Asset Overview: A09-RB-Agate and A11-RB-Beryl, Triassic

The Triassic in the northern Dutch offshore remains significantly under-explored, although it is a proven play elsewhere in the Southern North Sea. Numerous Triassic leads have been identified in the open A09 and A11 blocks which are located in proximity of nearby infrastructure.



The Triassic in the Dutch offshore

- The Triassic play is the second-most prolific system in the Southern North Sea Basin (ca 2.5 bcm gas production per year, offshore only, which is ca 22% of total offshore production).
- Recent analyses show that the Lower Triassic sediments in the northern Dutch offshore may contain over-looked resources with the potential presence of reservoir sands sourced from the North, structural traps around complex salt bodies and charge from mature Lower Carboniferous source rocks. Röt evaporites are present in large parts of the northern Dutch offshore and these are proven seal for many of the Triassic fields elsewhere.
- Within the A09 and A11 blocks several leads can be drilled from a single location. There is a strong risk-dependency between the leads hence a discovery would de-risk and open up a significant volume portfolio.
- Despite humble in-place volumes per lead, the aggregated volumes are material and would warrant economic development.



Extensive 3D and 2D seismic coverage over Triassic leads



Good geological understanding at the regional play level

Risking of Triassic play elements		
Structure	80%	 Seismic data supports the presence of traps analogous to the successfully tested traps in the Southern North Sea area. Identification of traps is partly based on 2D data and no wells have drilled Triassic strata in A09 and A11 to date.
Charge & migration	80%	 Wells A09-01 and UK 39/07-01 drilled 30 m and 23 m of coal respectively, proving the presence of Lower Carboniferous gas-prone source rocks. Supported by the presence of high contrast seismic facies suggesting the presence of coal and allowing to map these coals over an area. Basin modelling suggests SR currently in gas maturity window. Seismic data indicates the presence of many Zechstein windows to allow HC migration.
Seal presence & efficiency	50%	 Seismic interpretation supports the presence of Röt salt (bright reflector) which is a proven seal in other Triassic fields elsewhere in the North Sea area. Gas fields in the UK are sealed by a thin layer of Lower Cretaceous Marls. Well data is scarce and overpressures may have caused seal breach and limitation to the hydrocarbon column height to be retained below top seal.
Reservoir presence	90%	 Adequate reservoir rock parameters successfully tested in nearby wells. Lateral continuity is likely as indicated by convincing seismic control, although well density is sparse. Seismic data shows the presence of local depocentres. A15-01 drilled a local depocentre and proved the presence of Triassic reservoir rocks with good reservoir quality. However the A15-01 well did not encounter hydrocarbons.

A09-RB-Agate, Triassic

The undiscovered Agate lead is the largest of 3 leads mapped in the open A09 offshore block. These leads could be drilled with slanted wells from a single drilling platform.



Volumetric assessment

- **Primary targets:** Mixed fluvial/eolian sandstones of the Volpriehausen Fm.
- Secondary targets: Detfurth, Hardegsen and Solling Fm.
- Estimated recovery factors of 60-70%
- In the success case these structures are charged with natural wet gas with ca. 5% non-HC gasses (CO₂, N₂).

Risked recoverable bcm	P90	P50	P10
A09-RB-Agate	0.1	0.3	0.8
Total in block	0.5	1.5	4.4

Work program Requirements

- Apply for exploration license.
- Reprocess 3D vintage data.
- Drill exploration well to de-risk lead portfolio, to be converted into a production well (in success case).
- In success case, A09 could support stand-alone development. The prospects can be drilled with deviated wells from a single, central platform location. An alternative option would be a tie- back to A12 facilities in case A09 volumes < P50 volumes.
- The A12 facilities are capable of handling the higher reservoir pressures expected from the Triassic.

Block activity

- The A-quadrant is therefore relatively underexplored, with circa 12 Exploration wells drilled, typically one well/500km². Data for these wells is public.
- The nearest well (A08-1) well was drilled in 1996 into an Upper Jurassic 4-way dip closure on top of a Zechstein salt diapir.
- The closest infrastructure is the A12a platform which drains gas from the Tertiary A12-FA field (Shallow gas). The A12a jacket leg platform is unmanned and has processing capability. Distance from A12a to A9 is approximately 16km.
- The A09 block is fully covered with 3D seismic acquired in 1993, publicly available, and PSTM reprocessed in 2012.





Economic overview

- The aggregated expected volume of the leads in the block (1.5 bcm in A09) is significant, with a strong inter-lead risk dependency.
- A successful first well would open up the portfolio, and the combination of at least two discoveries per block would warrant a multi-well, stand-alone platform development concept.
- The Minimum Economic Field Size in this area has been estimated ca 1 bcm (recoverable) based on following assumptions:

Drilling start	2021	Avg. decline	15%
Est. Qi	0.25 bcm/ yr	Gas price	€0.19 /m3
RVIR cut-off	10%	Marginal allow.	25%-40%

A11-RB-Beryl, Triassic

The undiscovered Beryl lead (area ca. 27.1 km2) is the largest of 5 leads mapped in the open A11 offshore blocks



2D line NSR09-21068-1-PRCMIG, twt, reversed po

Volumetric assessment

- Primary targets: Mixed fluvial/eolian sandstones of the Volpriehausen Fm.
- Secondary targets: Detfurth, Hardegsen and Solling Fm.
- Estimated recovery factors of 60-70%
- In the success case these structures are charged with natural wet gas with ca. 5% non-HC gasses $(CO_2, N_2).$

Risked recoverable bcm	P90	P50	P10
A11-RB-Beryl	0.1	0.3	0.8
Total in block	0.5	2.3	5.5

Work program Requirements

- Apply for exploration license.
- Reprocess 3D vintage data.
- Drill exploration well to de-risk lead portfolio, to be converted into a production well (in success case).
- In success case, A09 could support stand-alone development. The prospects can be drilled with deviated wells from a single, central platform location. An alternative option would be a tie- back to A12 facilities in case A09 volumes < P50 volumes.
- The A12 facilities are capable of handling the higher reservoir pressures expected from the Triassic.

Block activity

Circa 12 wells have been drilled in the A-quadrant targeting pre-Tertiary levels and is therefore are relatively under-explored area with typically ca 1 well/500km2. All these wells are released to the

- The closest A11-1 well was drilled in 1981 to a deeper (Lower Carboniferous) combined dip/fault closure target. The closest infrastructure is the A12a platform which drains gas from the Tertiary A12-FA field (Shallow gas). The A12a jacket leg platform is un-manned with processing capability. Distance from A12a to A11 is ca 11km.
 - The A11 block is partly covered with 3D seismic acquired in 1998, publicly available, and PSTM reprocessed in 2012.
 - The entire block is covered with a high density grid of 2D seismic lines of various vintages.

Average production profile forecast



Economic overview

- The aggregated expected recoverable volume of the leads in the block (2.3 bcm in A11) is significant, with a strong inter-lead risk dependency. A successful first well would open up the portfolio, and the combination of at least two discoveries per block would warrant a multi-well, stand-alone platform development concept.
- ٠ The Minimum Economic Field Size in this area has been estimated ca 1 bcm (recoverable) based on following assumptions:

Drilling start	2021	Avg. decline	15%
Est. Qi	0.3 bcm/ yr	Gas price	€0.19 /m3
RVIR cut-off	10%	Marginal allow.	25%-40%