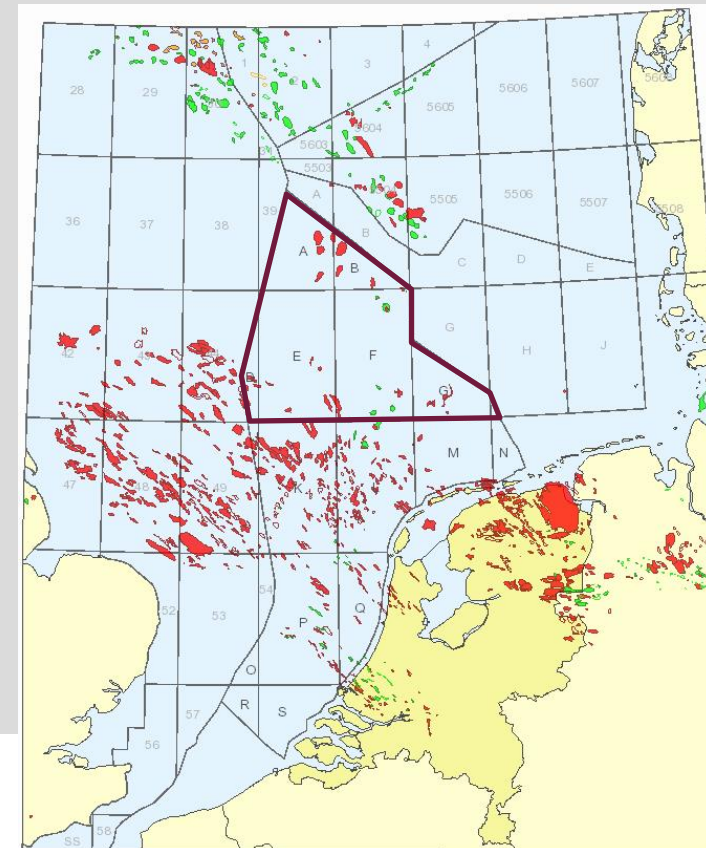


# 2. Background Shallow Gas in the Dutch Offshore Geological Setting





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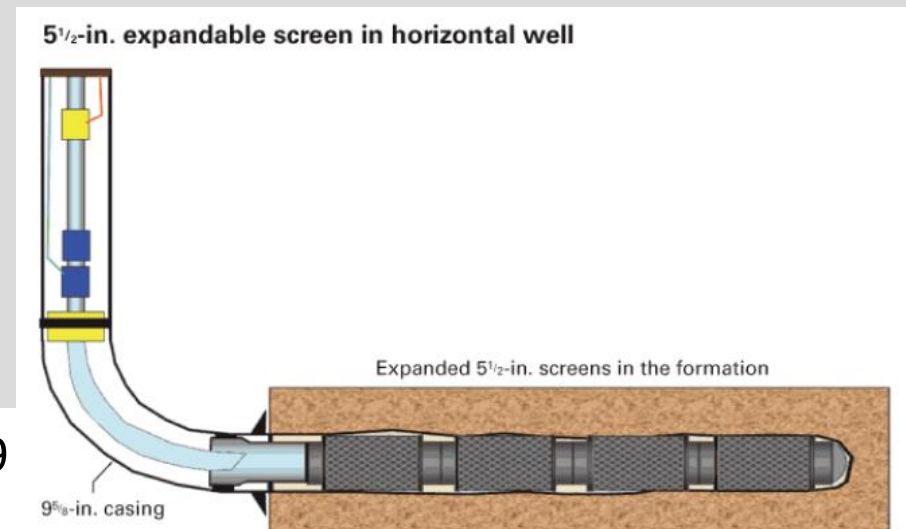


### 3. Why Explore for Shallow Gas? History

- Occurrence shallow leads known since early 70s
- Presence producible shallow gas proven by wells in 80s
- Early water breakthrough & sand production expected  
→ fields not developed

### 3. Why Explore for Shallow Gas? History

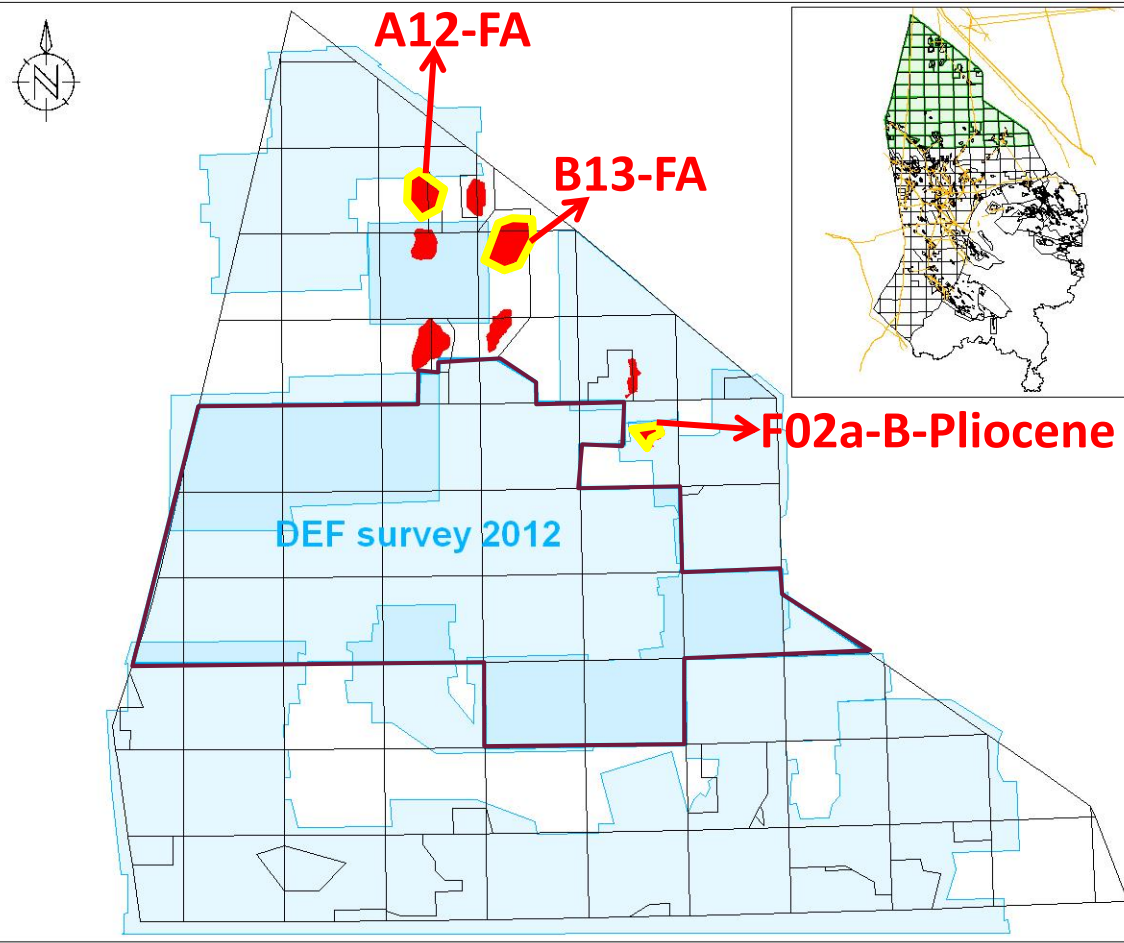
- Currently 3 successfully producing fields:
  - A12-FA (2007)
  - F02a-B-Pliocene (2009)
  - B13-FA (2011)
- Technical breakthrough (e.g. sand control in horizontal wells)



Reference: Chevron, Oil&Gas Journal, 2009



### 3. Why Explore for Shallow Gas?



#### Shallow Gas Offshore NL

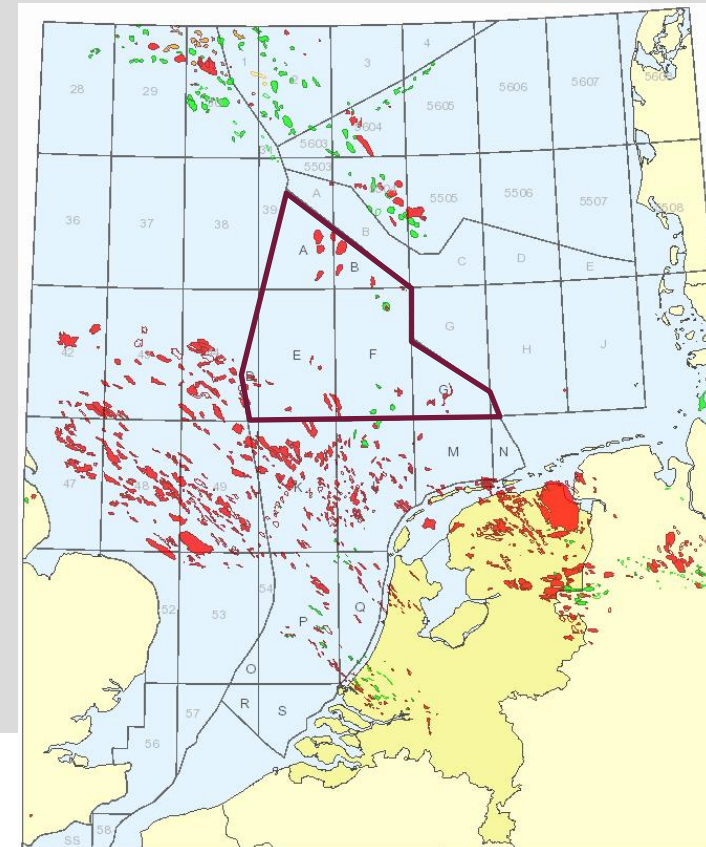
Today:

3 fields producing  
 5 fields under development/  
 development pending

### 3. Why Explore for Shallow Gas?

1. New technology proven successful for SG developments
2. New 3D seismic points to more opportunities
3. Significant volumes identified:  
36-118 bcm GIIP, 18-62 bcm UR  
Relatively high POS
4. Marginal field tax incentive applicable (2010, [www.nlog.nl](http://www.nlog.nl))  
& Guaranteed gas off take

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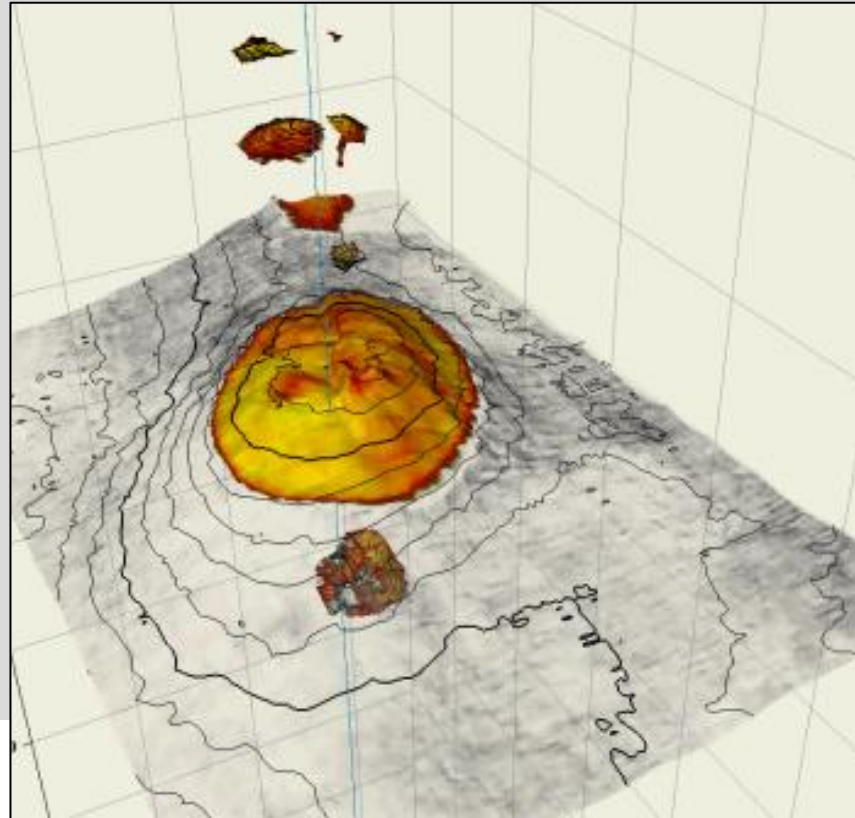
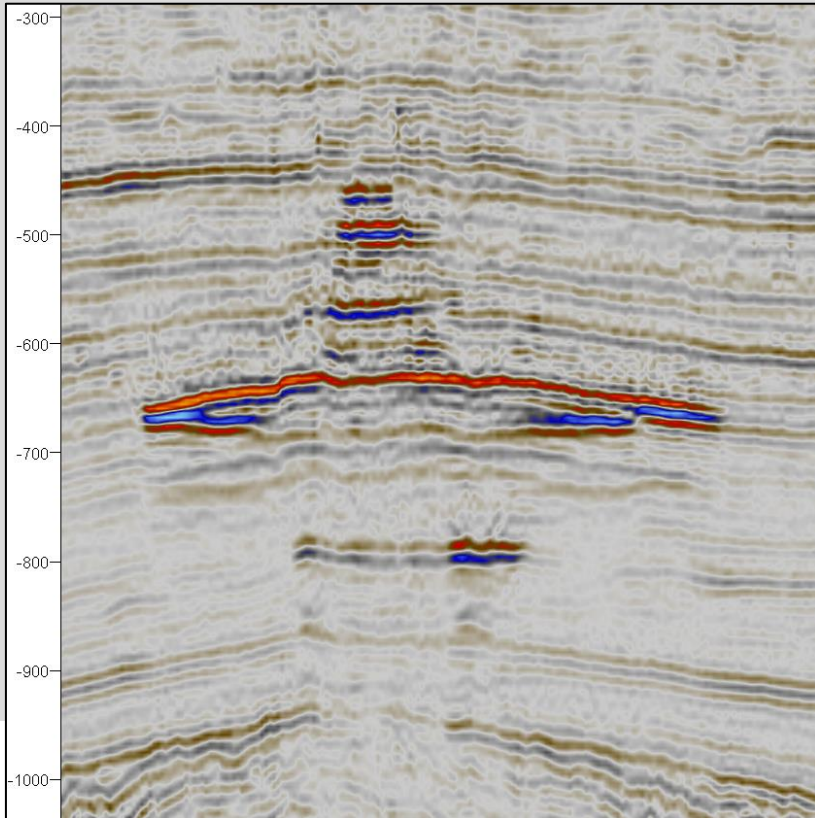




## 4. Shallow Gas Inventory EBN Identify Leads

Identify Shallow Gas (SG) leads:

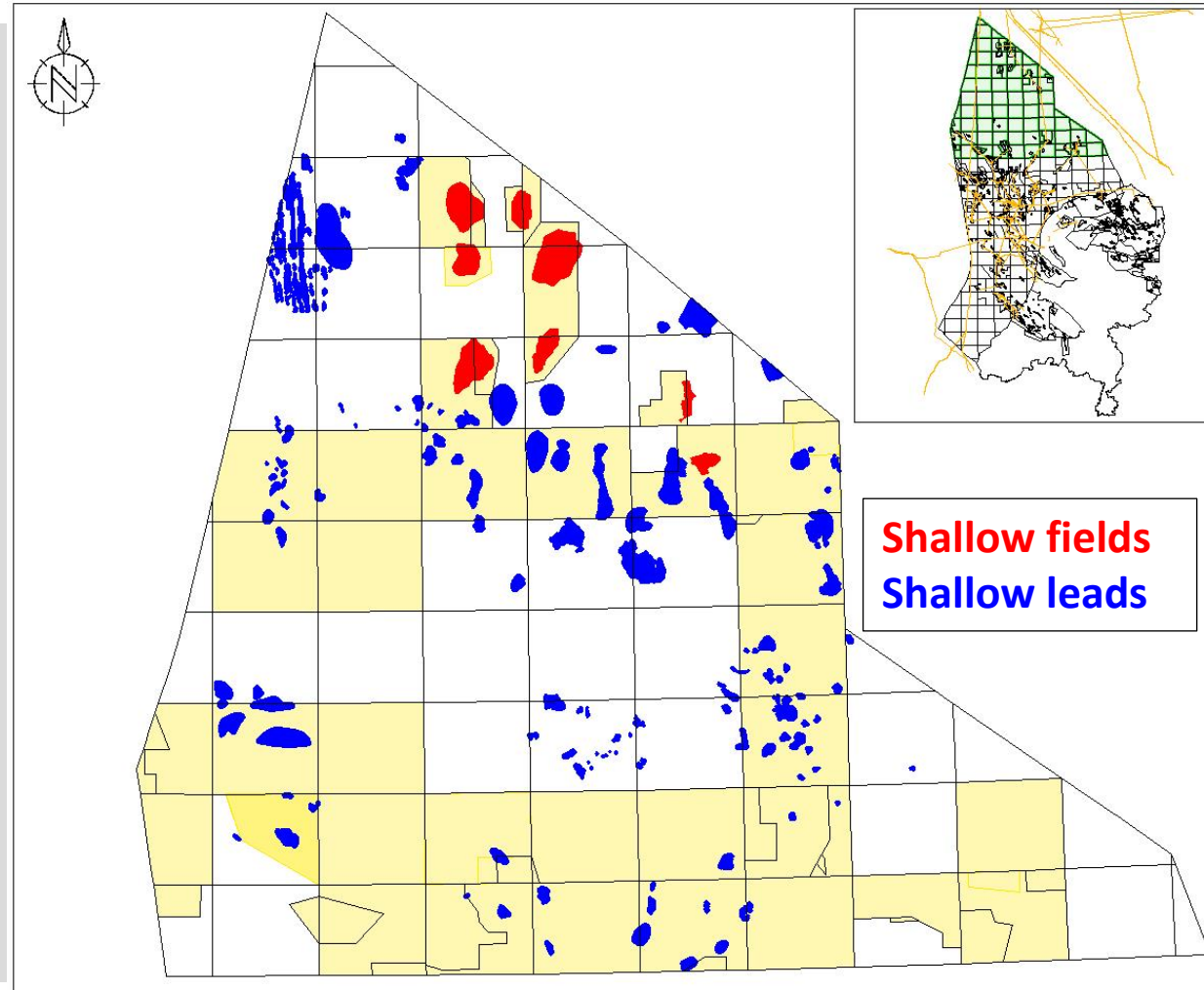
- High amplitude seismic reflection indicative for gas
- Mapping of *bright spots* (BS) defines SG leads



# 4. Shallow Gas Inventory EBN Identify Leads

Select most attractive leads based on:

1. Well data:  
gas shows, log data
2. *Bright spot* classification



## 4. Shallow Gas Inventory EBN Bright Spot Classification

Bright spot classification based on:

	<b>L</b>	<b>M</b>	<b>H</b>
<b>Area (km<sup>2</sup>)</b>	< 2	2 - 20	> 20
<b>Depth (ms)</b>	< 250	250 - 750	> 750
<b>Vertical relief (ms)</b>	<10	10 - 20	> 20
<b>Number of stacked reservoirs</b>	1	2	> 2
<b>Trapping Mechanism*</b>	ST	FDC	4WDC

\* **ST** = stratigraphic trap, **FDC** = fault-dip closure, **4WDC** = 4-way-dip closure

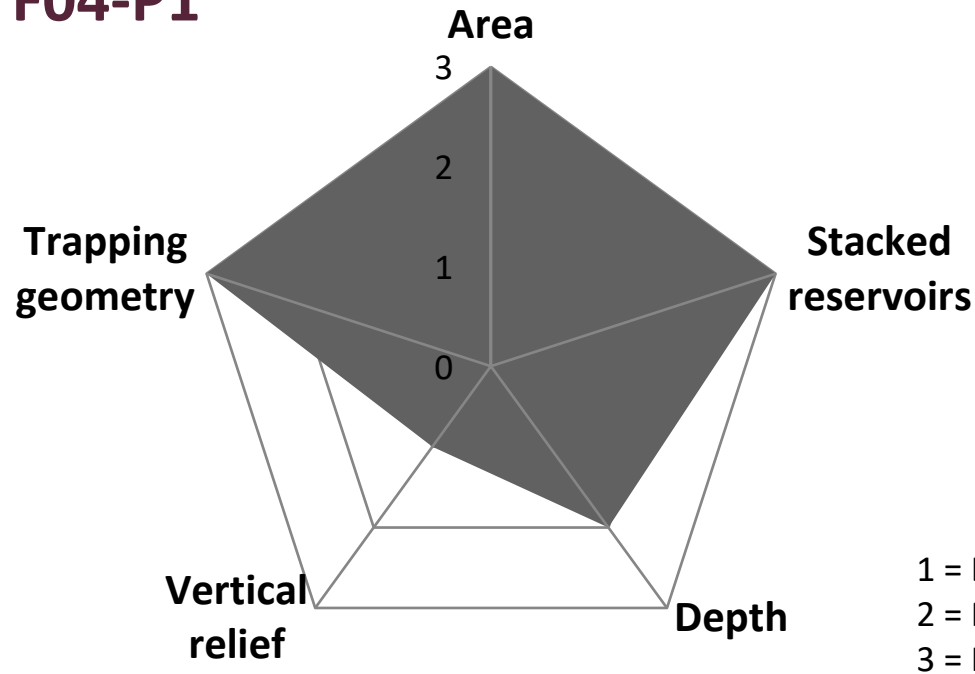


# 4. Shallow Gas Inventory EBN Bright Spot Classification

Number of

Area (km <sup>2</sup> )
Depth (ms)
Vertical relief
Number of s reservoirs
Trapping Me

**F04-P1**



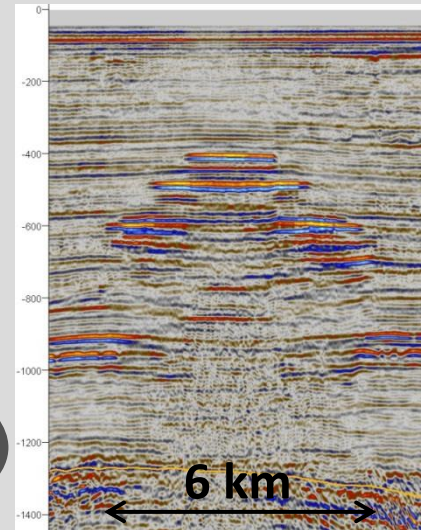
<b>H</b>
13
31
15
32
120

# 4. Shallow Gas Inventory EBN Bright Spot Classification

BS type:

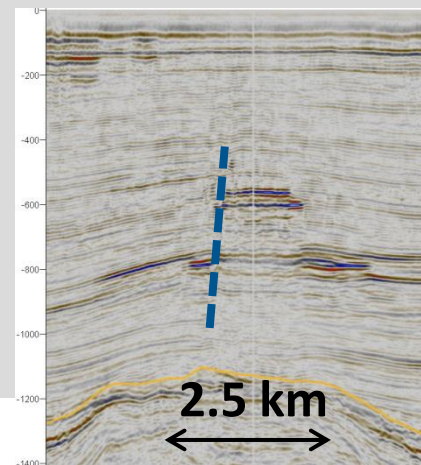
Prospectivity?

- 4WDC (e.g. A12-FA)
- FDC (e.g. F02a-B-Pliocene)
- Strat. trap
- Very shallow
- Small size



### 4WDC type

- Area: M/H
- Depth: M/H
- Vertical relief: L/M
- Number of Stacked Reservoirs: L/M/H
- 4WDC

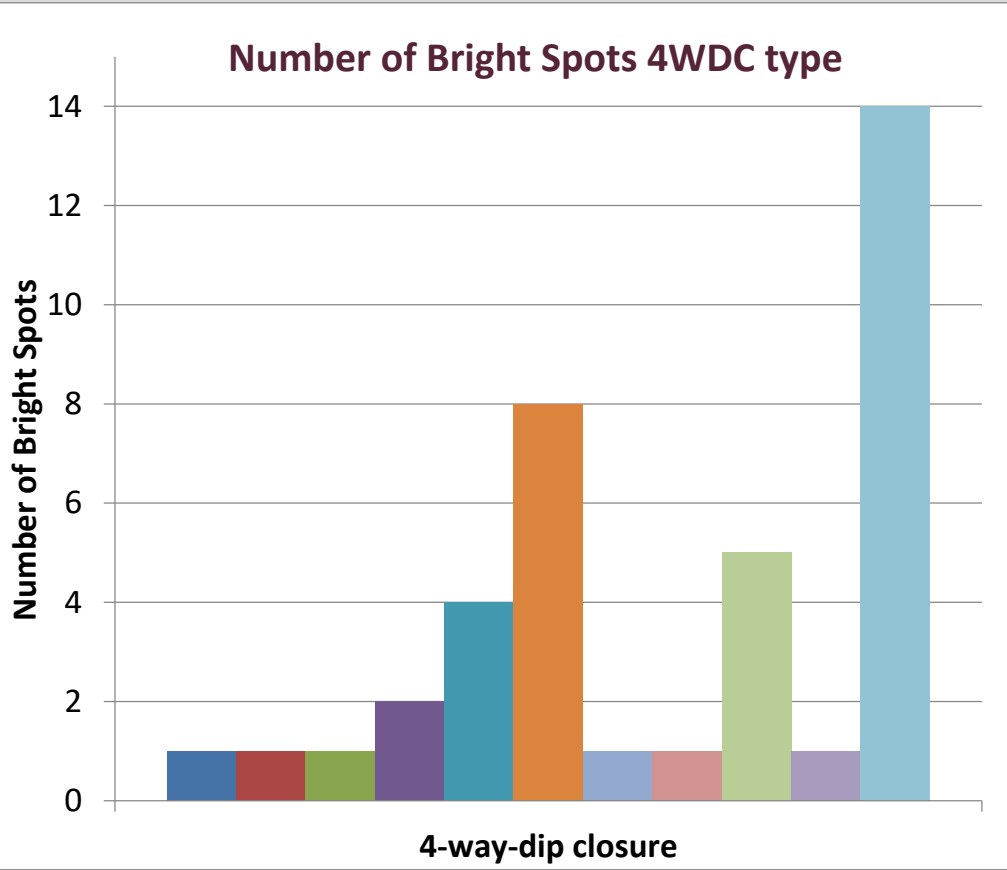


### FDC type

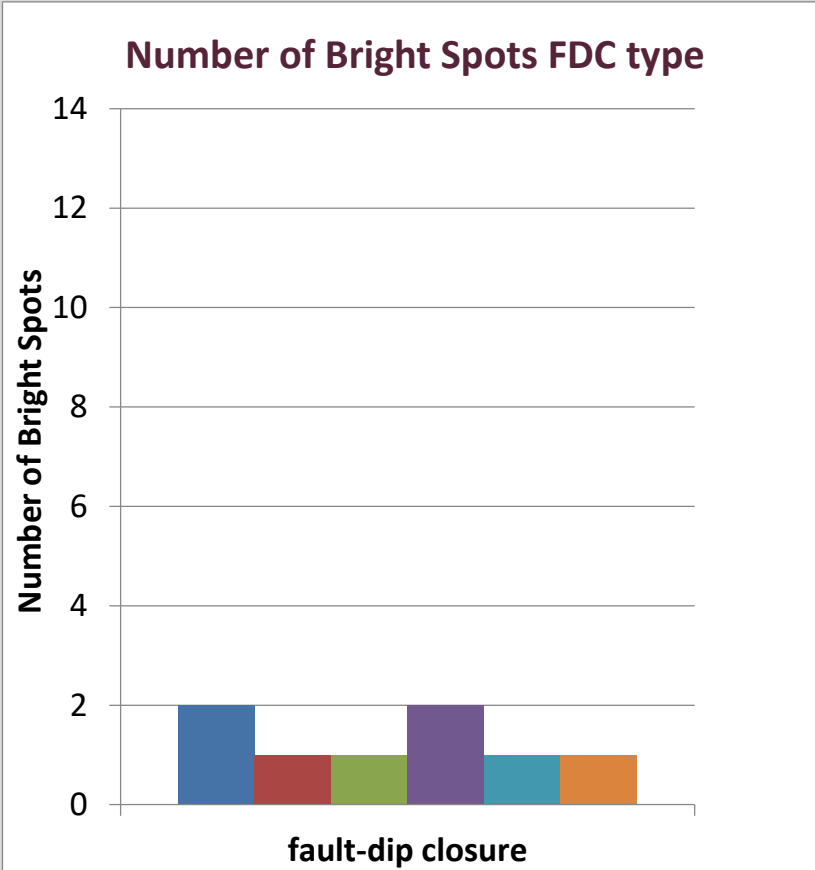
- Area: M/H
- Depth: M/H
- Vertical relief: M/H
- Number of Stacked Reservoirs: L/M/H
- FDC



# 4. Shallow Gas Inventory EBN Bright Spot Classification



39 Leads

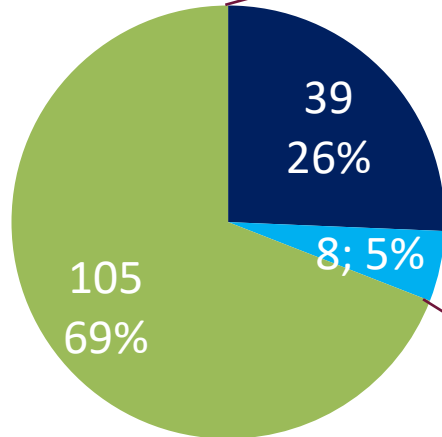


8 Leads

## 4. Shallow Gas Inventory EBN Size of the Prize

All Lead Types

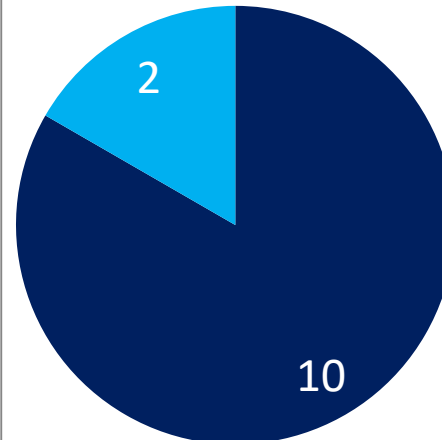
- 4WD type BS
- FDC BS
- Other BS



25%

Leads in Open Acreage

- 4WD type BS
- FDC BS

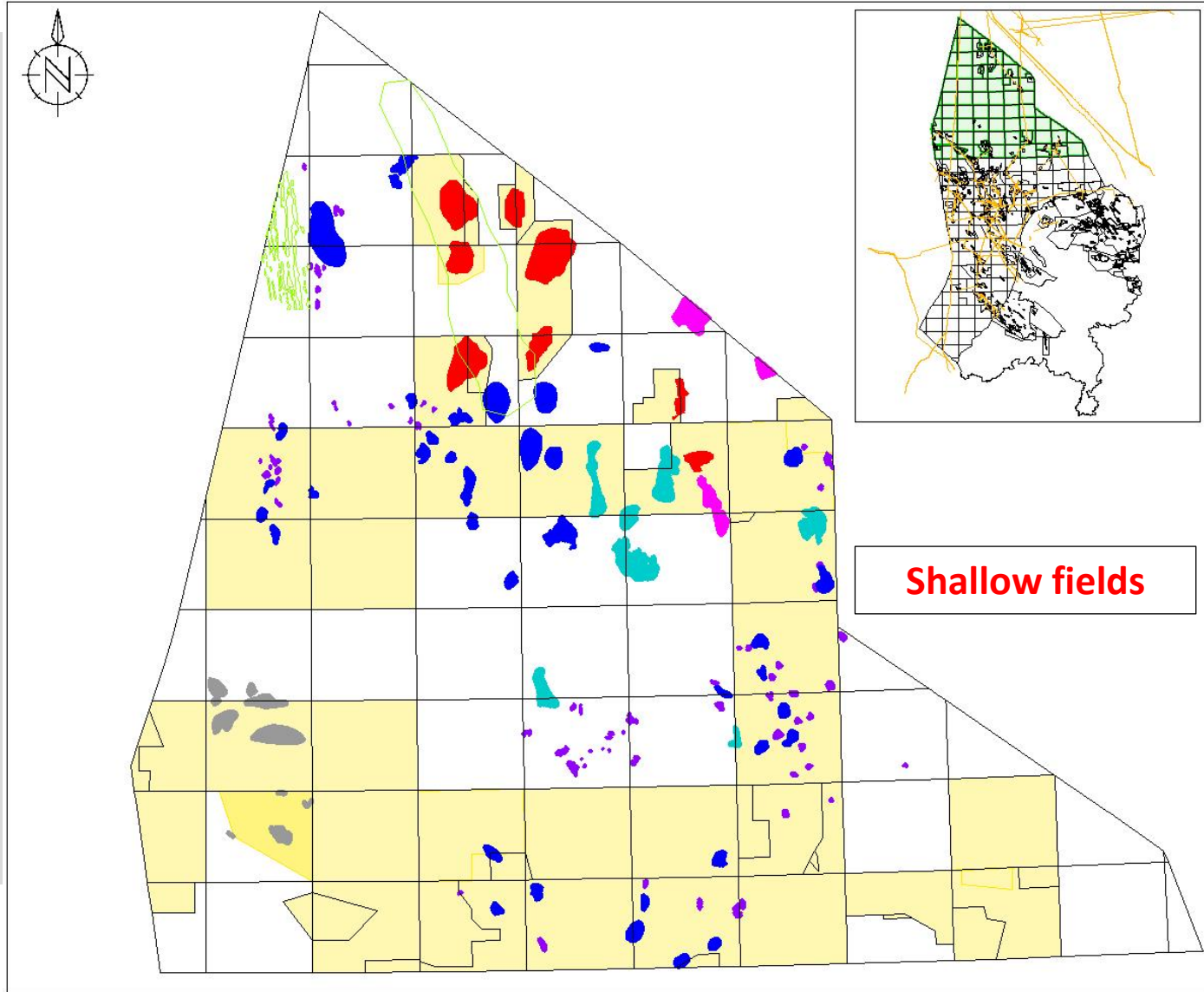


13 leads analysed in detail:

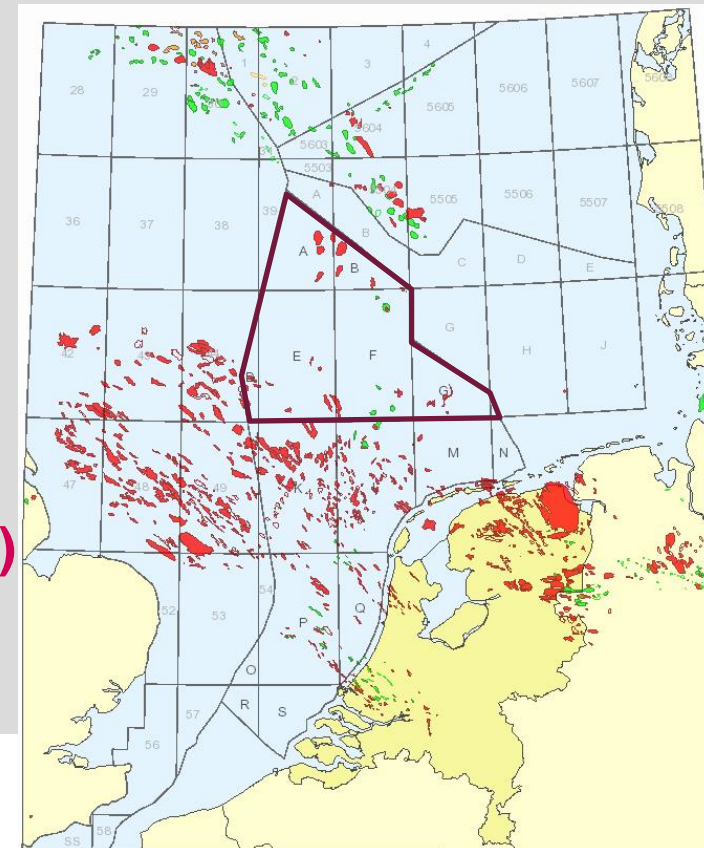
- Total GIIP P50-P10: 10 – 16 bcm



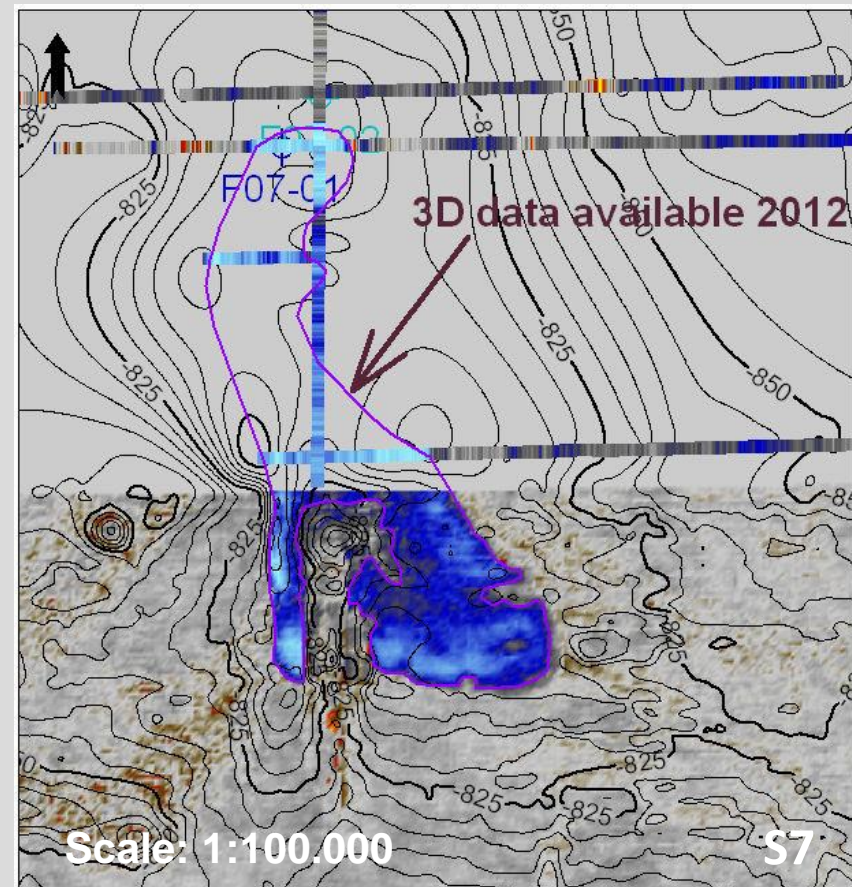
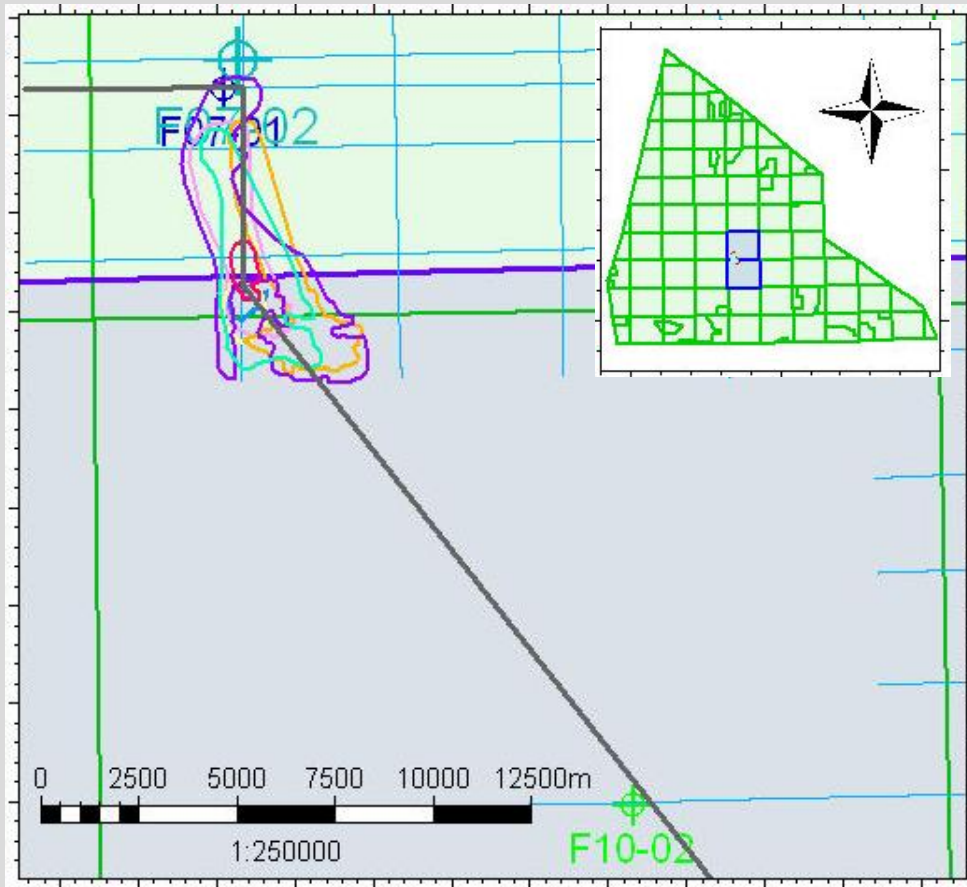
# 4. Shallow Gas Inventory EBN Bright Spot Classification



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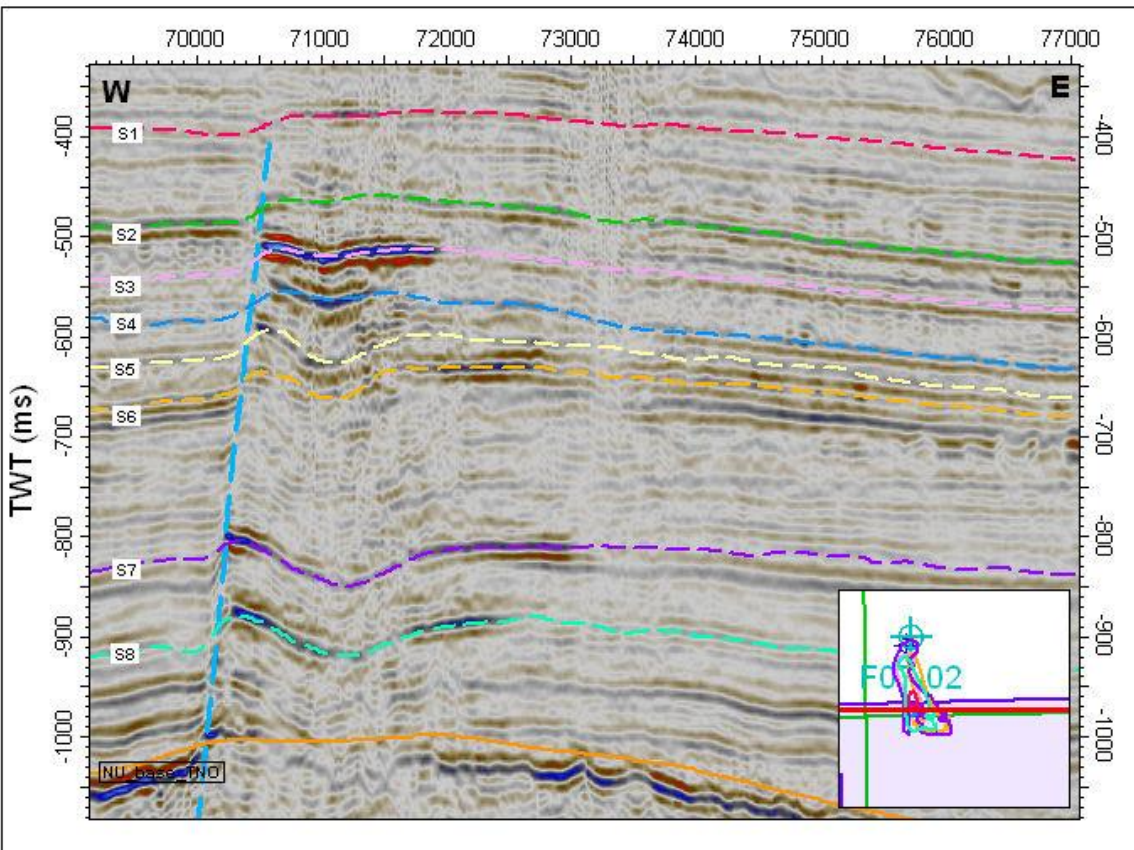


# 5. Case Study F07/F10-P1 (Open Acreage)





# 5. Case Study F07/F10-P1 (Open Acreage)



	GIIP (BCM)		
Zone	P10	P50	P90
<b>S7</b>	1.68	0.77	0.23
<b>S8</b>	1.89	0.92	0.37
<b>Total</b>	<b>3.57</b>	<b>1.69</b>	<b>0.60</b>

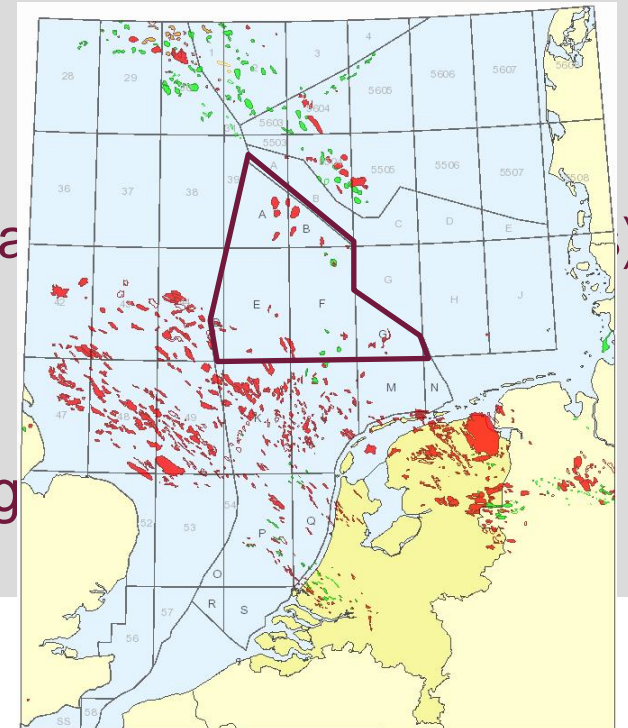
<b>S3</b>	0.48	0.21	0.06
<b>S6</b>	0.69	0.31	0.09
<b>Total</b>	<b>4.74</b>	<b>2.21</b>	<b>0.75</b>

[www.ebn.nl](http://www.ebn.nl)



# Shallow Gas Play in The Netherlands Takes Off

- Northern offshore NL: SG in Cenozoic unconsolidated sediments (Eridanos Delta)
- Extensive occurrences of SG known from seismic & wells
- Why explore for SG now?
  1. 3 Successfully producing fields (sand me...
  2. Area largely covered by 3D seismic
  3. Significant shallow gas potential (18 – 62
  4. Marginal field tax incentive applicable & g



# Shallow Gas Play in The Netherlands Takes Off

- Shallow Gas Inventory EBN
  - Bright Spot Classification
  - 152 leads in northern offshore NL
  - 47 attractive leads (12 open acreage)
- Case study F07/F10-P1 (open acreage)
  - Fairly large, 1.7 – 3.6 bcm GIIP (P50-P10)
- Remaining challenge: find cost efficient solutions due to
  - Relatively small leads
  - Distance to infrastructure

- TNO, Chevron, Dana, ONE, Total
- EBN B.V., in particular:
  - Berend Scheffers
  - Jan Lutgert
  - Nabil Chaouch
  - Harald de Haan

See you @ Prospex Dec 2012 in London