NORWEGIAN PETROLEUM DIRECTORATE

Charge risk on the Norwegian Shelf

FORCE – Petroleum Charge and Migration

23 January 2020

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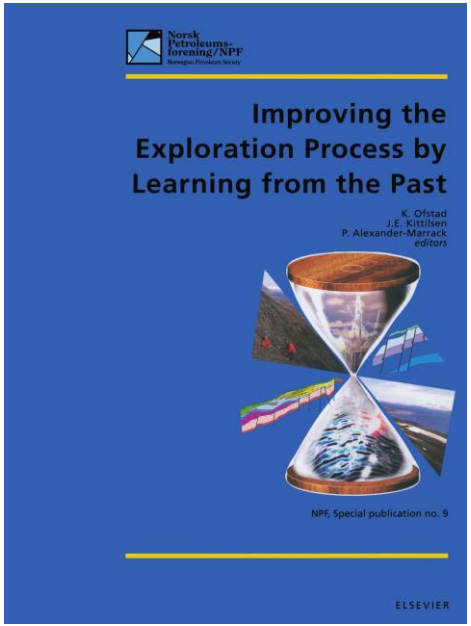
Background

A previous study by NPD presented at Exploration Revived 2017 (M. Bjørheim et. al.) Showed that charge failure seemed to be the most common post drill explanation for failure on the NCS.

The material presented today is based on a study that builds on the same dataset, expanded with data up to mid 2019. In addition, the pre drill risk assessment have been included in the dataset.

History of the dataset

FIND was a forum, similar to FORCE, to facilitate co-operation between companies. It was later merged into FORCE



Dataset

Section: "Well data"	Comments	Comments	Example: Dummy Prognosis	Example: Dummy Result	If there is more than one prognosis per prospect, please duplicate the prognosis column (column " i "): Prognosis	Result
Evaluation - dry well						
CHARGE	Charge	OK / Fail / Not relevant		OK		
	Presence of source					
	Maturity of source					
	Migration of HC					
TRAP	Trap	OK / Fail / Not relevant		OK		
	Presence of closure					
	Presence of top seal					
	Presence of lateral seal					
RESERVOIR	Reservoir	OK / Fail / Not relevant		OK		
	Presence of reservoir					
	Quality of reservoir					
COMMENT	Dry well comments					

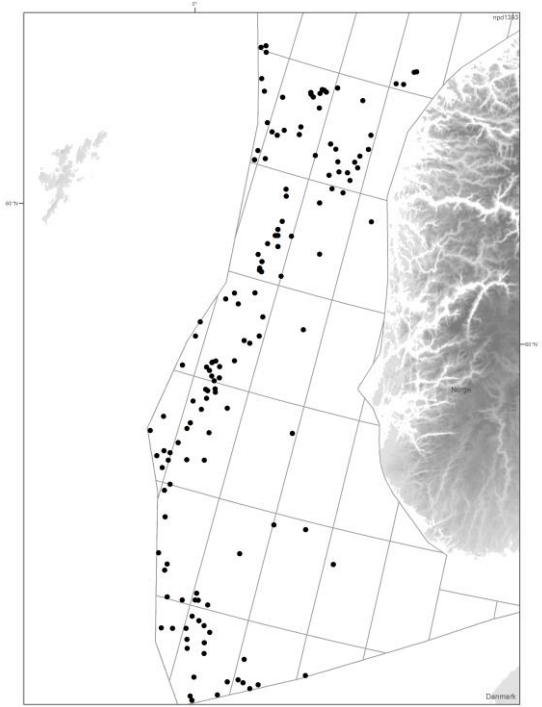
Probability			
Probability of discovery, technical	Total	Fraction	0.36
Probability of discovery, technical	Charge		0.45
Probability of discovery, technical	Trap		0.90
Probability of discovery, technical	Reservoir		0.90
Comments	Comments relevant to risking (DHI, AVO analysis, etc.)		

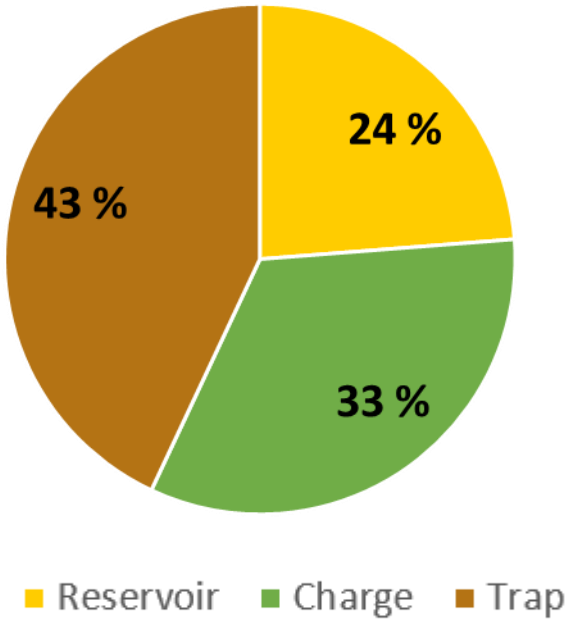
Dataset summary

- Wildcats (2007 – spring 2019)
- Focus: dry targets and reason for failure

- **North Sea: ~ 165 dry targets**
- **Norwegian Sea: ~ 70 dry targets**
- **Barents Sea:~ 80 dry targets**

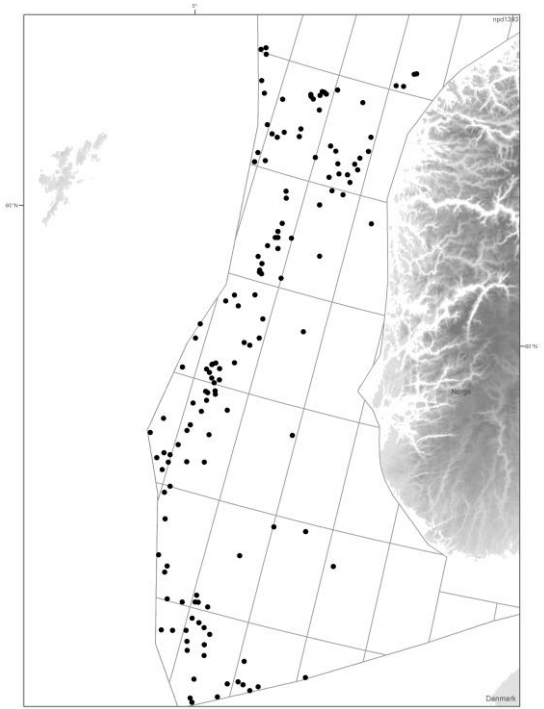
North Sea: Main risk prior to drilling

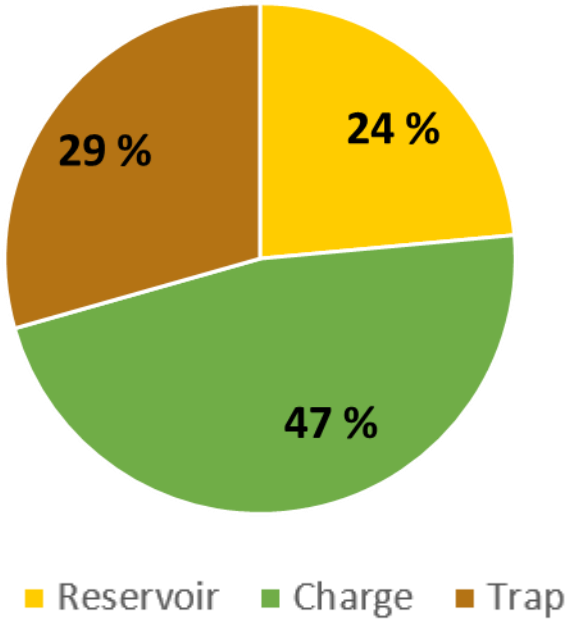




Reservoir	Presence of reservoir Quality of reservoir
Charge	Presence of source Maturity of source Migration of HC
Trap	Presence of Closure Presence of top seal Presence of lateral seal

North Sea: Main reason for failure





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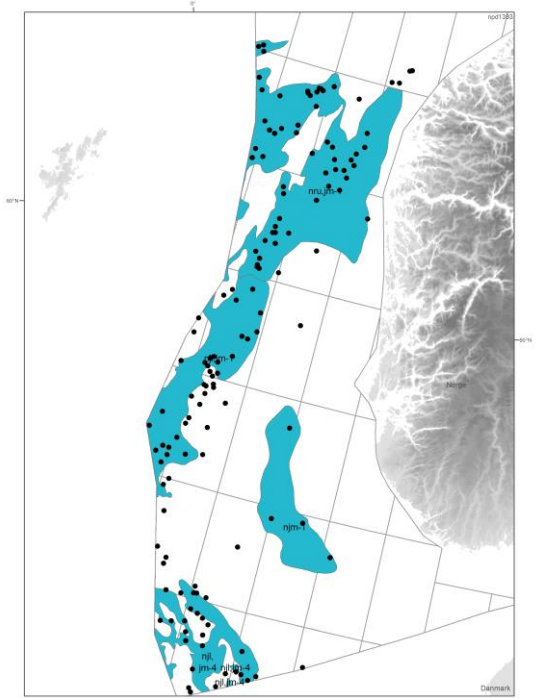
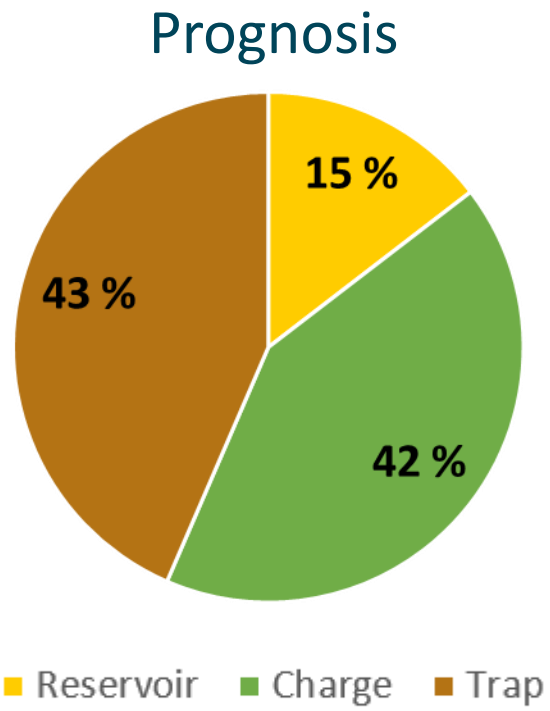
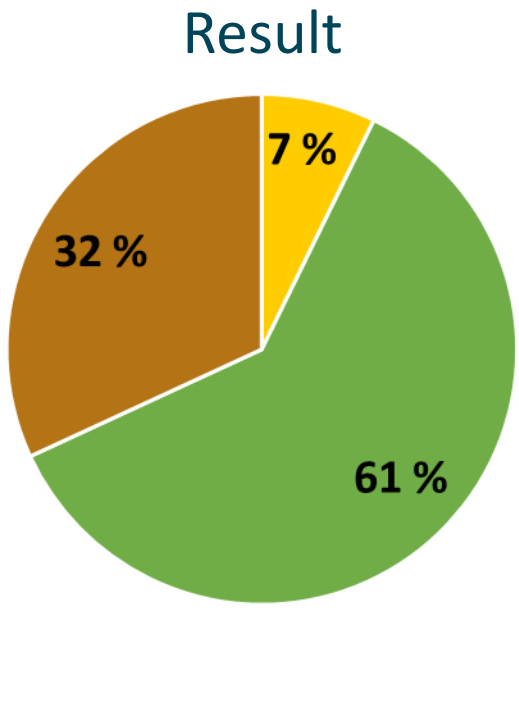
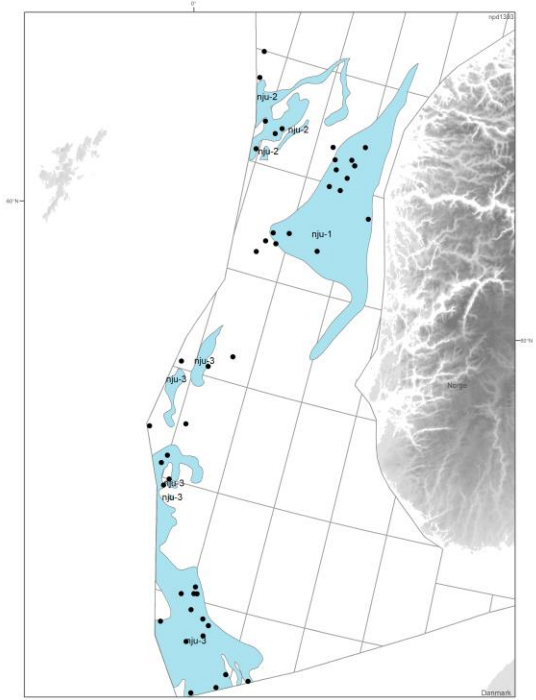
North Sea – U. Triassic to M. Jurassic plays



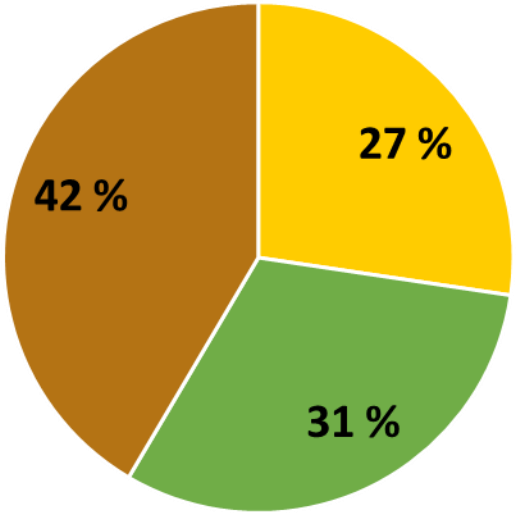




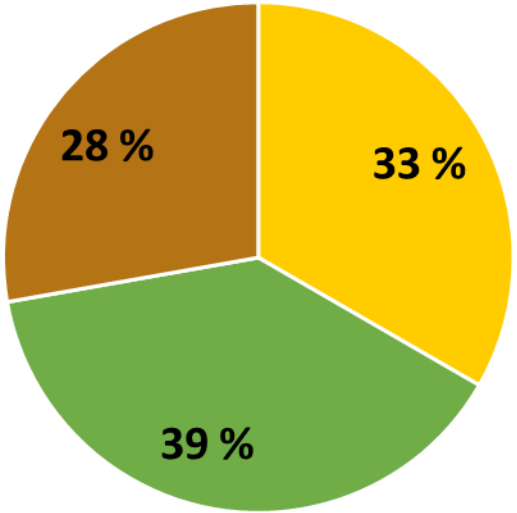
North Sea – Upper Jurassic plays



Prognosis

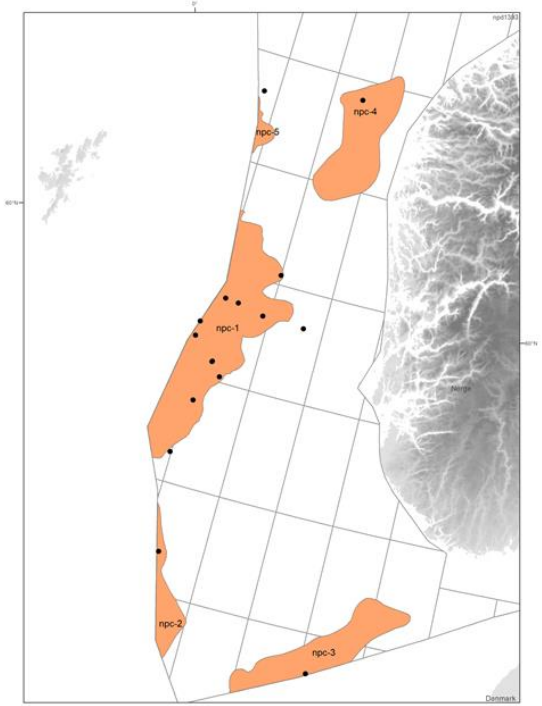


Result

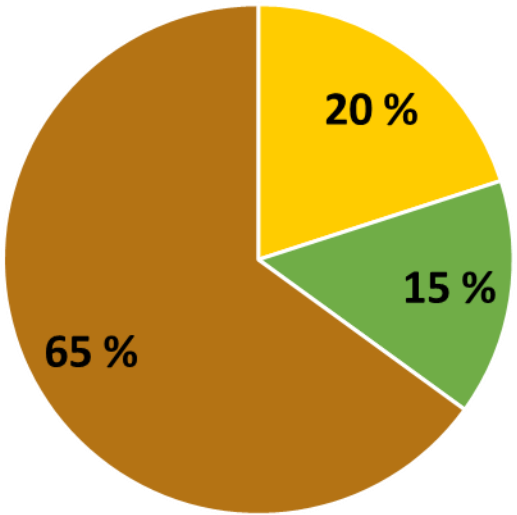


Reservoir Charge Trap

North Sea - Paleocene plays



Prognosis



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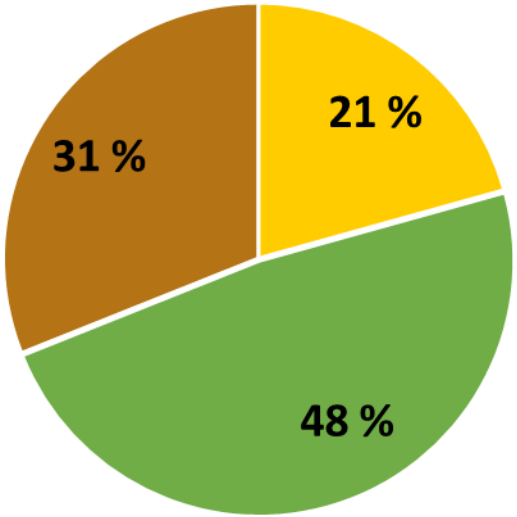
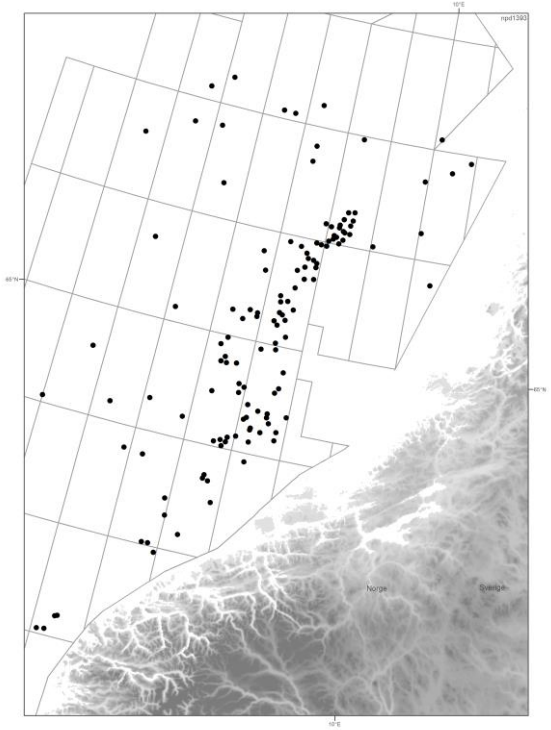
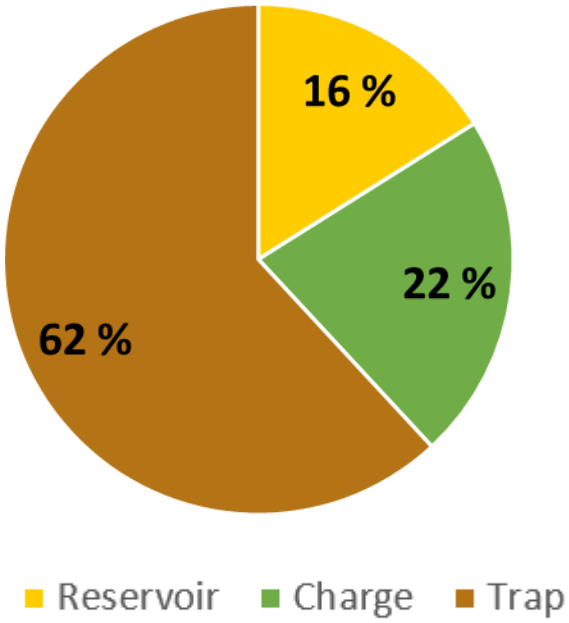


Reservoir Charge Trap

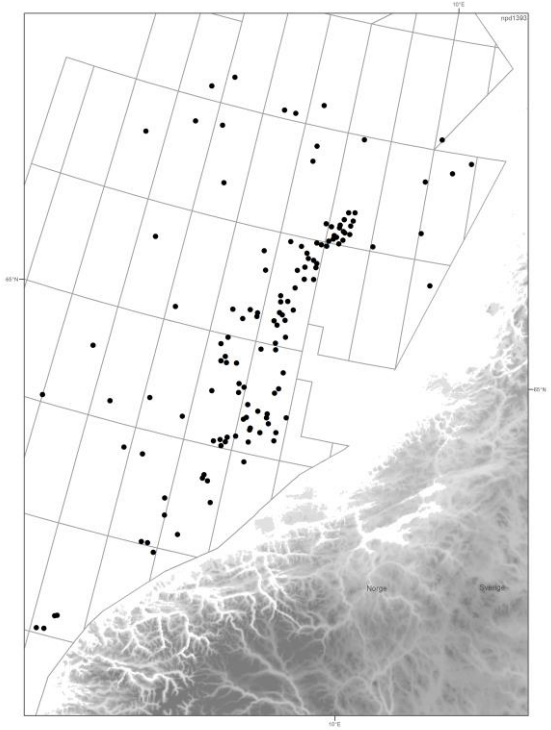
Norwegian Sea: Main risk prior to drilling

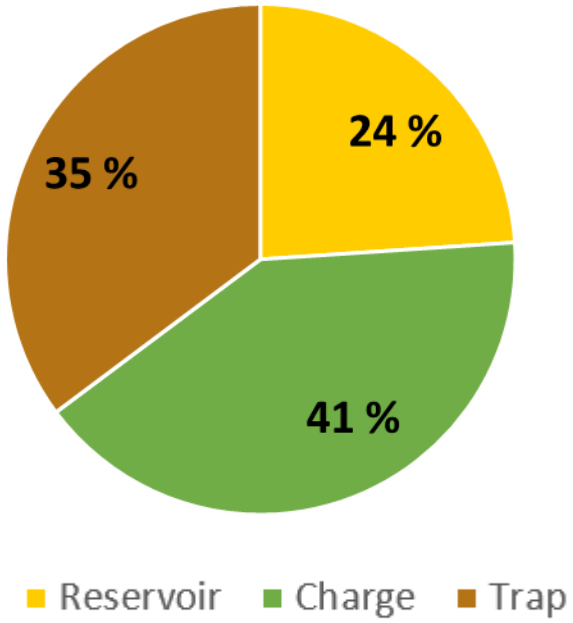




Reservoir	Presence of reservoir Quality of reservoir
Charge	Presence of source Maturity of source Migration of HC
Trap	Presence of Closure Presence of top seal Presence of lateral seal

Norwegian Sea: Main reason for failure





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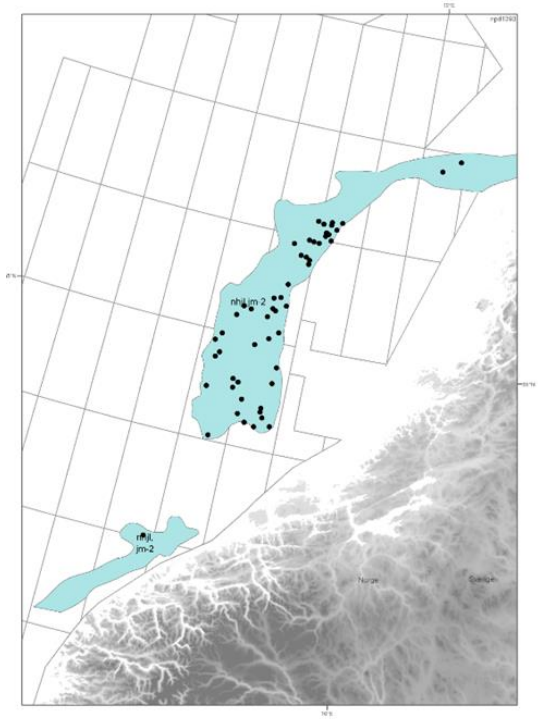
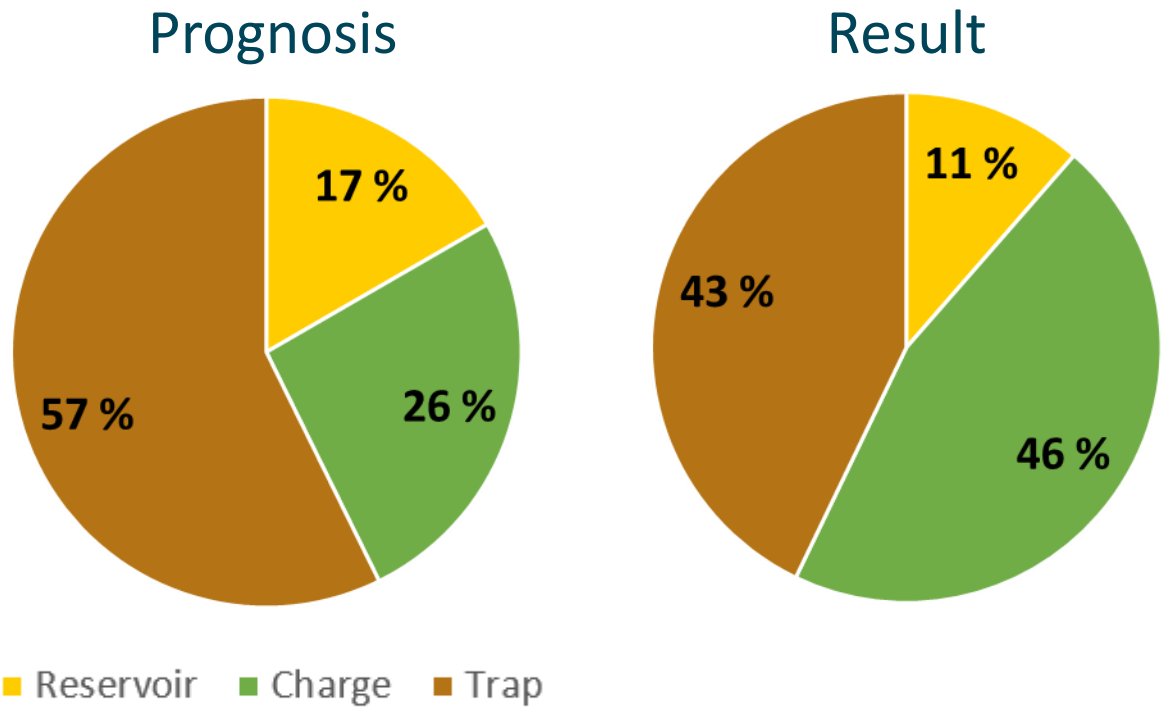
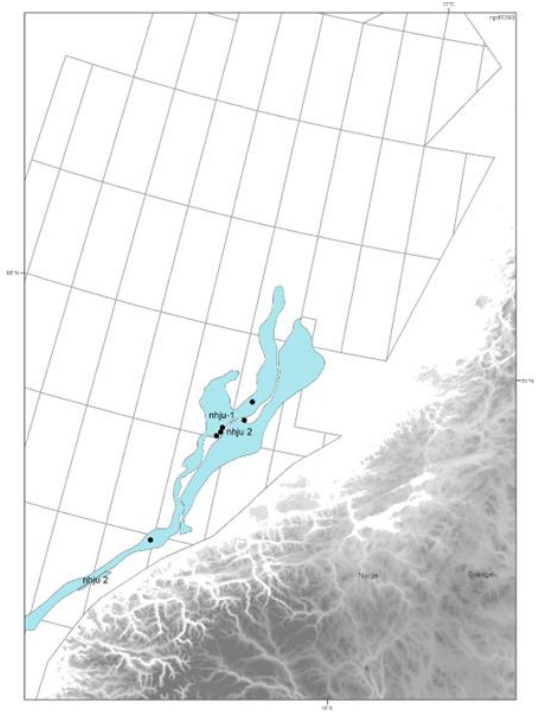
Norwegian Sea – U. Triassic to M. Jurassic plays

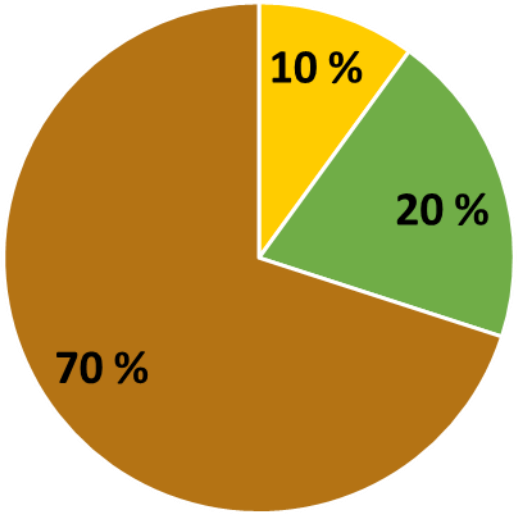




Norwegian Sea – Upper Jurassic plays



Prognosis



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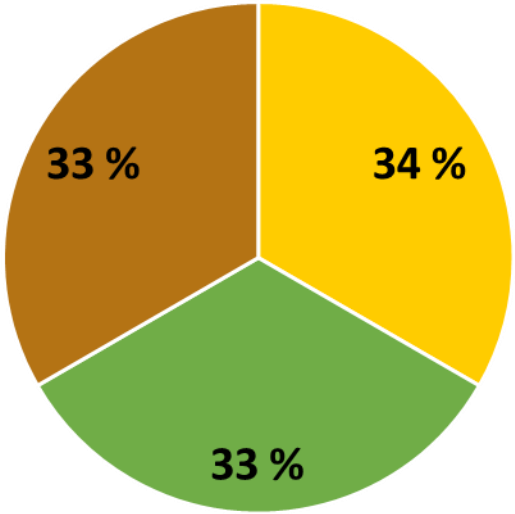
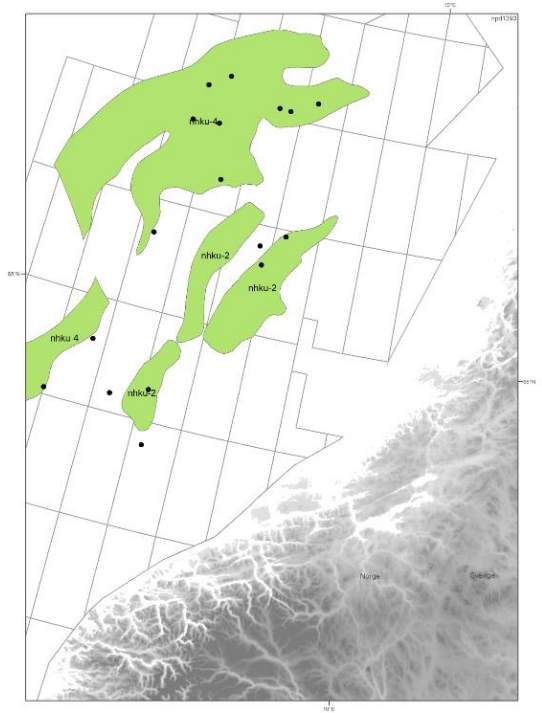
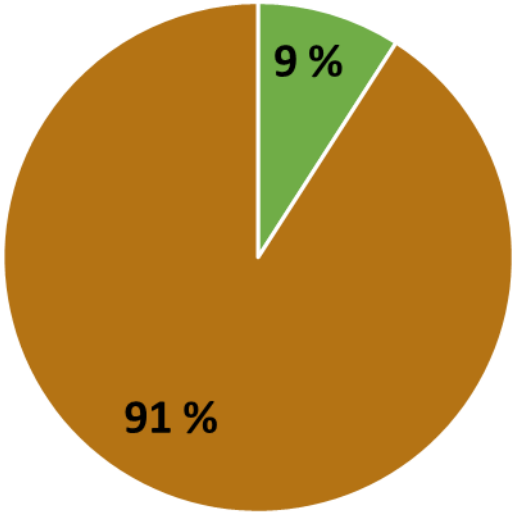


Reservoir Charge Trap

Norwegian Sea – Upper Cretaceous plays



Prognosis



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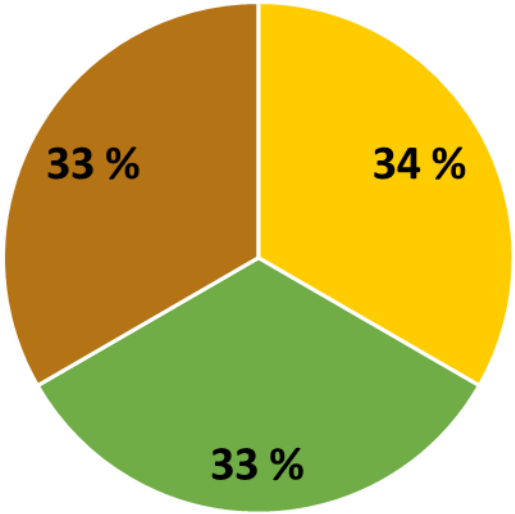
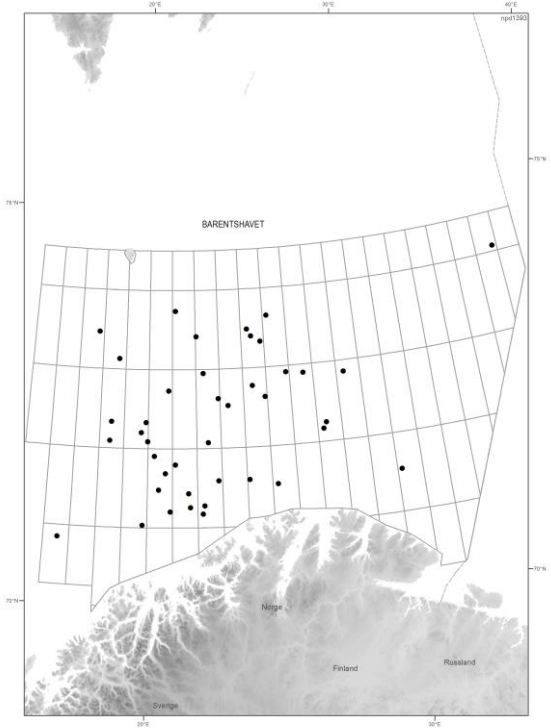
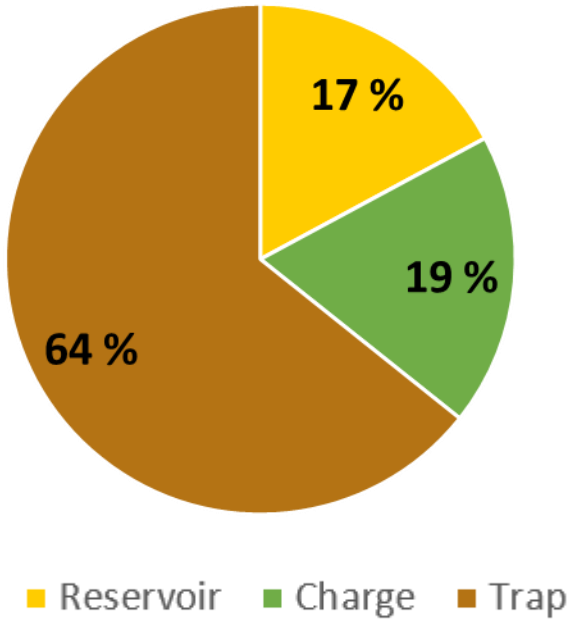


Reservoir Charge Trap

Barents Sea: Main risk prior to drilling





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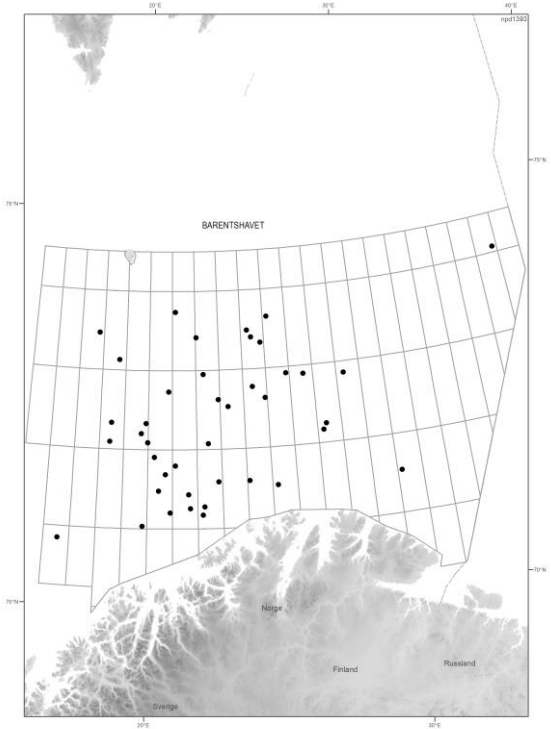
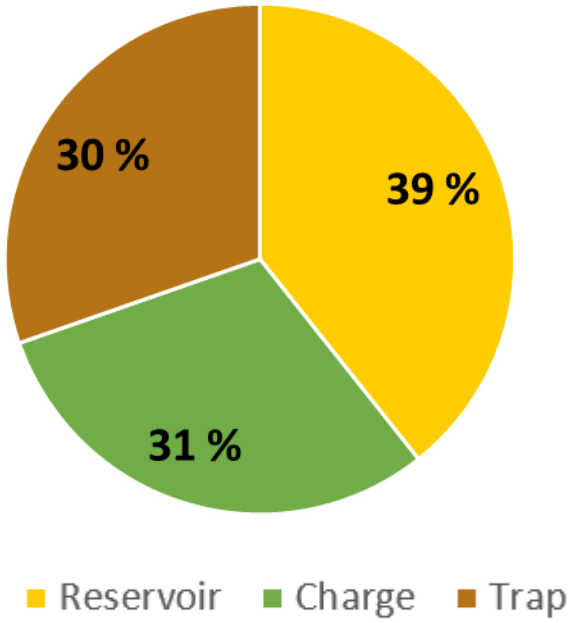
Barents Sea: Main reason for failure





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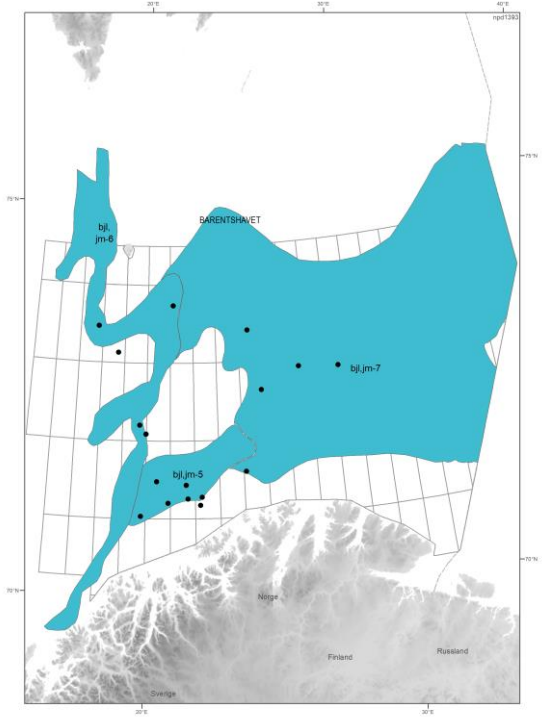
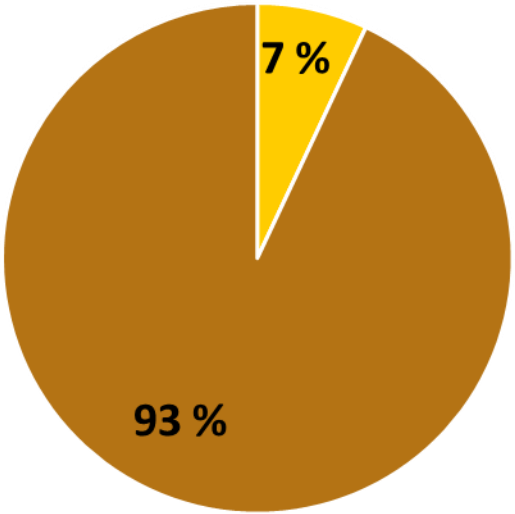
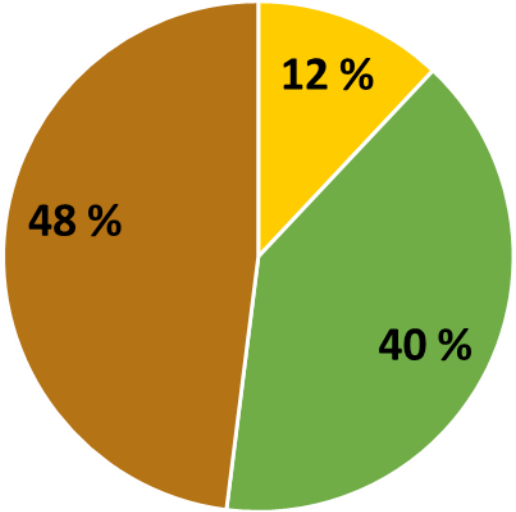
Barents Sea – U. Triassic to M. Jurassic plays



Prognosis

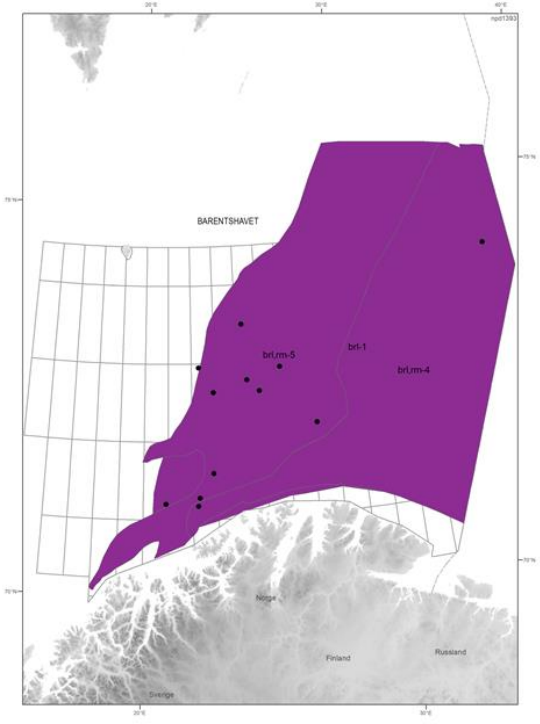


Result

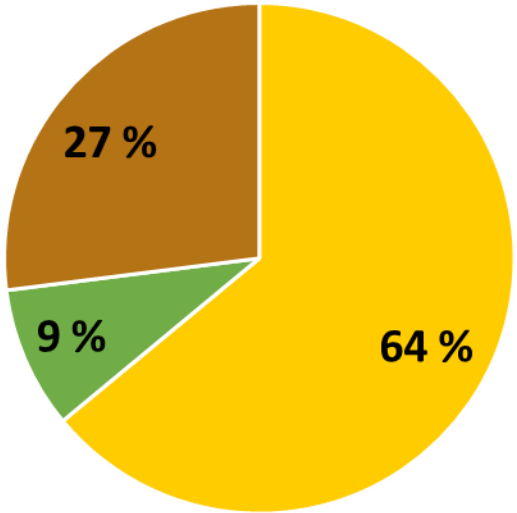


Reservoir Charge Trap

Barents Sea – Lower to middle Triassic plays



Prognosis



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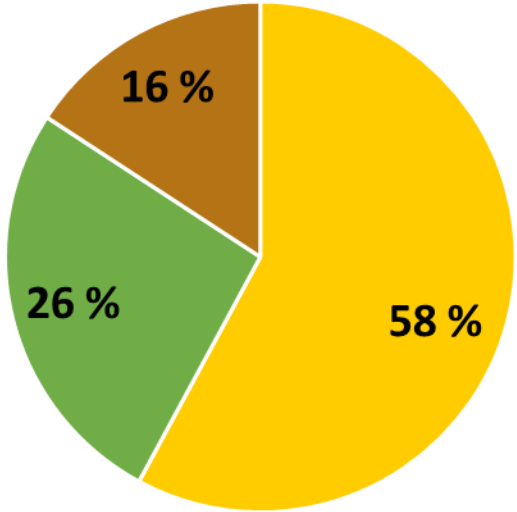
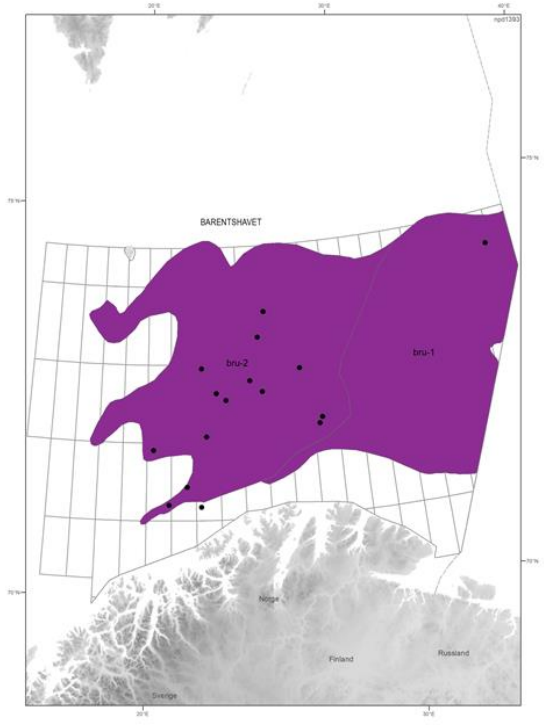


Reservoir Charge Trap

Barents Sea – Upper Triassic (Snadd) plays



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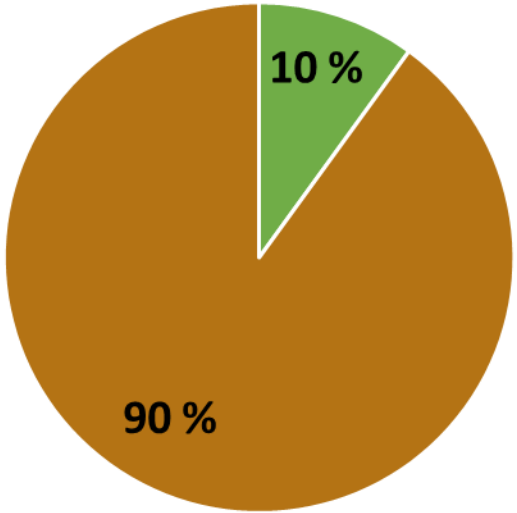

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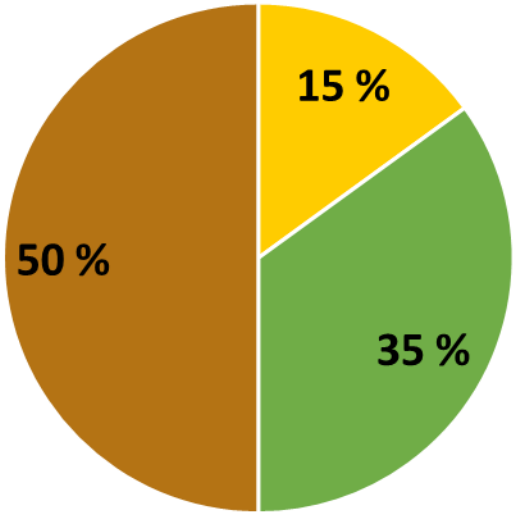

Reservoir Charge Trap

Summary

- Over all, charge may seem to be under evaluated as a risk pre-drill
- Do we not understand charge as well as we thought, or is it just easier to put a risk on trap pre drill? Is it to easy to blame charge post drill?
- How can we improve our understanding of charge (source/migration) and do better risk assesments?