

› E&P OPPORTUNITIES & ACTIVITIES IN THE NETHERLANDS

| Harmen Mijnlief

ebn

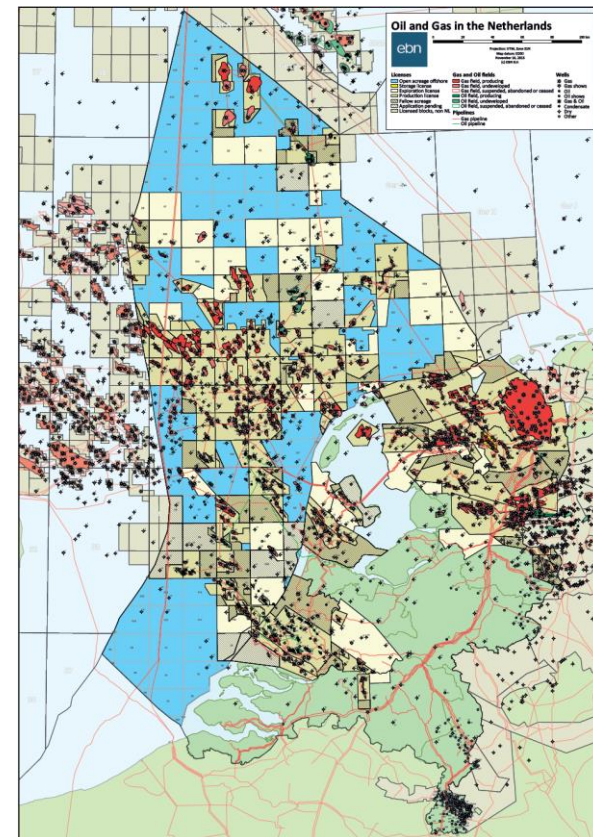


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WHAT TO EXPECT THE NEXT 20 MINUTES

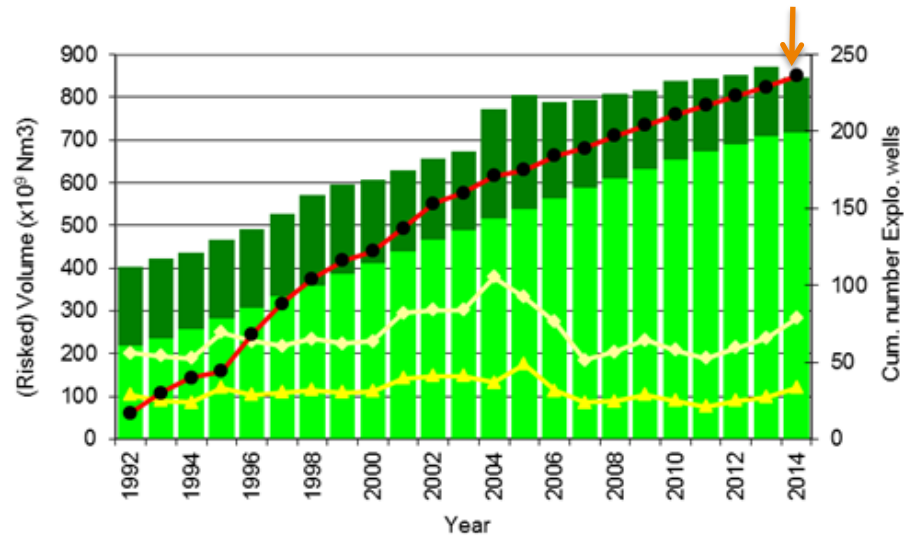
- › Status report on Dutch reserve estimates
- › Geological & Prospectivity studies
- › Some leads
- › Concluding remarks
- › Booth 10: the **Netherlands**, EBN, MEA & TNO



HISTORIC TRENDS

Reserves: 94 bcm
Contingent res.: 24 bcm
9 explo. wells

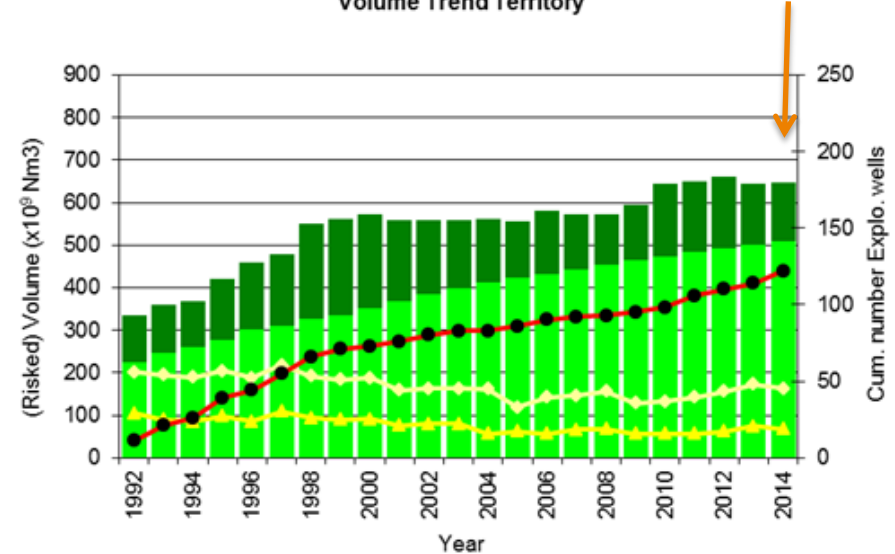
Volume Trend Continental Shelf



■ Production
■ Remaining reserves
— Low estimate Exploration potential
— High estimate Exploration potential
● Number of Exploration wells (cum.)

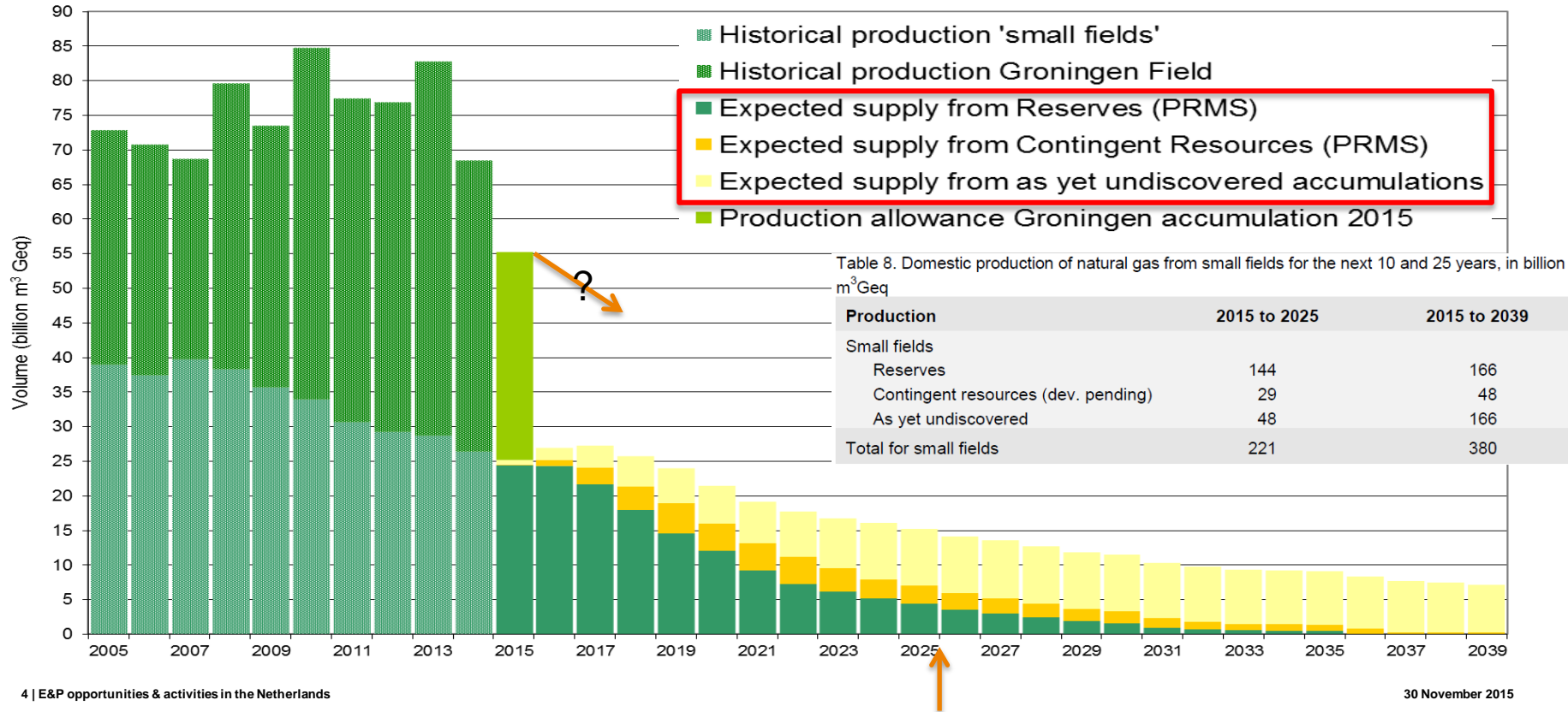
Reserves: 55 bcm
Contingent res.: 20 bcm
8 explo. wells

Volume Trend Territory



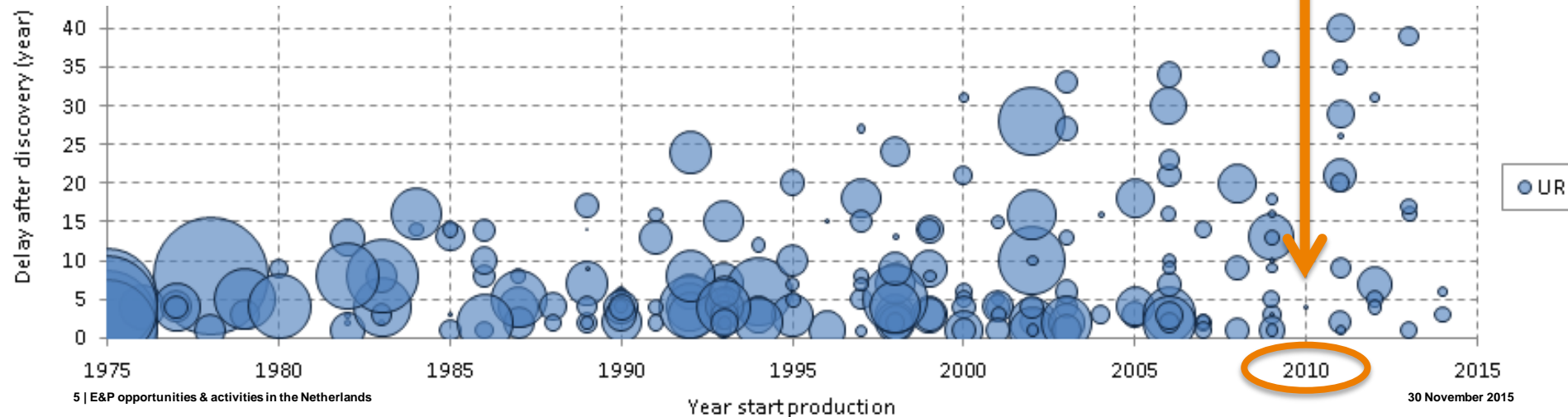
■ Production (ex. Groningen)
■ Remaining reserves
— Low Estimate Exploration potential
— High estimate Exploration potential
● Number of Exploration wells (cum.)

PAST & FUTURE PRODUCTION TREND

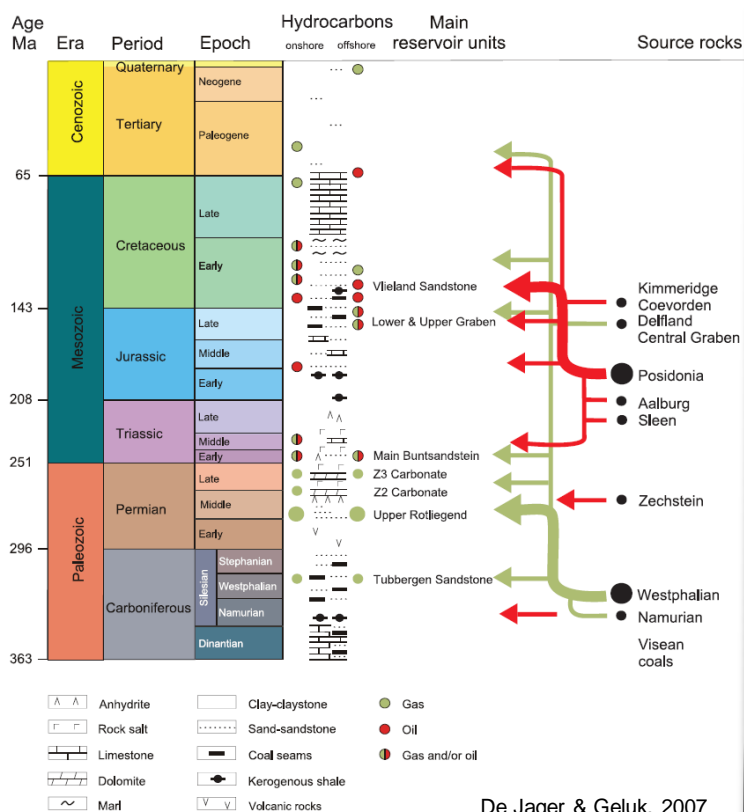


STRANDED FIELDS PORTFOLIO

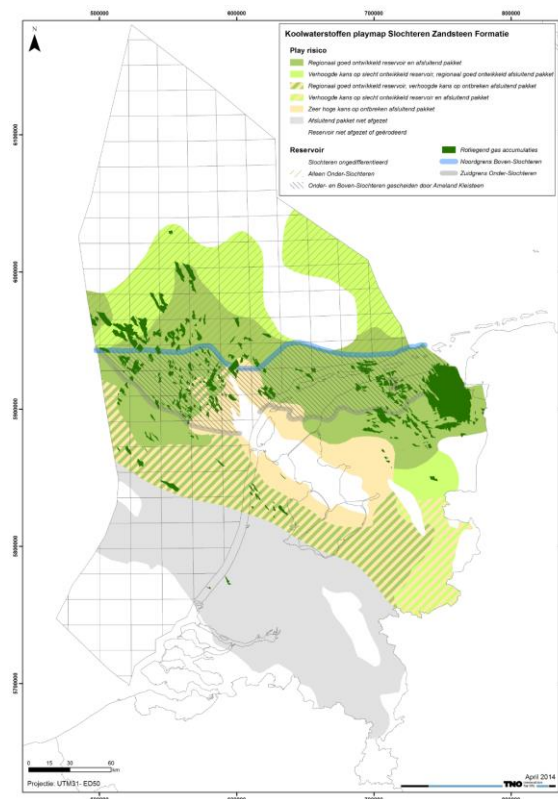
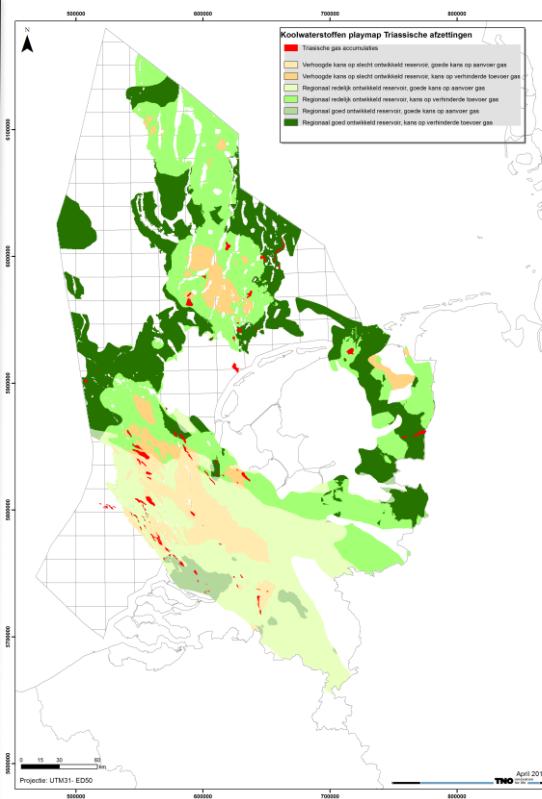
- › Stranded fields in portfolio @ 2010 => some 40 fields
- › Some recent successful stranded fields developments:
 - › **K4-Z**, discovery 1974, developed in 2013 with help of the marginal field incentive
 - › **K15-FH**, discovery 1992, currently under development
 - › **L04-D**, discovery 1981, currently in production with help of the marginal field incentive
 - › **Q07-FA**, discovery 1973, recently successfully appraised.



PROSPECTS IN DUTCH PROVEN PLAYS

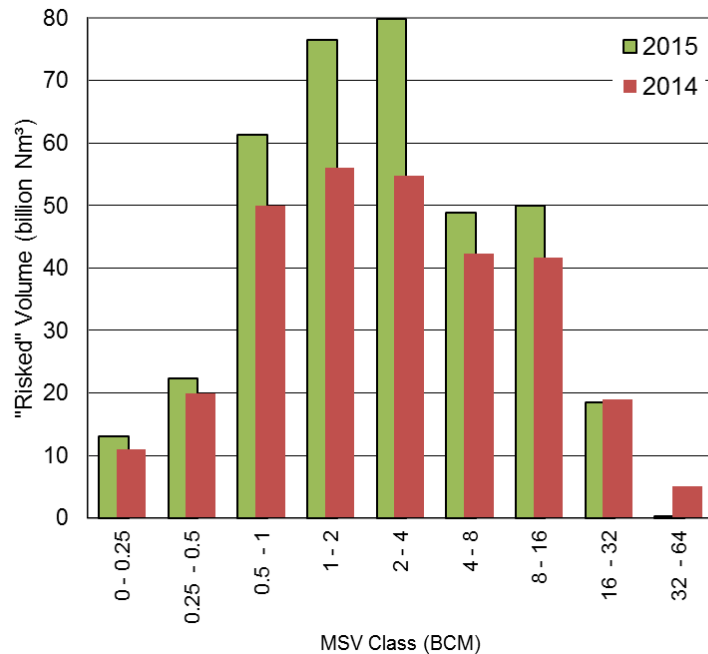


De Jager & Geluk, 2007



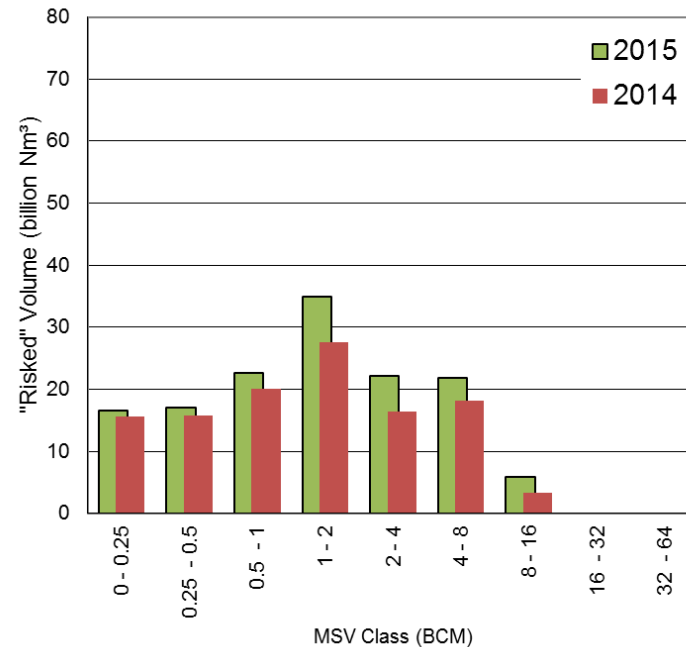
EXPLORATION POTENTIAL IN PROVEN PLAYS

Prospect portfolio Offshore



Exploration potential @ EMV=0 cut-off: 165 bcm

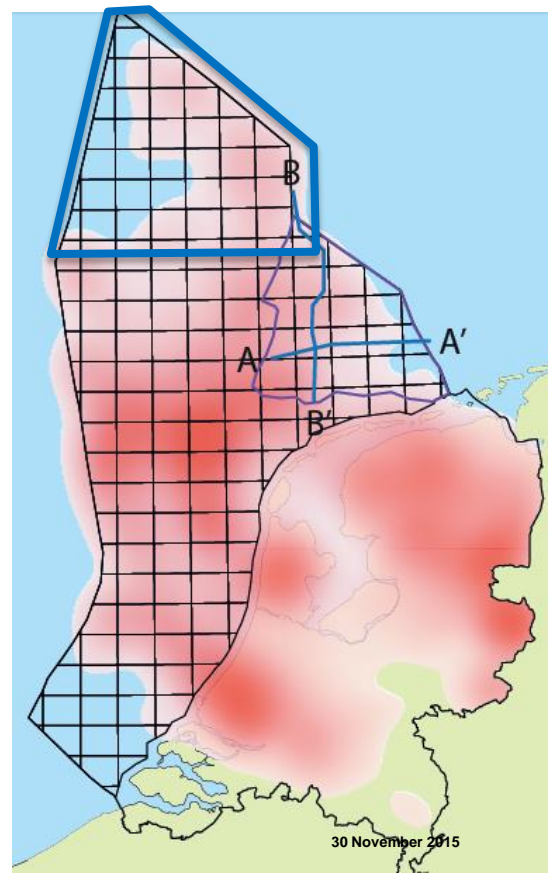
Prospect portfolio Onshore



Exploration potential @ EMV=0 cut-off: 113 bcm

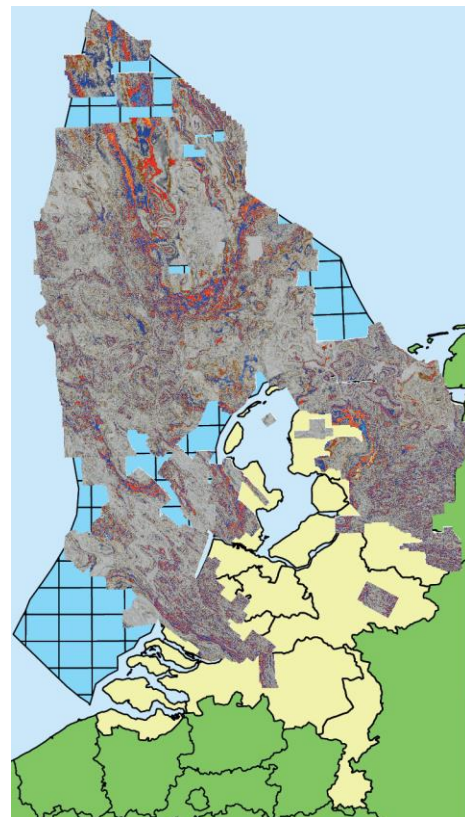
UNDER-EXPLORED DUTCH NORTHERN OFFSHORE

- › Generally 0 to 3 exploration wells per block
- › Wells are generally invalid tests or the “new” plays under study.
- › Outside the main proven play outlines:
 - › No reservoir
 - › Way north of southern provenance Rotliegend feather edge
 - › Very low net reservoir in Carboniferous
 - › Lack of sufficient charge
 - › Presumed lack of mature source rock: not present not mature or over mature
 - › No reservoir ⇔ source connection because of thick sealing packages in between



SUBSURFACE DATA AND E&P INVESTMENT CLIMATE

- › Subsurface data free of charge through ►► www.nlog.nl
 - › Well data
 - › Seismic data
 - › Oil & gas field data
 - › Etc.
 - › Regional subsurface maps & thematic datasets
 - › Geological studies
 - › Bibliography of Dutch geology
-
- › Stable, reliable & encouraging investment climate:
 - › Small fields policy; guaranteed off take of gas from small fields
 - › Marginal fields tax allowance
 - › State participation in exploration and production
 - › Fallow acreage



NORTHERN OFFSHORE G&G STUDIES

- › Ambition: unravel and understand all petroleum geological elements:

- › Structural development
- › Assessment of accommodation space
- › Basin fill architecture
- › Burial history

- › Define plays

- › Reservoir
- › Seal
- › Source

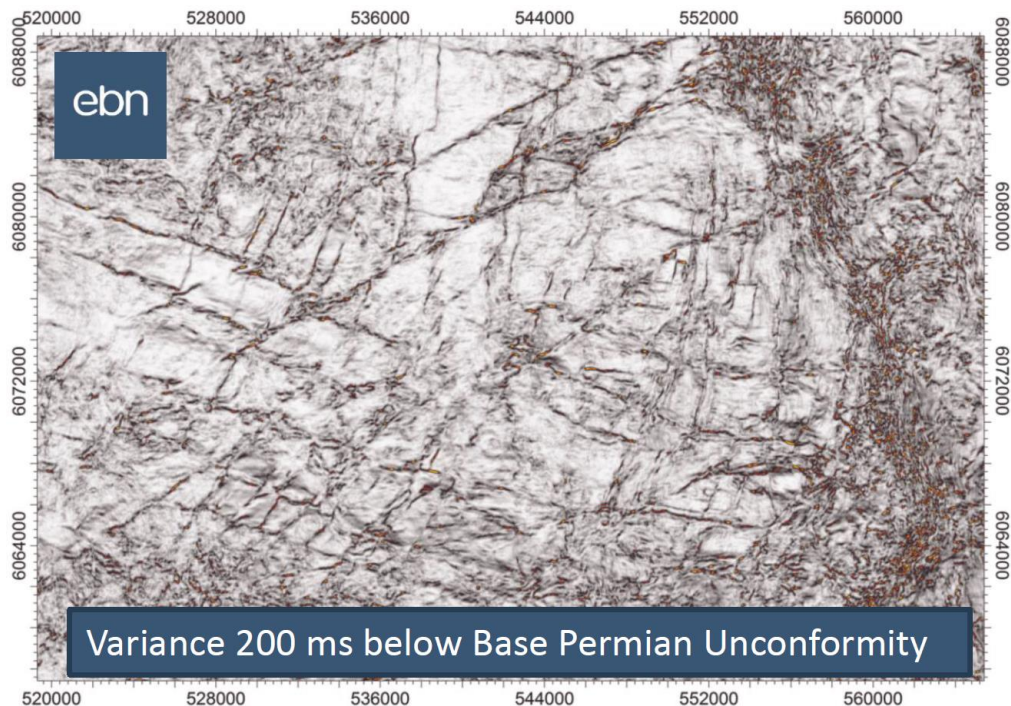
- › See presentation of 2013 for some incipient hypotheses

- › **G&G and “lead” studies performed:**

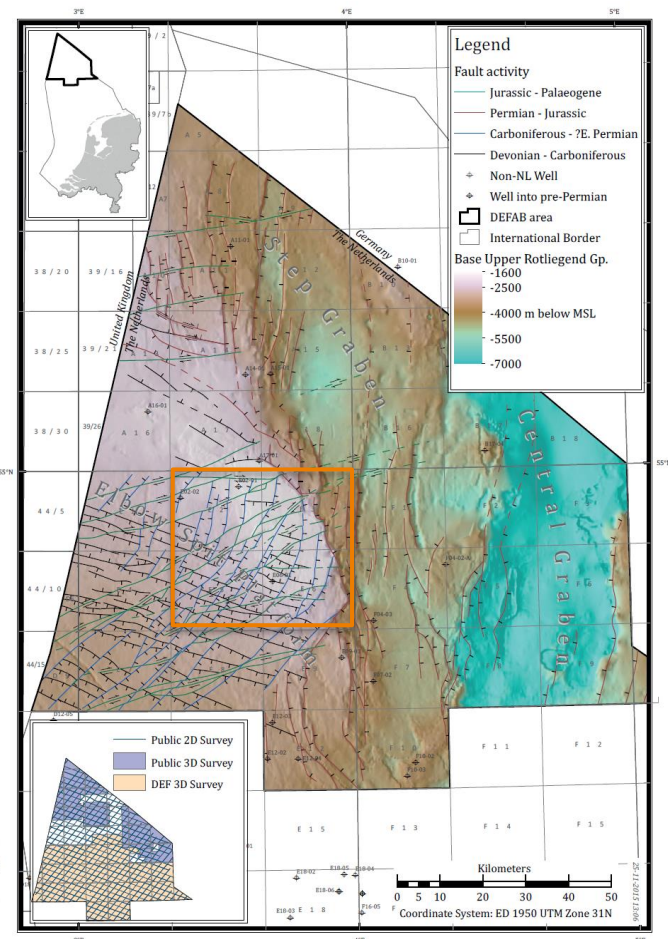
- › Shallow gas
- › Chalk
- › Upper Jurassic – Lower Cretaceous
- › Triassic
- › Carboniferous
- › Structural Development
- › Source rock

- › See poster presentations in **booth 10**
- › and the digital booth on www.nlog.nl

MAPPING SURFACES AND FAULTS

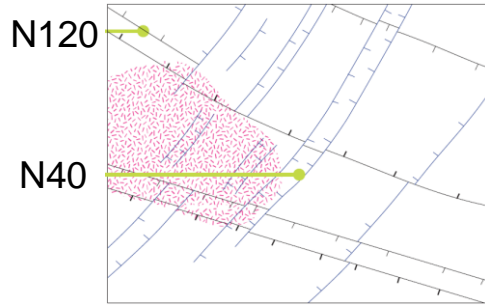


Go North, a fresh look at the Palaeozoic structural framework and hydrocarbon charge in the Dutch northern offshore
Marten ter Borgh*, Bastiaan Jaarsma and Eveline Rosendaal EBN, the Netherlands. * Corresponding author, marten.borgh-ter@ebn.nl

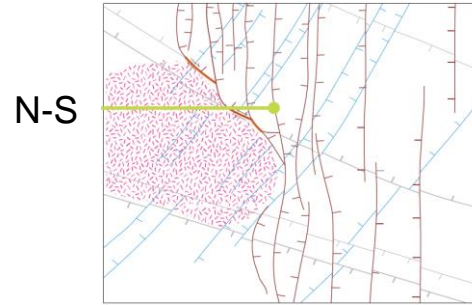


STRUCTURAL FRAMEWORK & DEVELOPMENT

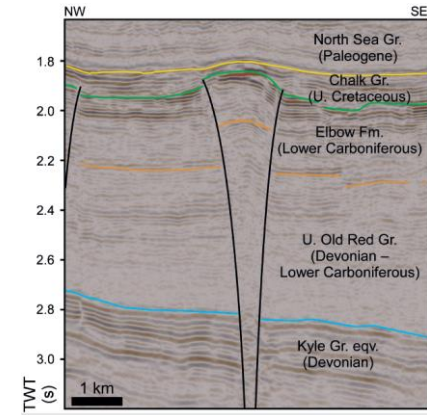
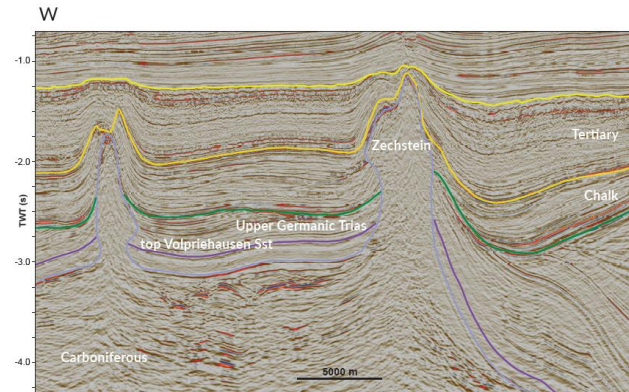
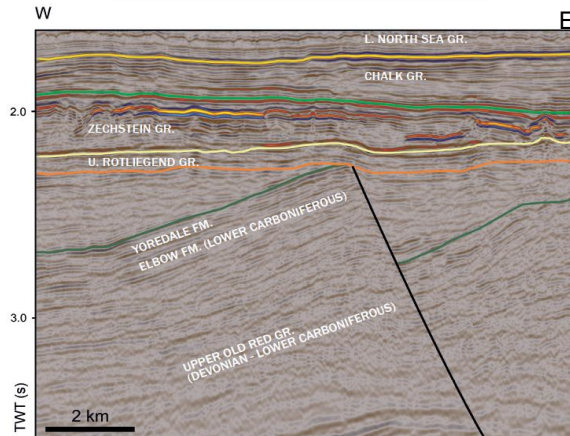
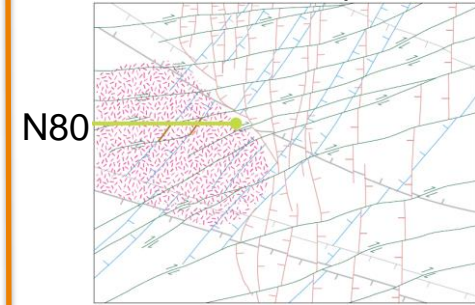
*Devonian–Carboniferous,
-normal faults*



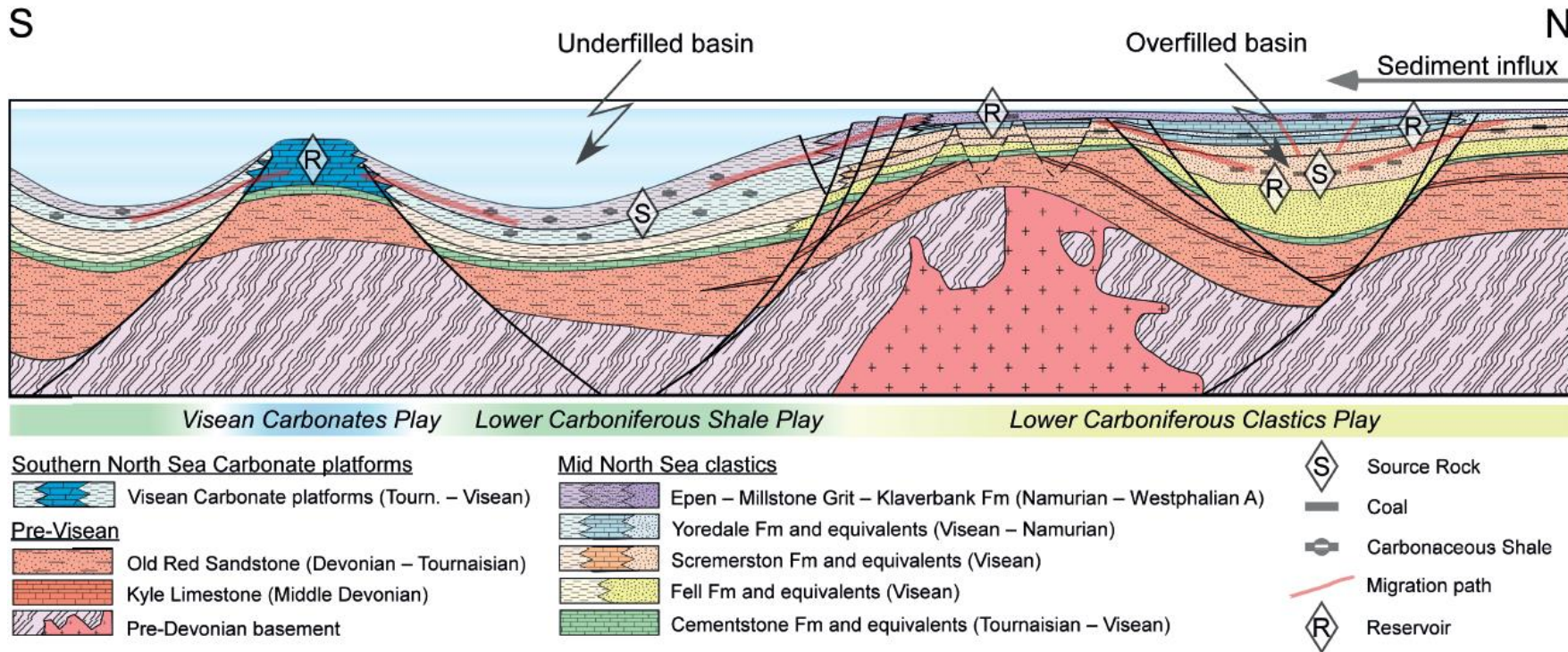
*(Permian) Triassic – Jurassic,
-normal faults*



*Jurassic – Palaeogene
-dextral strike-slip faults*

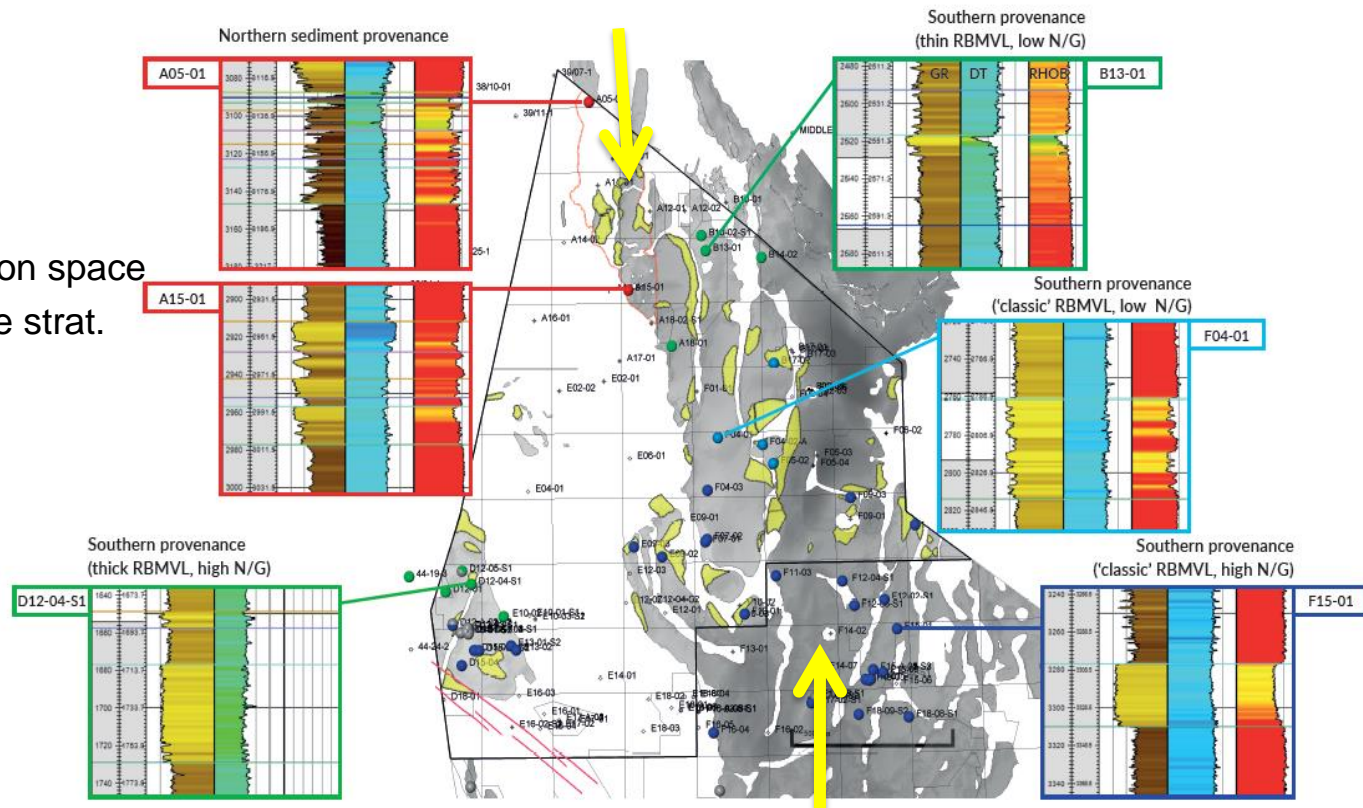


LOWER CARBONIFEROUS BASIN FILL ARCHITECTURE

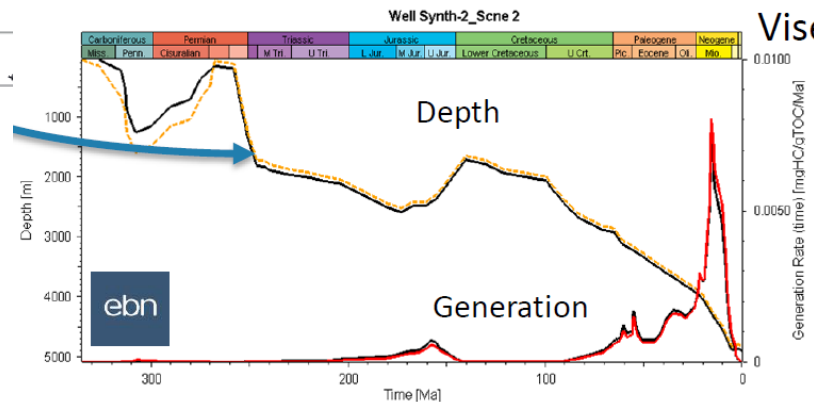
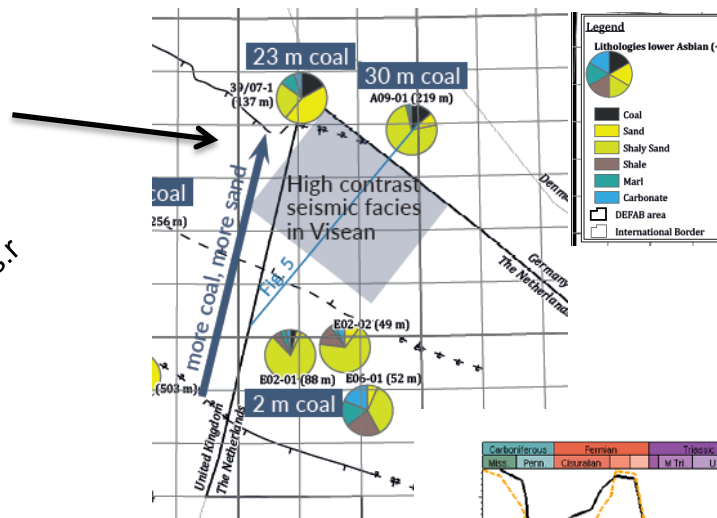
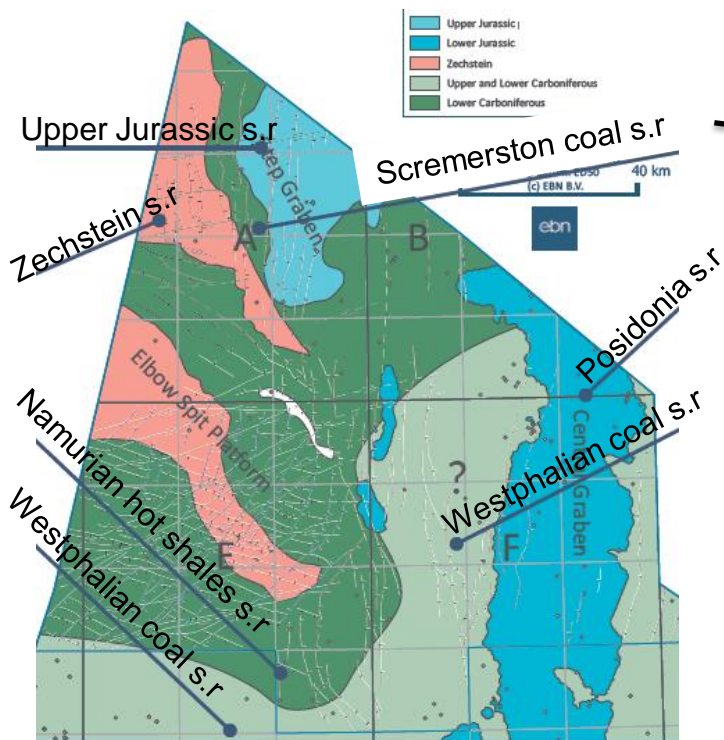


TRIASSIC PROSPECTIVITY

- › Southern provenance
- › Northern provenance
- › Basin wide accommodation space
 - › Traditional layer cake strat.
 - › Local pods



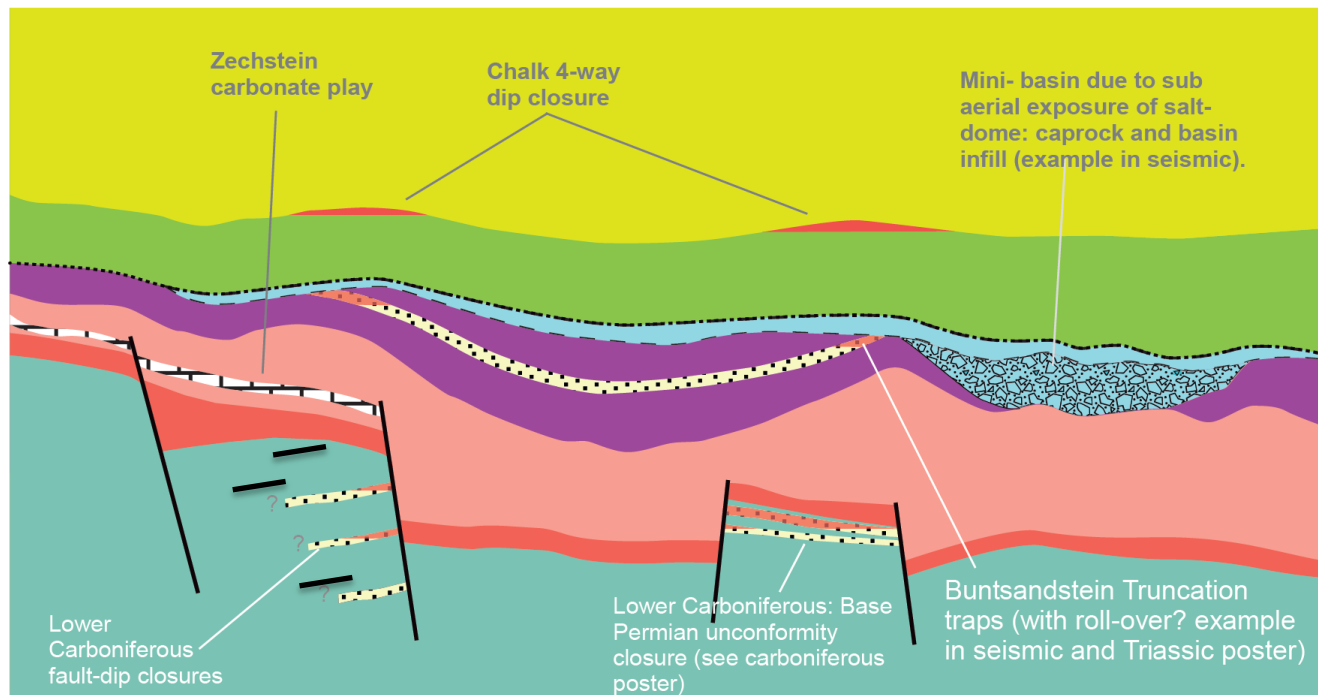
SOURCE ROCKS IN THE DUTCH N-OFFSHORE



PLAYS IN THE DUTCH NORTHERN OFFSHORE

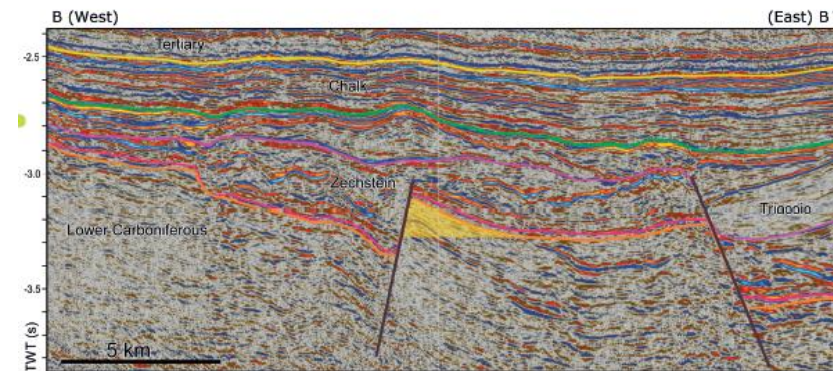
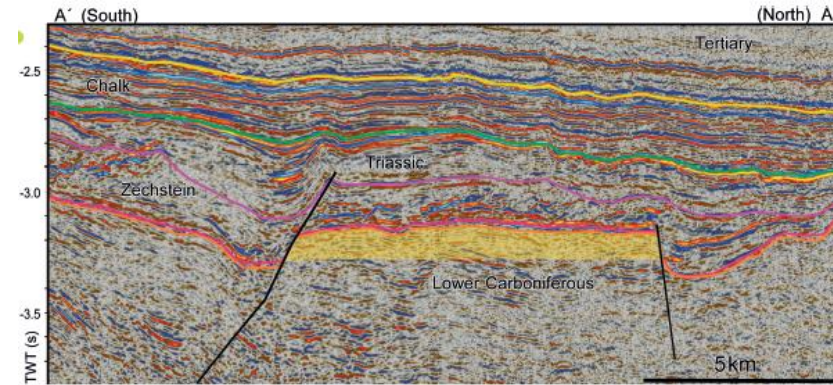
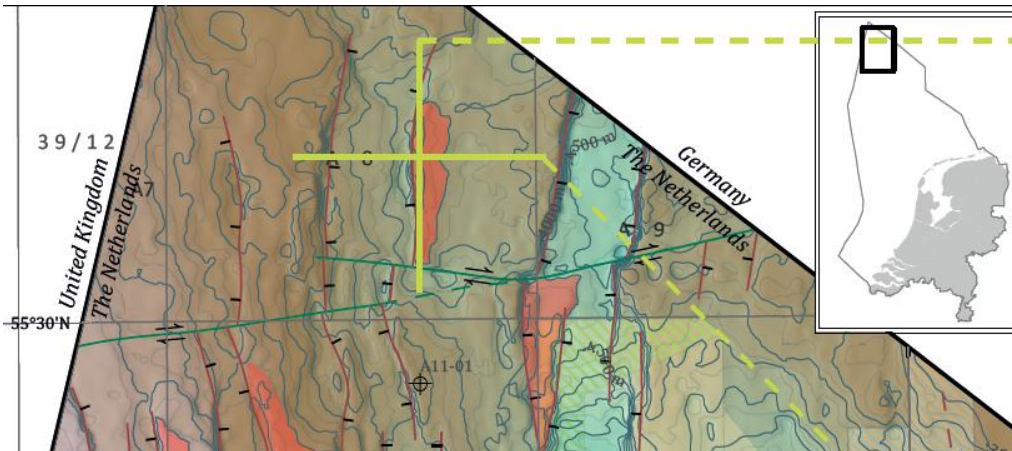
› Plays, reservoirs:

- › Tertiary,
- › Chalk,
- › Jurassic,
- › Triassic,
- › Zechstein,
- › Rotliegend,
- › Upper Carboniferous,
- › Lower Carboniferous



A CARBONIFEROUS LEAD

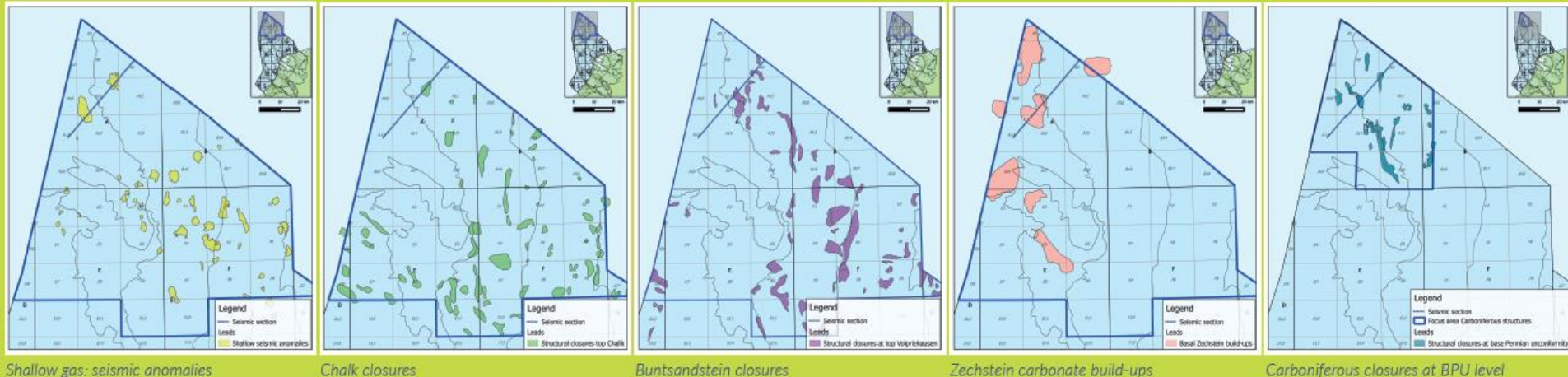
Lead	Kilimanjaro
Reservoir	Namurian & Visean clastics
Seal	Silverpit shales & Zechstein salt
Source	Scremerston coals



EXPLORATION POTENTIAL OF THE DUTCH N-OFFSHORE

› Preliminary inventory:

- › Chalk: >55 untested closures, sizes varying between 10 and 300 MMbbls
- › Triassic: > 50 closures, 29 leads, 80 bcm **unrisked**
- › Zechstein: 7 leads
- › Rotliegend Cygnus equivalents: not evaluated
- › Carboniferous: 20 leads/structures, 75 bcm **unrisked**



CONCLUDING REMARKS

- › G & G studies provide a better understanding of the Dutch Northern Offshore
- › There are well defined plays with respect to source, reservoir and seal combinations
- › Wells drilled in this area are often invalid tests for the plays discussed
- › Within this area numerous leads have been identified to mature
- › Posters and presentation available in the digital booth on www.nlog.nl
- › Further information through EBN or TNO
- › Some of the study results may be presented at:

Palaeozoic Plays of Northwest Europe

Date: 26 - 27 May 2016

Event type: Conference

Organised by: Petroleum Group

Venue: The Geological Society, Burlington House



Mesozoic Resource Potential in the Southern Permian Basin

7-9 September 2016

Burlington House, Piccadilly, London



The ebn logo consists of the lowercase letters 'ebn' in a white, sans-serif font, centered within a solid dark blue square.

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› **THANK YOU FOR YOUR
ATTENTION**

HOPE TO SEE YOU IN
BOOTH 10



Ministry of Economic Affairs

TNO innovation
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