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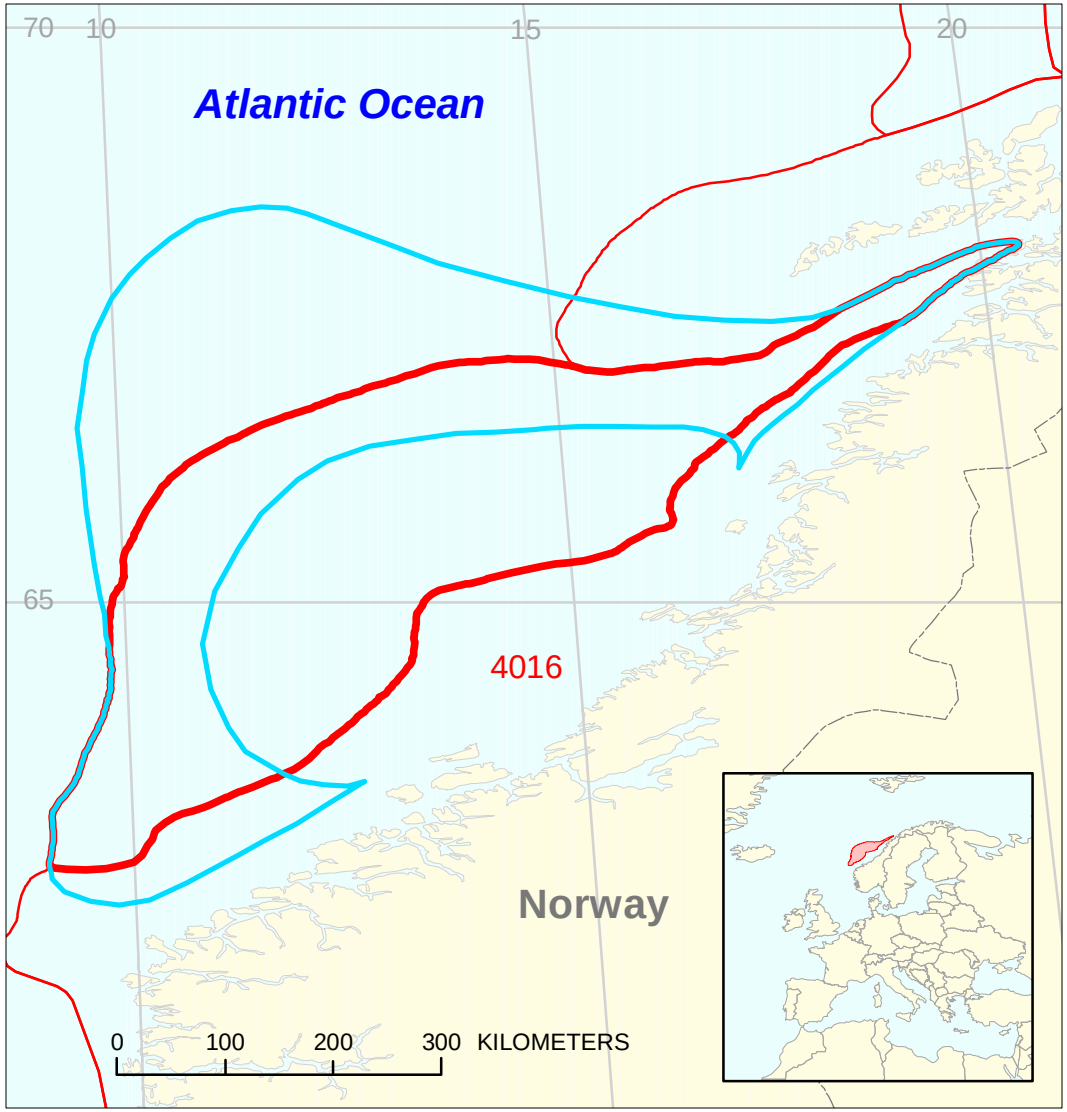
Mid-Norway Continental Margin
Assessment Unit 40170102



Mid-Norway Continental Margin Assessment Unit 40170102
Vestford-Helgeland Geologic Province 4017
Other geologic province boundary

Geologic Summary

Detailed map of this assessment unit

Assessment Input Data

Assessment Results
- Assessment Unit Summary
- Detailed Assessment Results
- Undiscovered Field-Size Distributions

USGS PROVINCE: Vestford-Helgeland (4017) **GEOLOGIST:** D.L. Gautier

TOTAL PETROLEUM SYSTEM: Upper Jurassic Spekk (401701)

ASSESSMENT UNIT: Mid-Norway Continental Margin (40170102)

DESCRIPTION: This assessment unit includes most of the offshore area from the coast of Norway westward to the Oceanic Crust, near the Prime Meridian and between the northern reaches of the Viking Graben (between lat. 62 N. and lat. 70 N.). Excluded from this assessment unit is the region of intense exploration, leasing, and production around the Halten Terrace and Trondelag Platform, which are included in assessment unit 40170101.

SOURCE ROCKS: Upper Jurassic marine shales equivalent to the Spekk Formation of the Halten Terrace and to the Kimmeridge Clay in the northern North Sea constitute the oldest readily identifiable stratigraphic marker on regional seismic sections. Although not drilled in the area of this assessment unit, this organic carbon-rich shale is expected to have similar hydrogen-enriched, high TOC, oil-prone properties of equivalent rocks elsewhere in this area.

MATURATION: Estimated depths of burial and time-temperature integrals of the Upper Jurassic in most of the assessment unit indicate thermal maturity in excess of stability of oil in all but a few small areas in the area of the assessment unit. Thus, resources in this assessment unit are expected to be largely gas rather than oil. Thermal maturity is thought to have greatly increased in late Neogene time as a result of burial beneath glacio-marine sediments derived from the glaciation of the Scandinavian Shield.

MIGRATION: This assessment unit is entirely hypothetical and migration pathways can only be speculated. However, migration is expected to have taken place from the Upper Jurassic source rocks into a variety of structural blocks formed during Mesozoic rifting and into various large inversion structures and myriad potential stratigraphic traps that can be expected to be widely distributed around this enormous assessment unit.

RESERVOIR ROCKS: A wide range of potential reservoir rocks include deeply buried clastic rocks as old as Devonian in rift-related fault blocks, Permian carbonate rocks, fluvial channel and deltaic sandstones of Jurassic age, and a variety of Cretaceous and Tertiary sandstones ranging from late Early Cretaceous to rocks as young as Oligocene.

TRAPS AND SEALS: Postulated seals and traps are analogous to those in the Halten Terrace, Trondelag Platform, and Viking Graben, consisting of lithologic permeability barriers in stratigraphic traps as well as seals provided by overlying marine fine-grained rocks in the case of structural closures.

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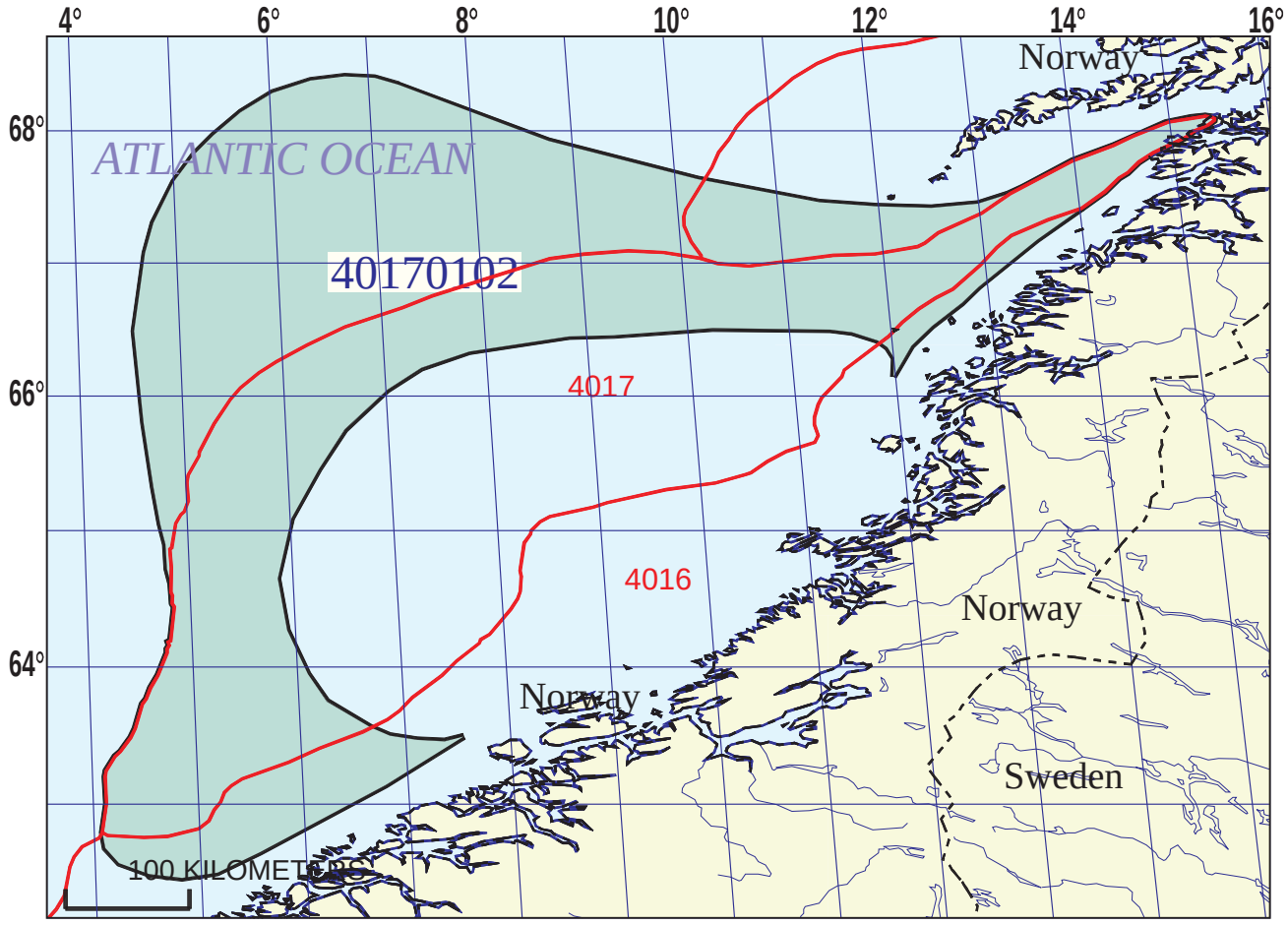
Steel, R.J., 1993, Triassic-Jurassic megasequence stratigraphy in the northern North Sea–rift to post-rift evolution, *in* J.R. Parker, ed., Petroleum geology of northwest Europe: London, Geological Society Proceedings of the 4th Conference, p. 299-315.

Dalland, A., Worsley, D., and Ofstad, K, 1988, A lithostratigraphic scheme for the Mesozoic and Cenozoic succession offshore Mid and Northern Norway: Norwegian Petroleum Directorate Bulletin 4, p. 419-448.

Spencer, A.M., Birkeland, O, and Koch, J.-O, 1993, Petroleum geology of the proven hydrocarbon basins, offshore Norway: First Break, v. 11, no. 5, p. 161-176.



Mid-Norway Continental Margin Assessment Unit - 40170102

EXPLANATION

- Hydrography
- Shoreline
- 4017 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 40170102 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

SEVENTH APPROXIMATION
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS

Date:……..	10/22/99		
Assessment Geologist:……..	D.L. Gautier		
Region:……..	Europe	Number:	4
Province:……..	Vestford-Helgeland	Number:	4017
Priority or Boutique……	Priority		
Total Petroleum System:……	Upper Jurassic Spekk	Number:	401701
Assessment Unit:……	Mid-Norway Continental Margin	Number:	40170102
* Notes from Assessor	Seismic surveyed, but undrilled.		

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (≥20,000 cfg/bo overall):… Gas

What is the minimum field size?……. 20 mmboe grown (≥1mmboe)
(the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:…… Oil: 0 Gas: 0
Established (>13 fields) _____ Frontier (1-13 fields) _____ Hypothetical (no fields) X

Median size (grown) of discovered oil fields (mmboe):
1st 3rd _____ 2nd 3rd _____ 3rd 3rd _____
Median size (grown) of discovered gas fields (bcfg):
1st 3rd _____ 2nd 3rd _____ 3rd 3rd _____

Assessment-Unit Probabilities:

Attribute	Probability of occurrence (0-1.0)
1. **CHARGE:** Adequate petroleum charge for an undiscovered field ≥ minimum size……	1.0
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	1.0
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	1.0

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):…….. 1.0

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field ≥ minimum size…… 0.95

UNDISCOVERED FIELDS

Number of Undiscovered Fields: How many undiscovered fields exist that are ≥ minimum size?:
(uncertainty of fixed but unknown values)

Oil fields:……min. no. (>0)	1	median no.	3	max no.	7
Gas fields:……min. no. (>0)	1	median no.	30	max no.	90

Size of Undiscovered Fields: What are the anticipated sizes (**grown**) of the above fields?:
(variations in the sizes of undiscovered fields)

Oil in oil fields (mmbo)……min. size	20	median size	80	max. size	1000
Gas in gas fields (bcfg):……min. size	120	median size	1000	max. size	150000

Assessment Unit (name, no.)
Mid-Norway Continental Margin, 40170102

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	1700	3500	5200
NGL/gas ratio (bngl/mmcfg)……	40	80	120

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……	22	44	66
Oil/gas ratio (bo/mmcfg)……			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

Oil Fields:	minimum	median	maximum
API gravity (degrees)……			
Sulfur content of oil (%)……			
Drilling Depth (m) ……	2000	4000	4500
Depth (m) of water (if applicable)……	500	1000	2500

Gas Fields:	minimum	median	maximum
Inert gas content (%)……			
CO_2 content (%)……			
Hydrogen-sulfide content (%)……			
Drilling Depth (m)……	2000	5000	8000
Depth (m) of water (if applicable)……	500	1000	2500

Assessment Unit (name, no.)
Mid-Norway Continental Margin, 40170102

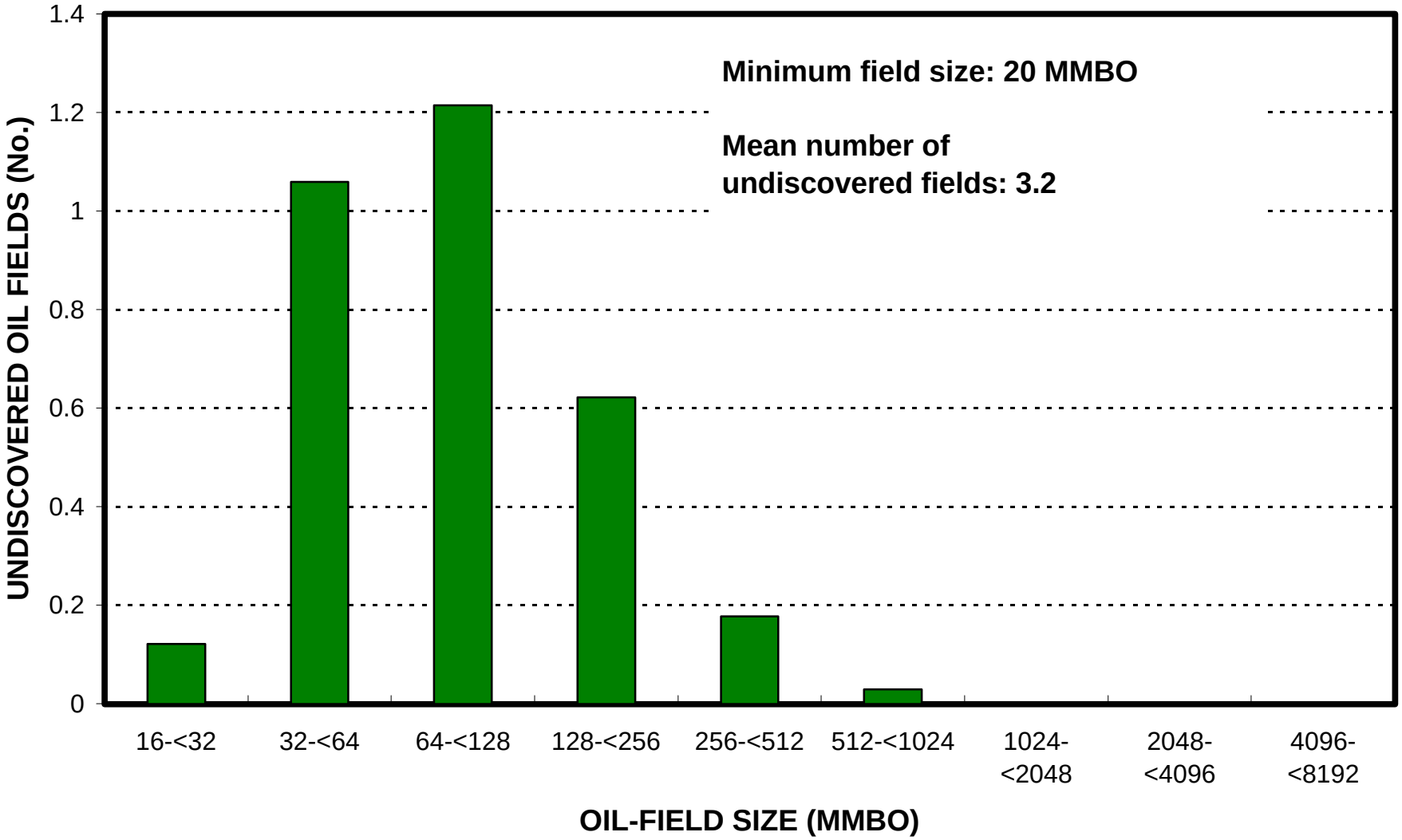
ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

1. Norway represents 100 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		100	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		100	
Portion of volume % that is offshore (0-100%)……		100	

Mid-Norway Continental Margin, AU 40170102
Undiscovered Field-Size Distribution



Mid-Norway Continental Margin, AU 40170102
Undiscovered Field-Size Distribution