



November 20th, 2025

10th Dutch **Exploration Day**

ebn

State Energy Company
of the Netherlands

Useful models in CCS

Joop de Kok (EBN)



A sustainable **gas** system

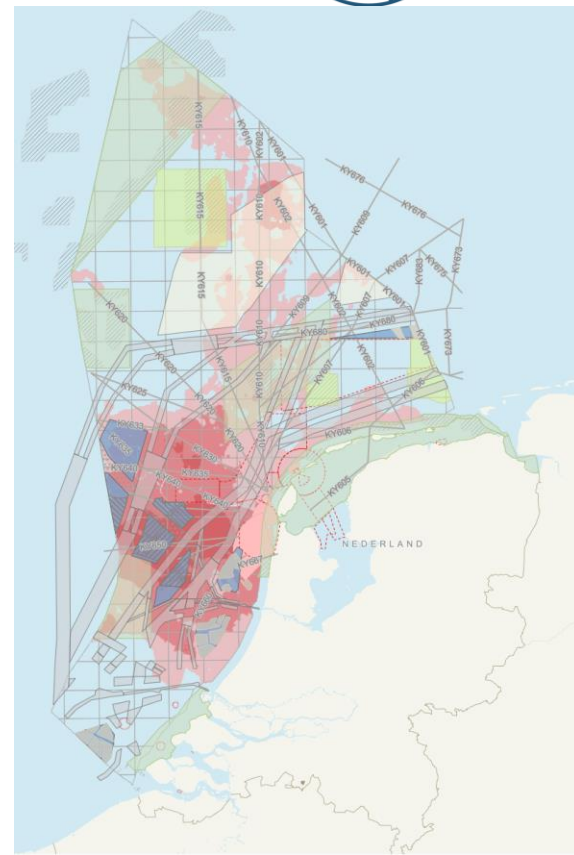
Exploring...



... for CO₂ storage resources

- Depleted gas reservoirs
- (Oil reservoirs (EOR))
- Aquifers

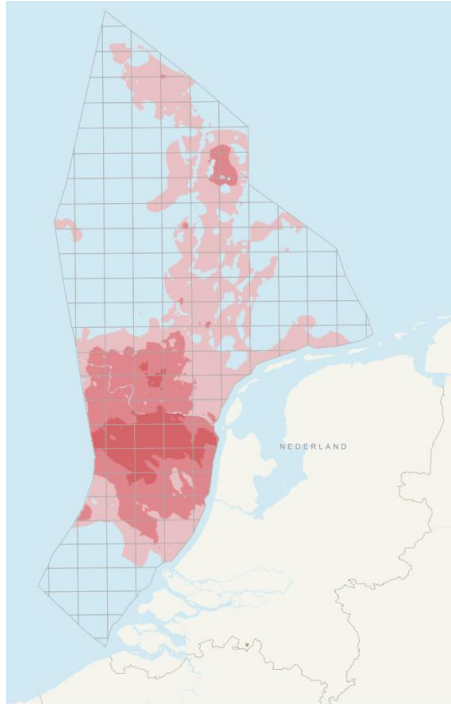
In a very busy North Sea



Aquifers vs depleted gas reservoirs

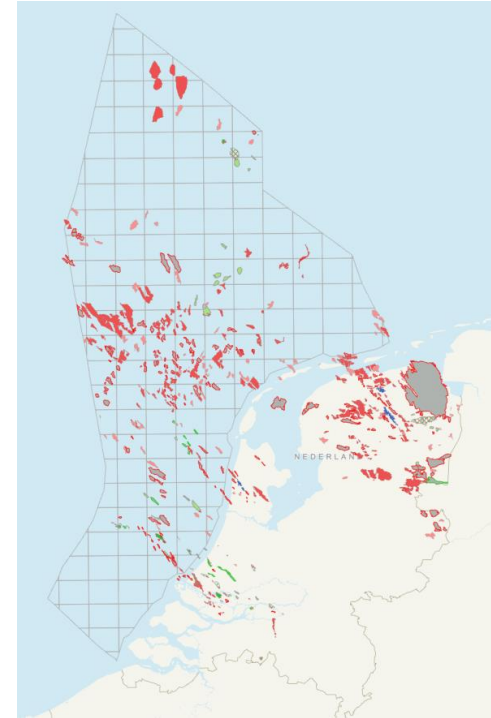


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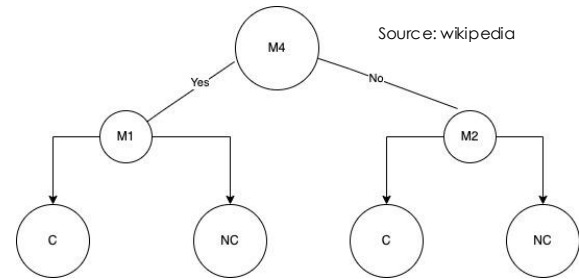
Aquifers		Depleted gas reservoirs
Large uncertainty – but larger potential (?)	Storage resources	Small uncertainty – but less upside
Less legacy wells – but abandonment more uncertain (?)	Legacy wells	More legacy wells – but better documented(?)
Less complex	CO ₂ behavior	More complex at low pressures
More uncertain	Trapping mechanisms	Mainly structural trapping

What role do models play in CCS?



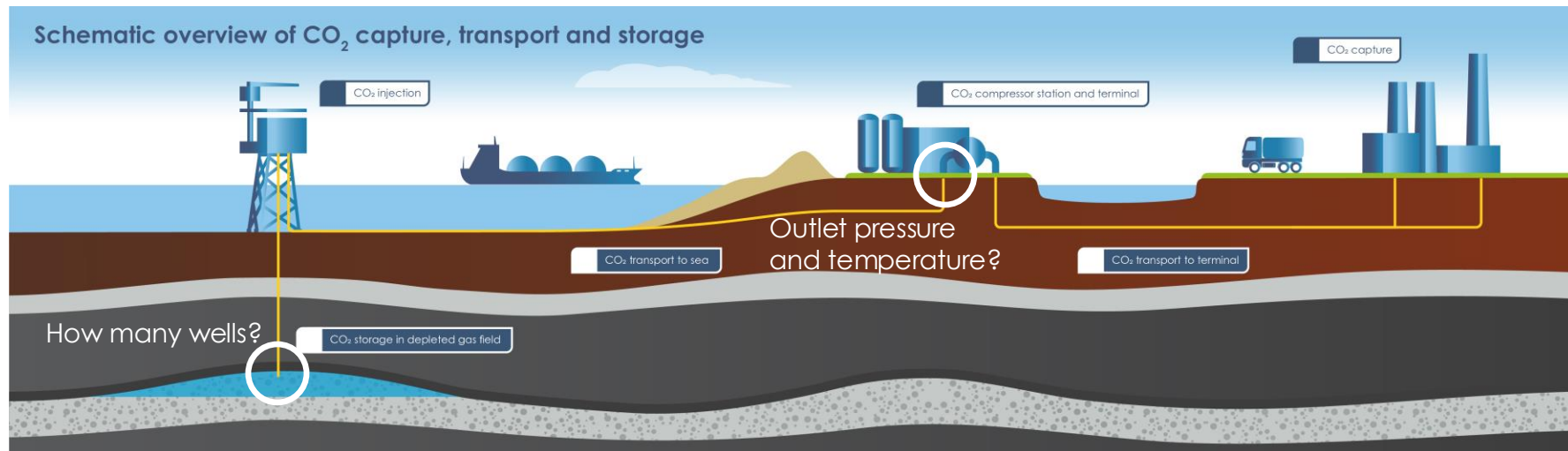
Model cliches

- “All models are wrong, some are useful” – George Box
- Models are tools to make better decisions
- Which decisions?



Decisions in CCS

Storage at the end of value chain



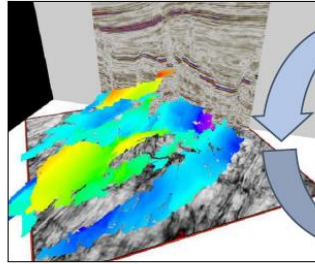
Models



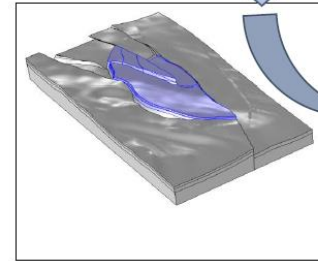
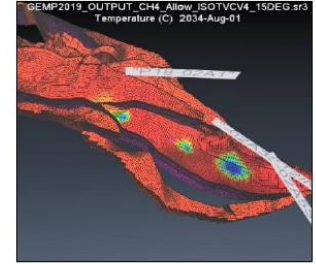
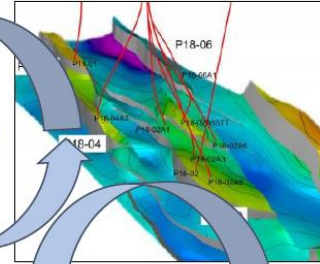
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Which models for which decisions?
Many decisions, many (coupled) models

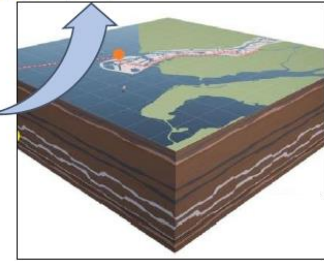
Geology & Geophysics



Reservoir Engineering



Geomechanics



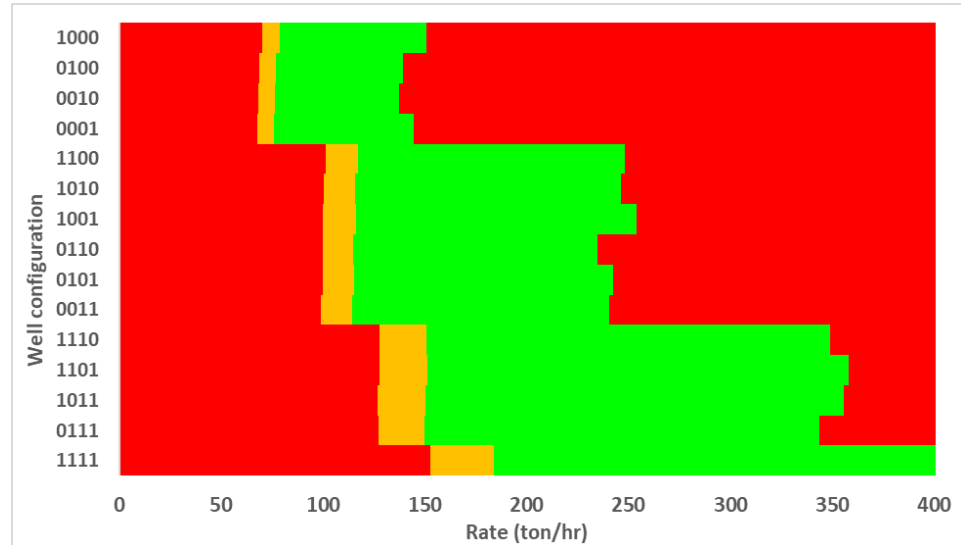
Flow Assurance

More models

Which well completion?

Pressure and temperature limits
→ operating envelope

Requires coupled models

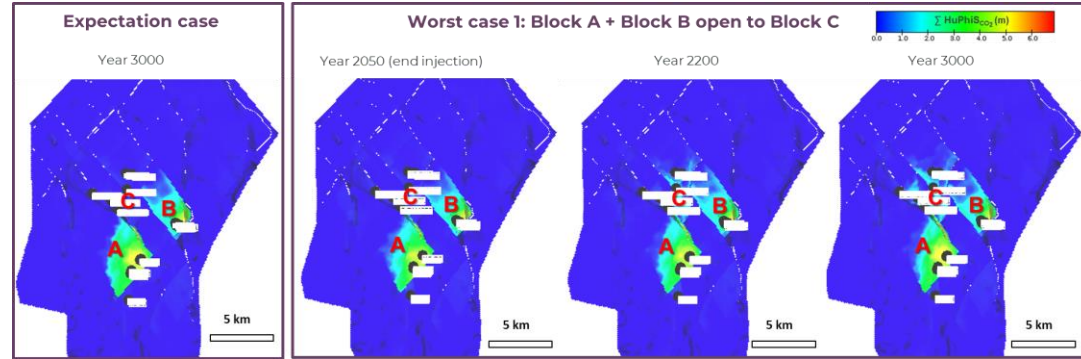


Even more models

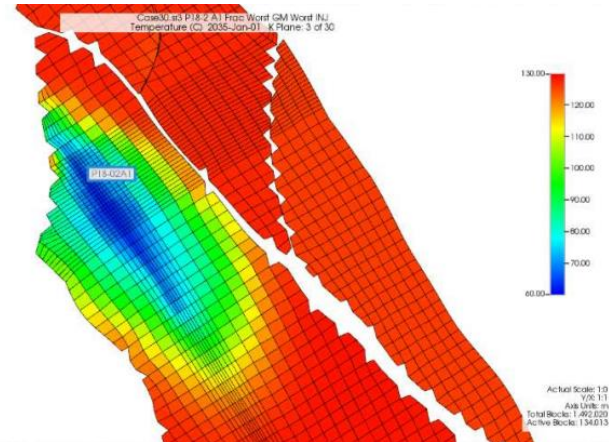


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How large should my storage complex be?
Design model for potential leaks



Where do I place my new wells?
Take geomechanics into consideration



Monitoring

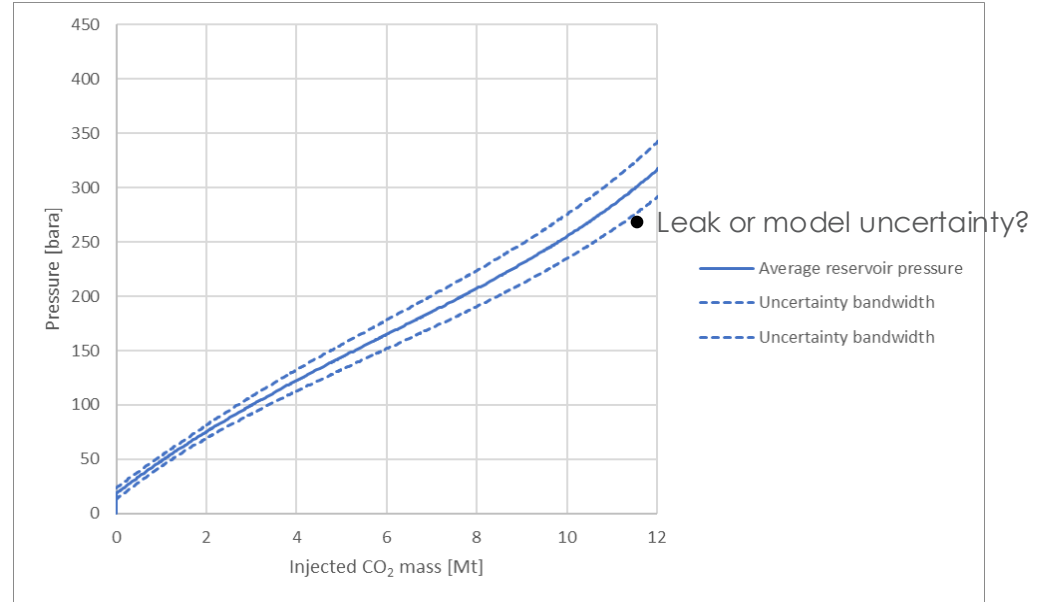


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Risk-based and site specific

- Containment
- Capacity (storage resources)
- Injectivity



A sustainable gas system

Summary



Main differences with conventional gas production models:

- More focused on risks
- More processes to consider – coupled simulations
- Larger timescales

Take this into account when designing your models