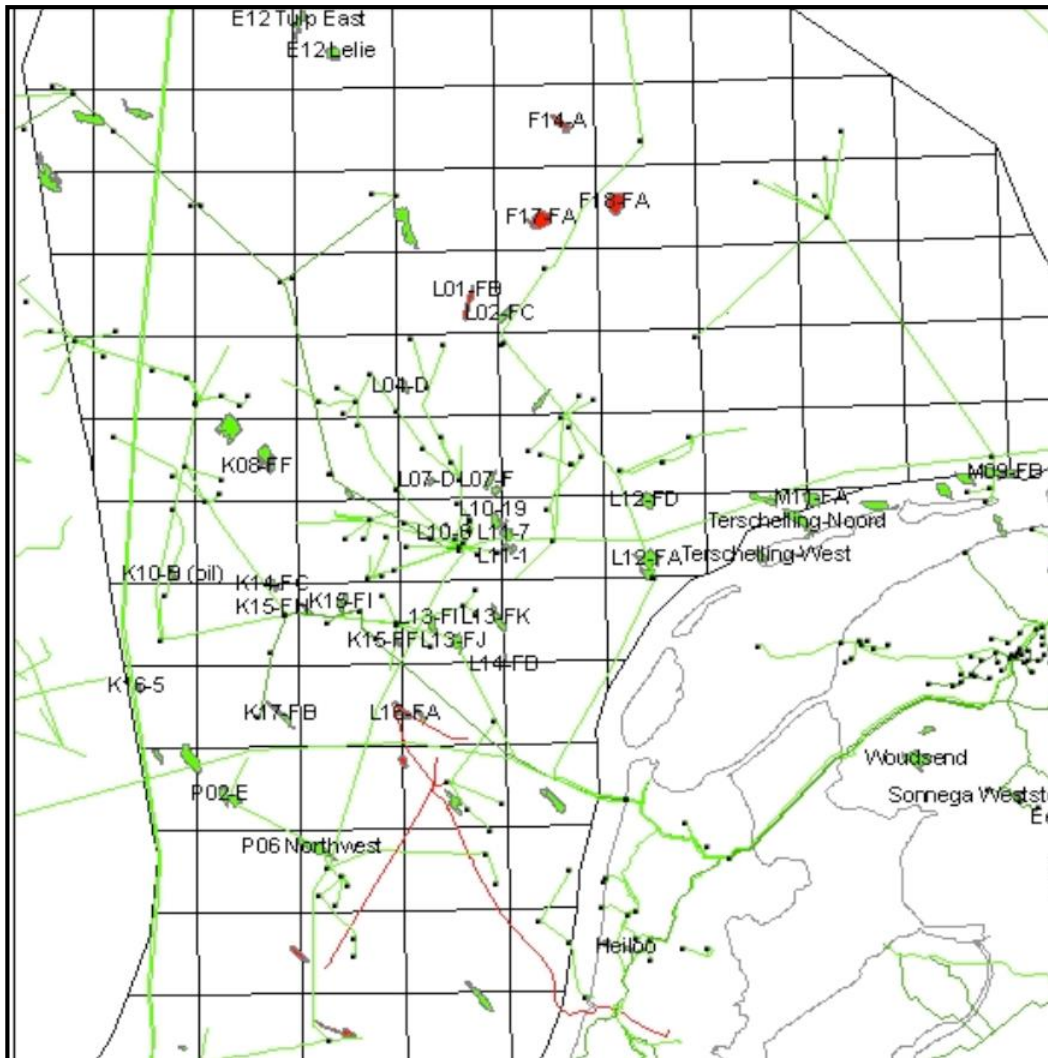


Tight Gas in the Netherlands

A Study Proposal

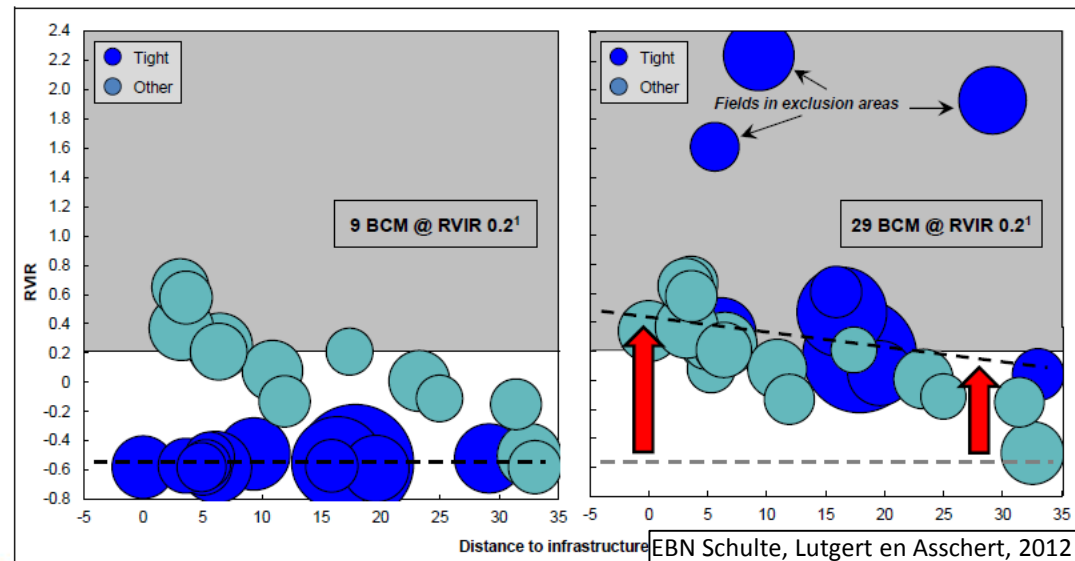


EBN Exploration Day

23 May 2016

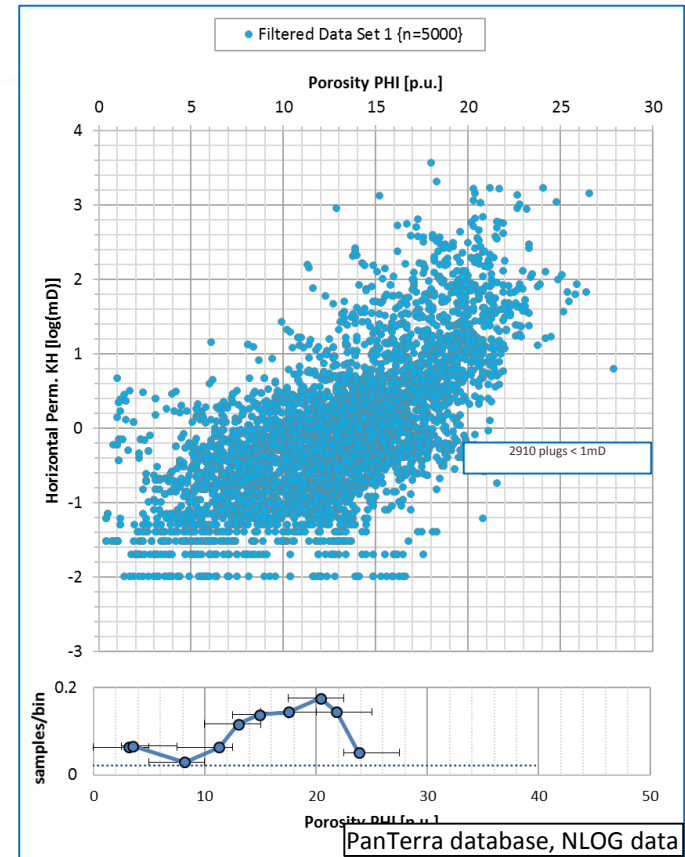
Why a Tight Gas Study Proposal

- The Netherlands contains circa 50 discoveries with about **100 – 200 bcm** undevelopped gas in tight reservoirs
- Several successful and unsuccessful tight gas appraisal/developments have taken place
- Infrastructure is aging
- Time is running out for tight gas field appraisal / development
- EBN study demonstrates good commercial opportunities with tight gas stimulation



Tight Gas Study Proposal

- PanTerra proposes to categorize and map offshore tight gas discoveries and fields in Rotliegend and Bunter reservoirs
- PanTerra is in a unique position for this study because of its:
 - database and experience with core studies
 - geological knowledge of the Netherlands
 - experienced G&G and reservoir engineering department
 - access to stimulation and other experts



Tight Gas Study Proposal

- Categorize and describe offshore tight gas discoveries in Rotliegend and Bunter reservoirs
- Collect, study and integrate:
 - Core descriptions (Depositional system, facies, diagenesis)
 - Core experiments (mineral and clay content, porosity, permeability, capillary pressure, electrical properties a,m,n)
- Define burial history (literature, wells and seismic)
- Petrophysical consistent log evaluation
- Identify tight rock classes
- Integrate SCAL data for a hydraulic rock-typing approach
 - pore throat radius
 - relative permeability measurements: What is “mobile gas”?
- Collect, evaluate and integrate well test, stimulation and production data and correlate them with the rock types defined above.
- Describe common tight gas factors and differences
 - Can sweet-spots be identified
 - Recommend which stimulation techniques work best
 - Define best practice to calculate production forecasts and recovery

None Proprietary Study

- Estimated start: Summer 2016
- Duration: About one year
- Workscope: to be framed with sponsors
- PanTerra seeks sponsors for this project
- Cost estimate: Pending study framework