UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Assessment of undiscovered conventionally recoverable petroleum resources of onshore China

by

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Open-File Report 83-801

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

[1] Missoula, Montana

1983

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ASSESSMENT OF ENERGY RESOURCES

This report was prepared as part of the World Energy Resources Program of the U.S. Geological Survey (USGS). The objective of the study is to assess the undiscovered conventionally recoverable resources remaining within the petroleum producing provinces. The study utilizes geological and petroleum engineering data, in conjunction with statistical techniques, to estimate undiscovered resources by a process involving a team of geologists and statisticians. The estimates represent the views of the U.S. Geological Survey estimation team and should not be regarded as an official position of the Department the Interior.

Other U.S. Geological Survey publications relating to the assessment of undiscovered conventionally recoverable petroleum resources include the following:

Open-File Reports
- 81-0986 - Persian Gulf Basin and Zagros fold belt (Arabian-Iranian basin)
- 81-1027 - Volga-Ural Basin, USSR
- 81-1142 - Indonesia
- 81-1143 - Northeastern Mexico
- 81-1144 - Southeastern Mexico, northern Guatemala, and Belize
- 81-1145 - Trinidad
- 81-1146 - Venezuela
- 81-1147 - West Siberian and Kara Sea Basins, USSR
- 82-0296 - Middle Caspian Basin, USSR
- 82-1027 - East Siberian Basin, USSR
- 82-1056 - North Africa
- 82-1057 - Timan-Pechora Basin, USSR, and Barents-northern Kara shelf
- 83-0598 - Northwestern, central, and northeastern Africa

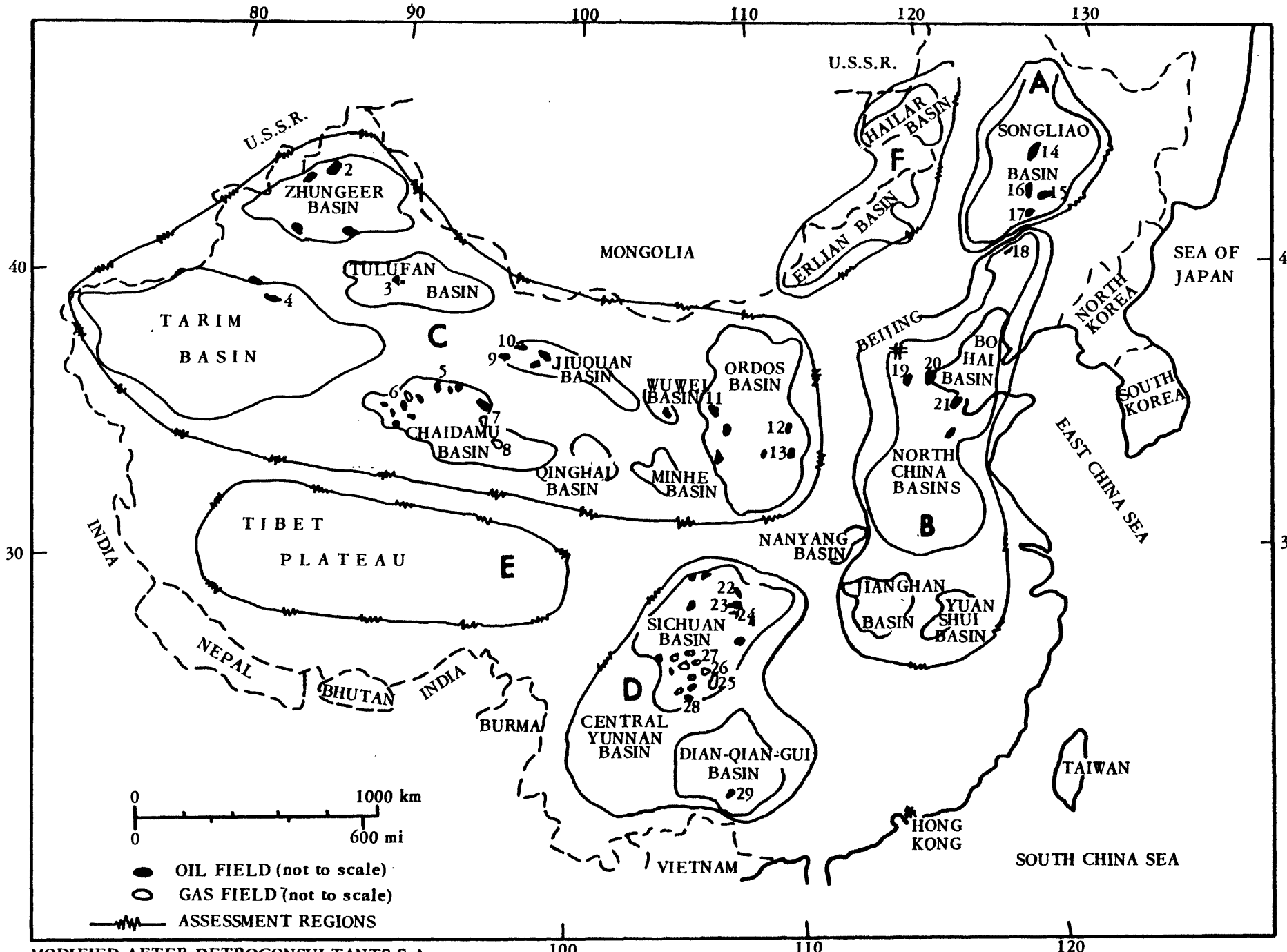
ADKNOWLEDGMENTS

The resource assessment for this report was prepared in collaboration with the Resource Appraisal Group of the Branch of Oil and Gas Resources.

INTRODUCTION

The location of the main onshore China basins is shown in figure 1. Estimates by the USGS of oil and gas resources in these basins, and in aggregate, are given in table 1 and figures 2 through 15. Data supplementary to these estimates are supplied in table 2.

Assessments are first made conditional (COND) upon the occurrence of commercial petroleum in the assessment area. Then the conditional resource values are adjusted to unconditional (UNCOND) values by taking account of the marginal probability (M.P.) or uncertainty of commercial petroleum ever occurring in the subject area. If commercial petroleum already exists, the M.P. is 1, and the UNCOND value remains the same as the COND value. Both the conditional and unconditional assessments are shown in the figures. Only UNCOND resource values may be aggregated.



MODIFIED AFTER PETROCONSULTANTS S A

FIGURE 1. LOCATIONS OF ONSHORE CHINA ASSESSMENT REGIONS, A THROUGH F

EXPLANATION

Names of fields numbered on figure 1

Zhungeer Basin

1. Karamai - oil
2. Urho - oil

Tulufan Basin

3. Shengtingkou - oil

Tarim basin

4. Ichkelik - oil

Chaidamu Basin

5. Lenghu 3, 4, and 5 - oil
6. Nan Shan - oil
7. Mahai - gas
8. Yenhu - gas

Jiuquan Basin

9. Ya-Erh-Hsai - oil
10. Pai-Yang-Ho - oil

Ordos Basin

11. Machiatan - oil
12. Yungping - oil
13. Yenchang - oil

Songliao Basin

14. Taching - oil
15. Chinshankou - oil
16. Tengluku - oil
17. Kungchuling - oil

North China basins

18. Tungan - oil
19. Renqui - oil
20. Takang - oil
21. Shengli - oil

Sichuan Basin

22. Yinshan - oil
23. Nanchung - oil
24. Lungnussu - oil
25. Shihyoukou - gas
26. Huangkuanshan - gas
27. Tengchingkuan - gas
28. Kaomutin - gas

Dian-Qian-Gui Basin

29. Paise - oil

Table 1.--Assessment of undiscovered conventionally recoverable petroleum resources of onshore China.

Unconditional resource assessment by USGS as of 2/17/83; see also figures 2 through 15.

Region	Crude Oil in Billions of Barrels (BB)				Natural gas in Trillions of Cubic Feet (Tcf) and Billions of Barrels of Oil Equivalent (BBOE) @ 6,000 cu ft/bbl.			
	Low F_{95} 1/	High F_5 1/	Mean	Mode	Low F_{95} 1/	High F_5 1/	Mean	Mode
A Songliao basin	0.8	6.0	3.0	2.3	0.7	10.7	5.0	3.8
B North China Basin and Jianghan, Nanyang Basins	2.1	13.4	6.9	5.6	3.9	33.1	16.7	13.6
C Northwest China basins	4.8	31.9	16.0	12.1	26.6	191.4	95.5	72.9
D South central China basins	0.9	10.0	4.6	3.3	10.1	73.2	36.4	27.7
E Tibet Plateau	1.0	8.0	3.5	2.0	0.0	38.5	10.5	12.0
F Erlian and Hailar Basins	0.2	3.0	1.4	1.0	0.0	12.7	4.2	6.0
Aggregate total - onshore China	13	73	35	24	57	363	168	105

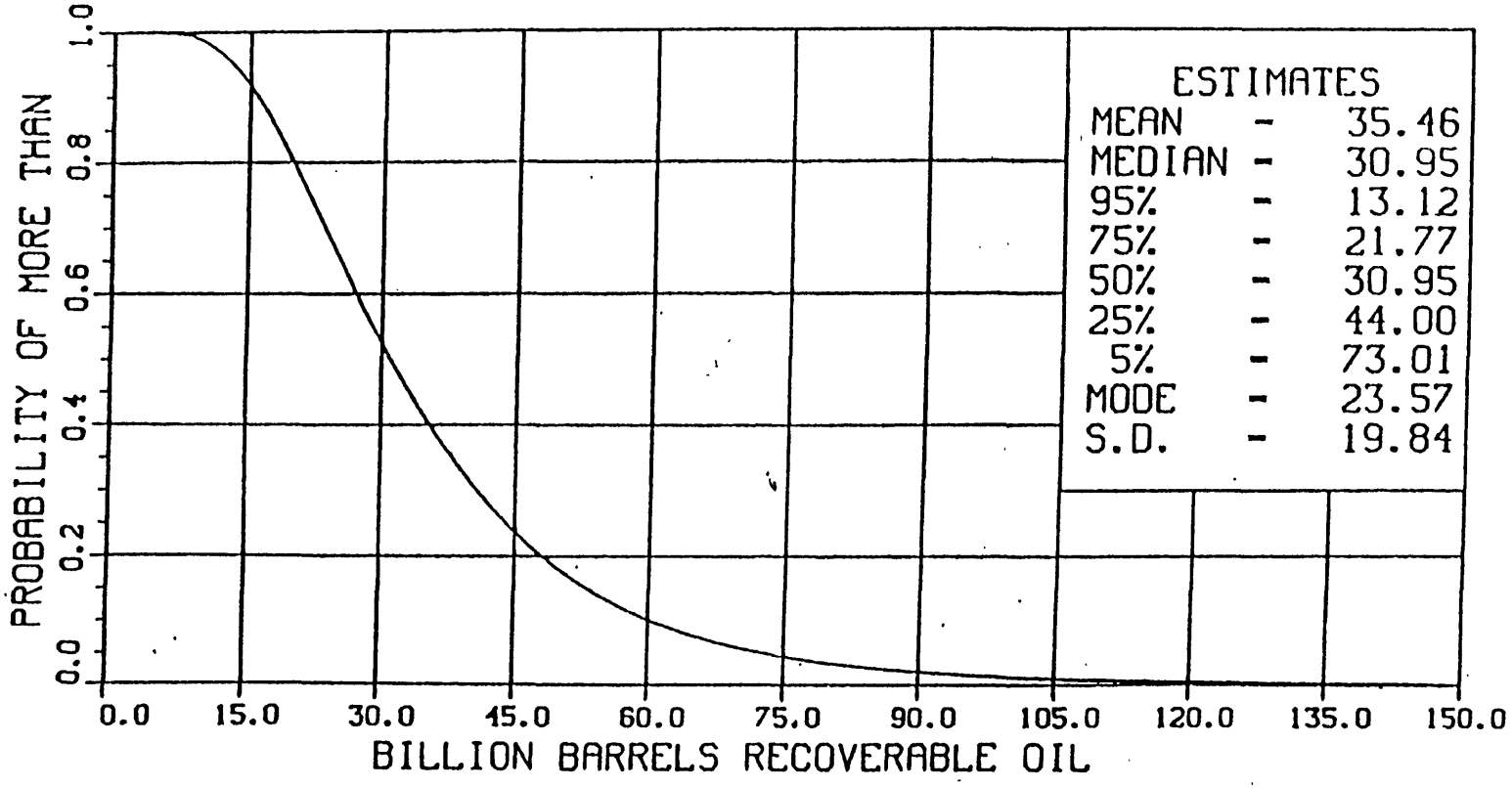
1/ F_{95} denotes the 95th fractile; the probability of more than the amount F_{95} is 95 percent. F_5 is defined similarly.

2/ Totals are derived by statistical aggregation; only the mean total equals the sum of the component parts.

UNCOND

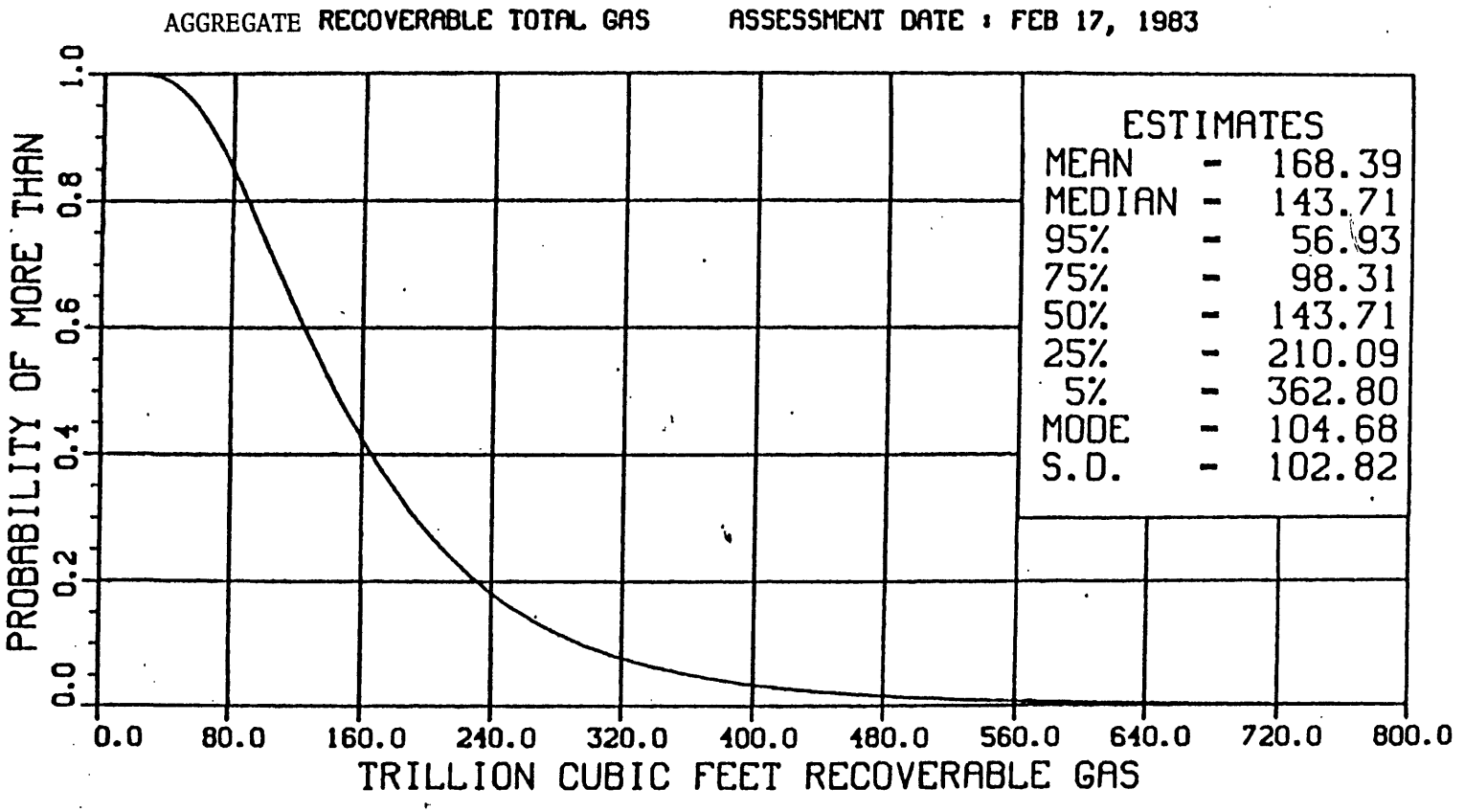
Figure 2.-- CHINA ONSHORE

AGGREGATE RECOVERABLE OIL ASSESSMENT DATE : FEB 17, 1983



UNCOND

Figure 3.-- CHINA ONSHORE

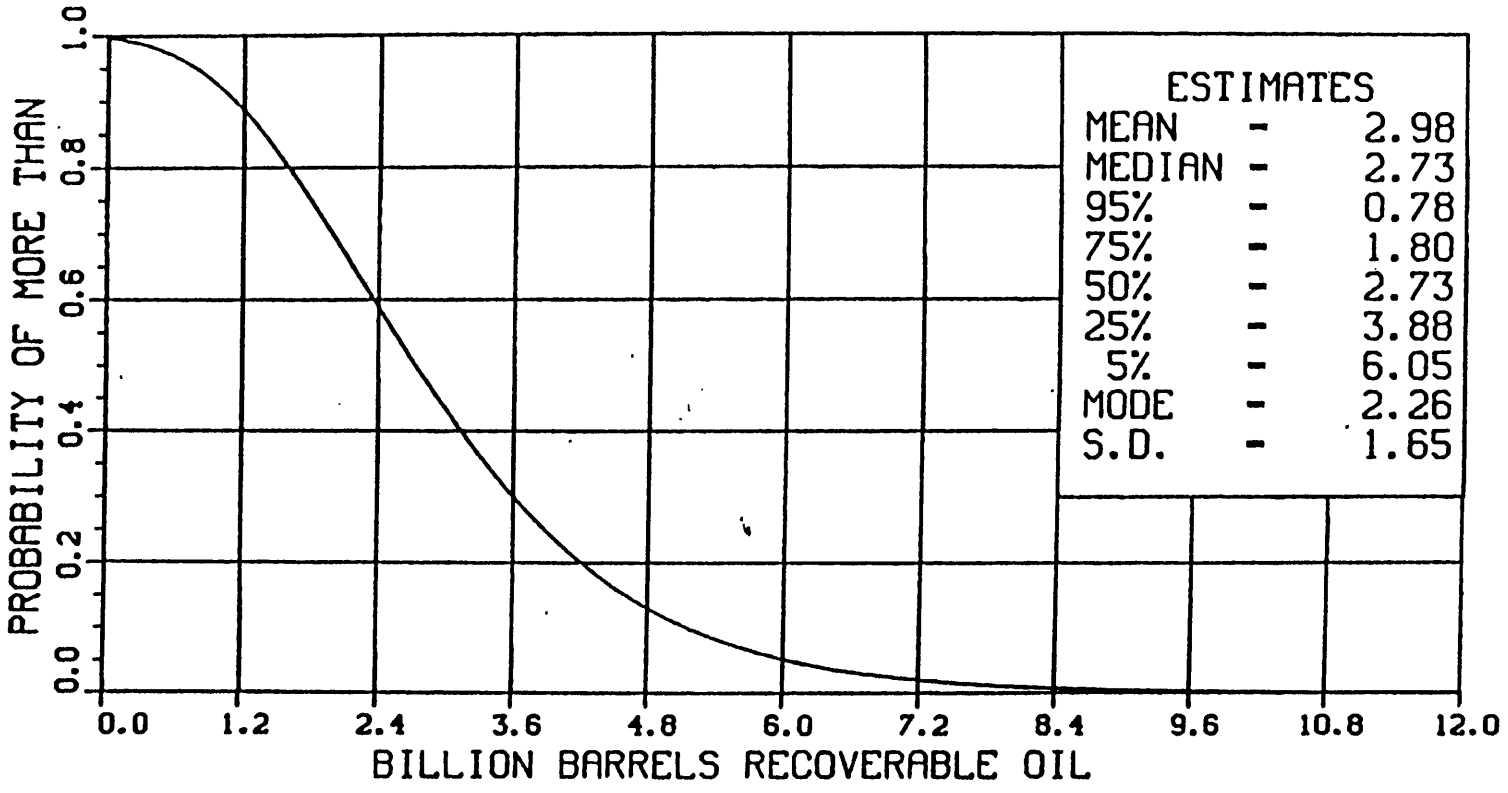


UNCOND

AREA A

Figure 4.--CHINA, SONGLIAO BASIN

RECOVERABLE OIL ASSESSMENT DATE : FEB 17, 1983



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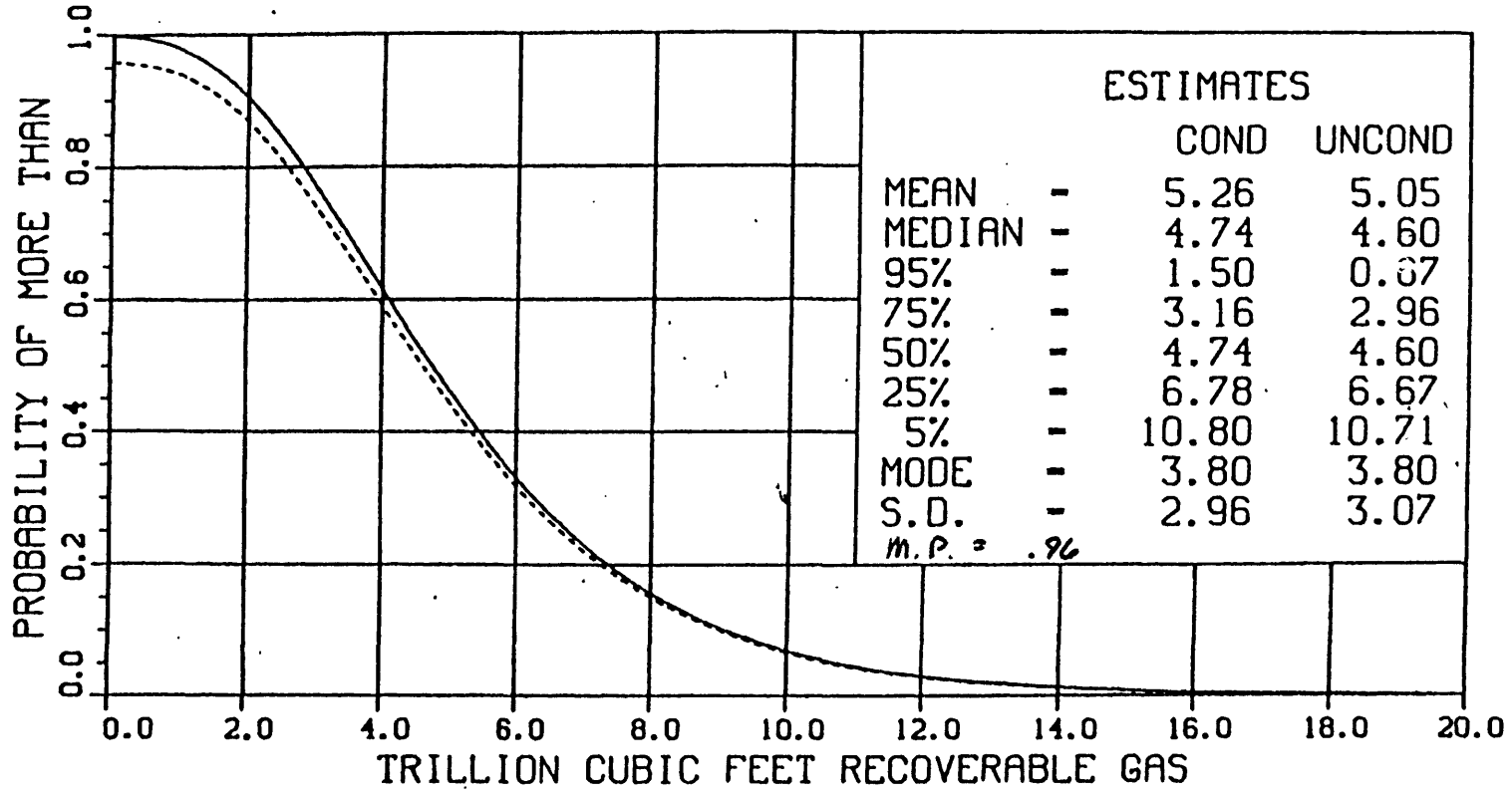
AREA A

Figure 5.--CHINA, SONGLIAO BASIN

RECOVERABLE TOTAL GAS ASSESSMENT DATE : FEB 17, 1983



UNCOND

AREA B

Figure 6.--NORTH CHINA BASINS, JIUQUAN, NANYANG BASINS

RECOVERABLE OIL ASSESSMENT DATE : FEB 17, 1983

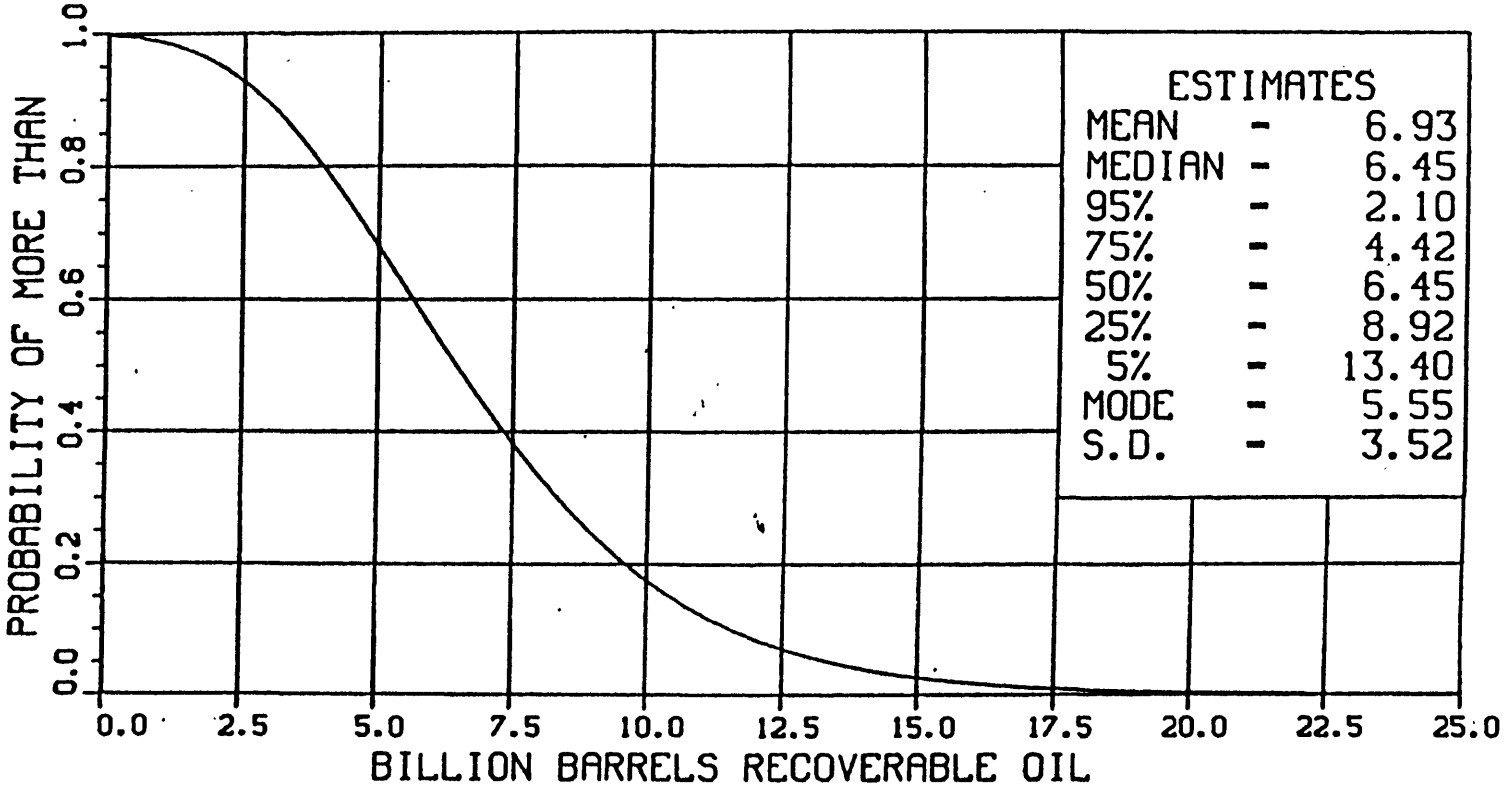


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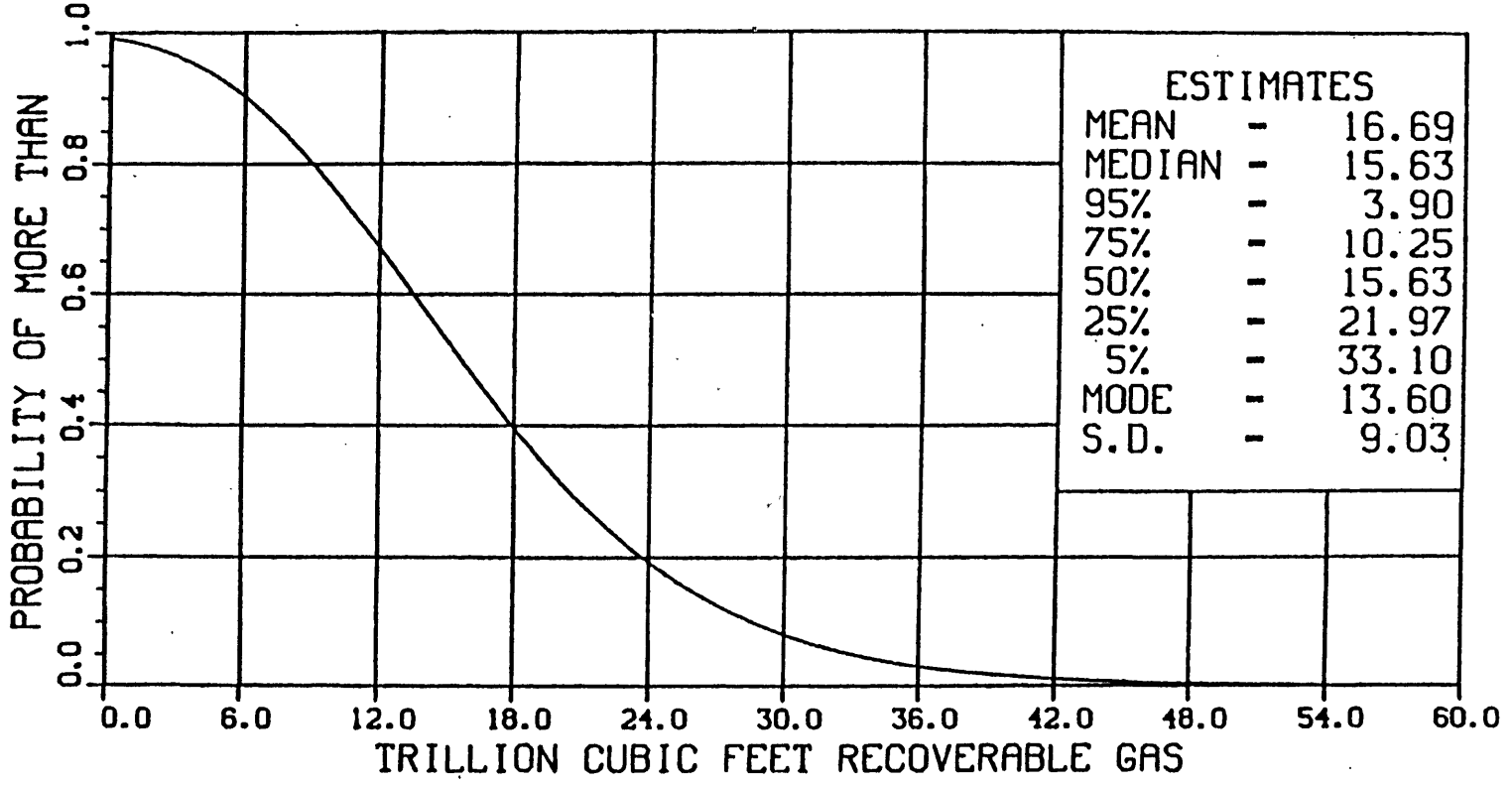
Figure 7.-- NORTH CHINA BASINS, JIUQUAN, NANYANG BASINS

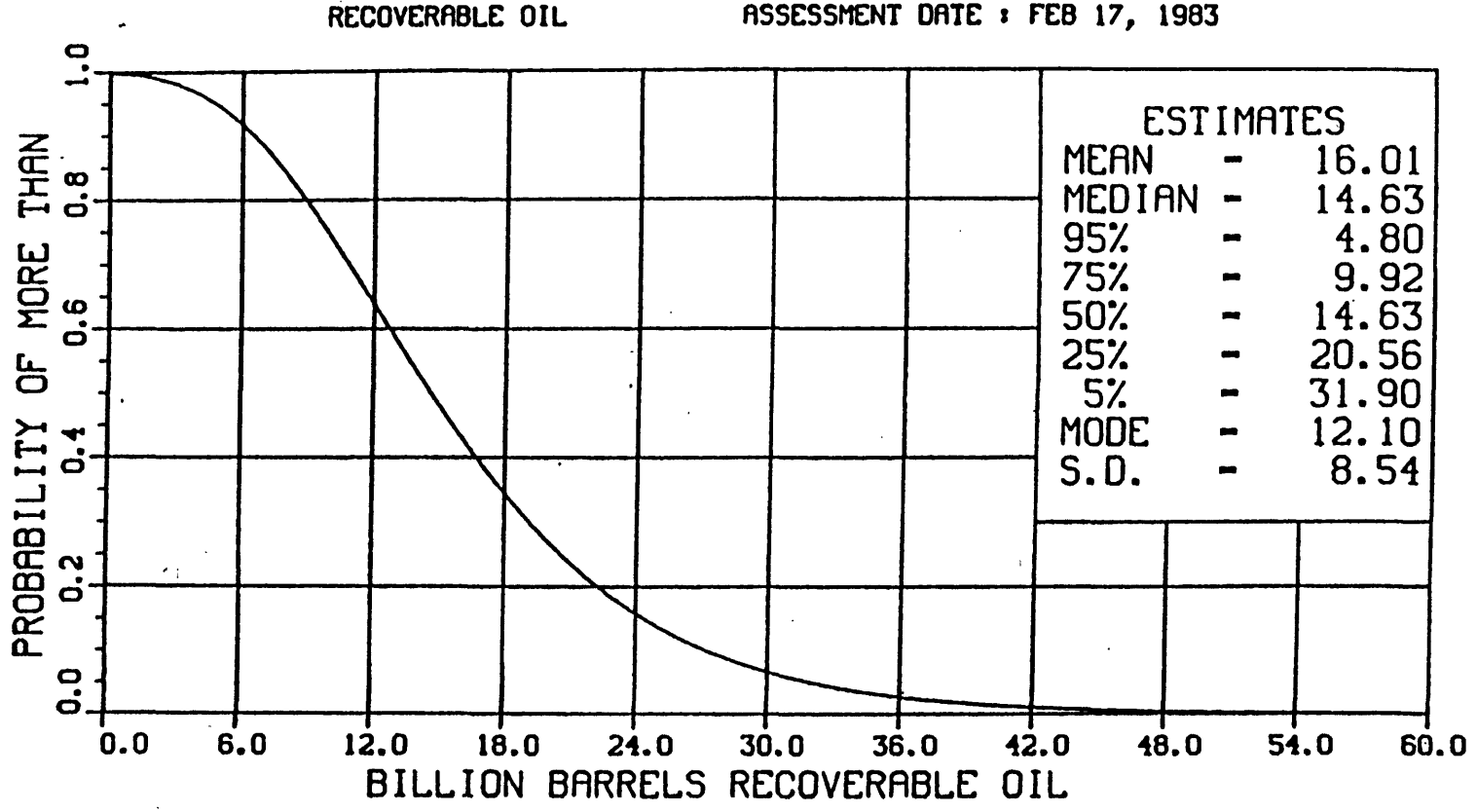
RECOVERABLE TOTAL GAS ASSESSMENT DATE : FEB 17, 1983



UNCOND

AREA C

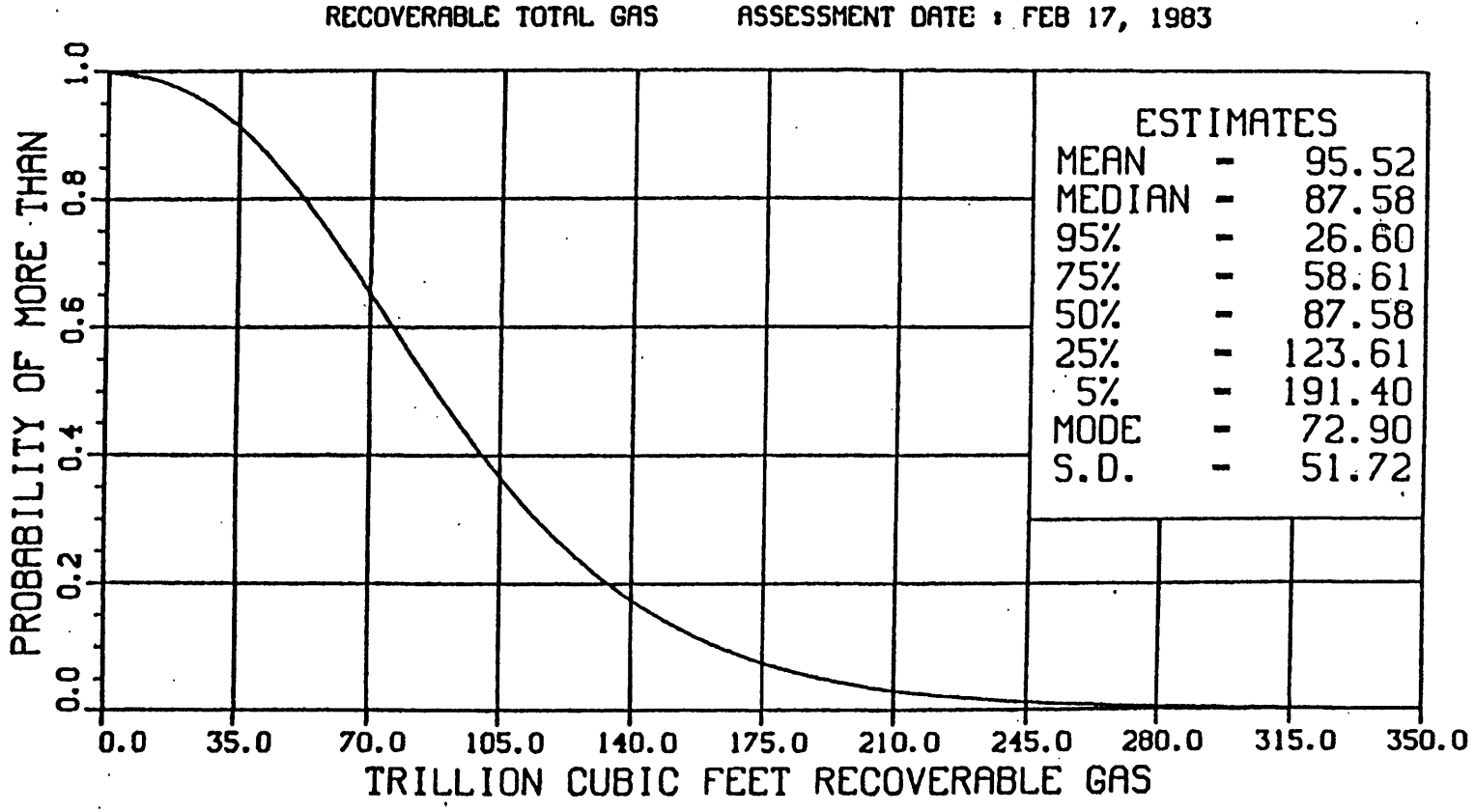
Figure 8.--NW CHINA BASINS, ZHUNGEER, ORDOS, TARIM, CHAIDAMU, ETC.



UNCOND

AREA C

Figure 9.--NW CHINA BASINS, ZHUNGEER, ORDOS, TARIM, CHAIDAMU, ETC.

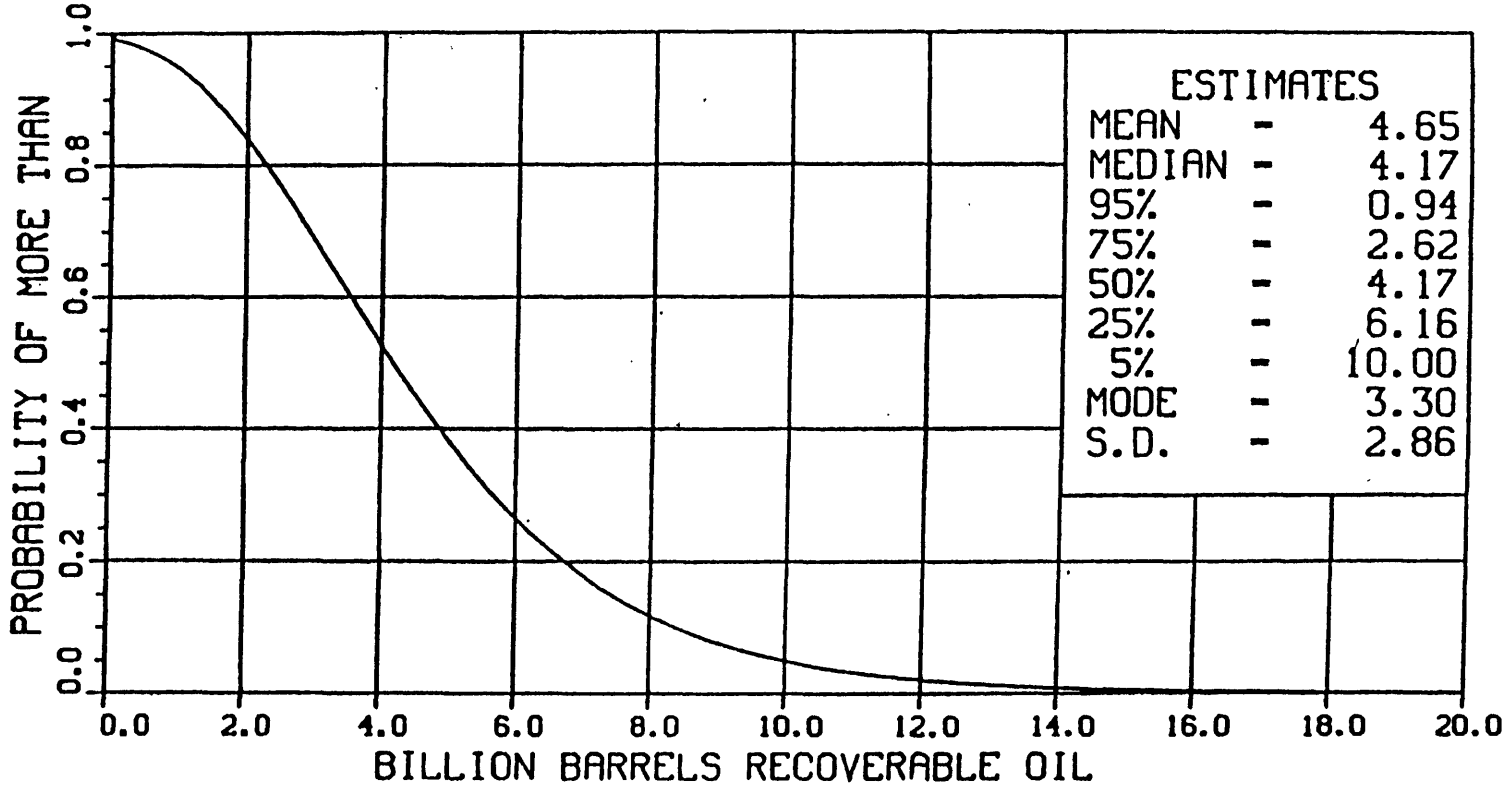


UNCOND

AREA D

Figure 10.--SOUTH CENTRAL CHINA BASINS, SICHUAN, ETC.

RECOVERABLE OIL ASSESSMENT DATE : FEB 17, 1983



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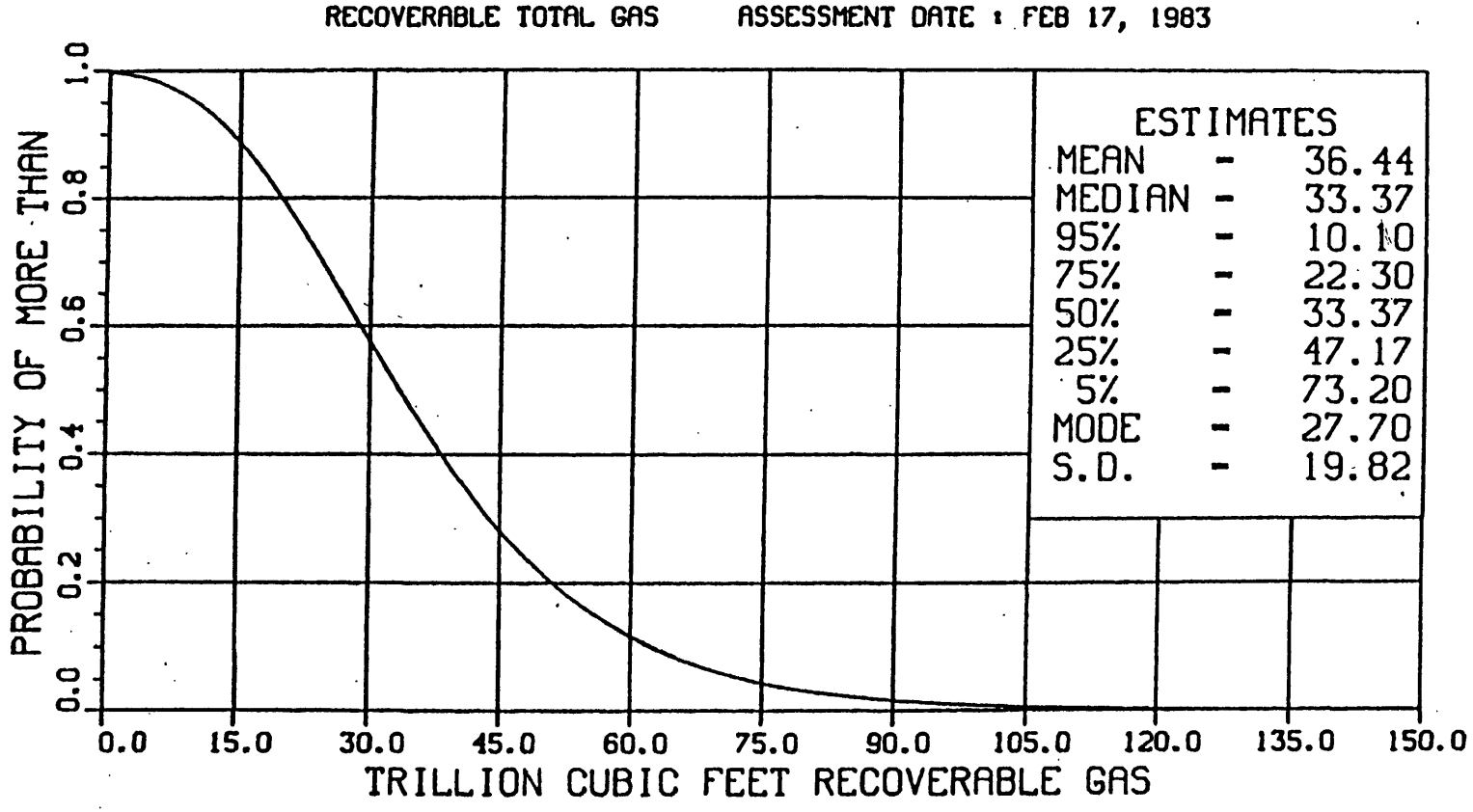
AREA D

Figure 11.-- SOUTH CENTRAL CHINA BASINS, Sichuan, etc.

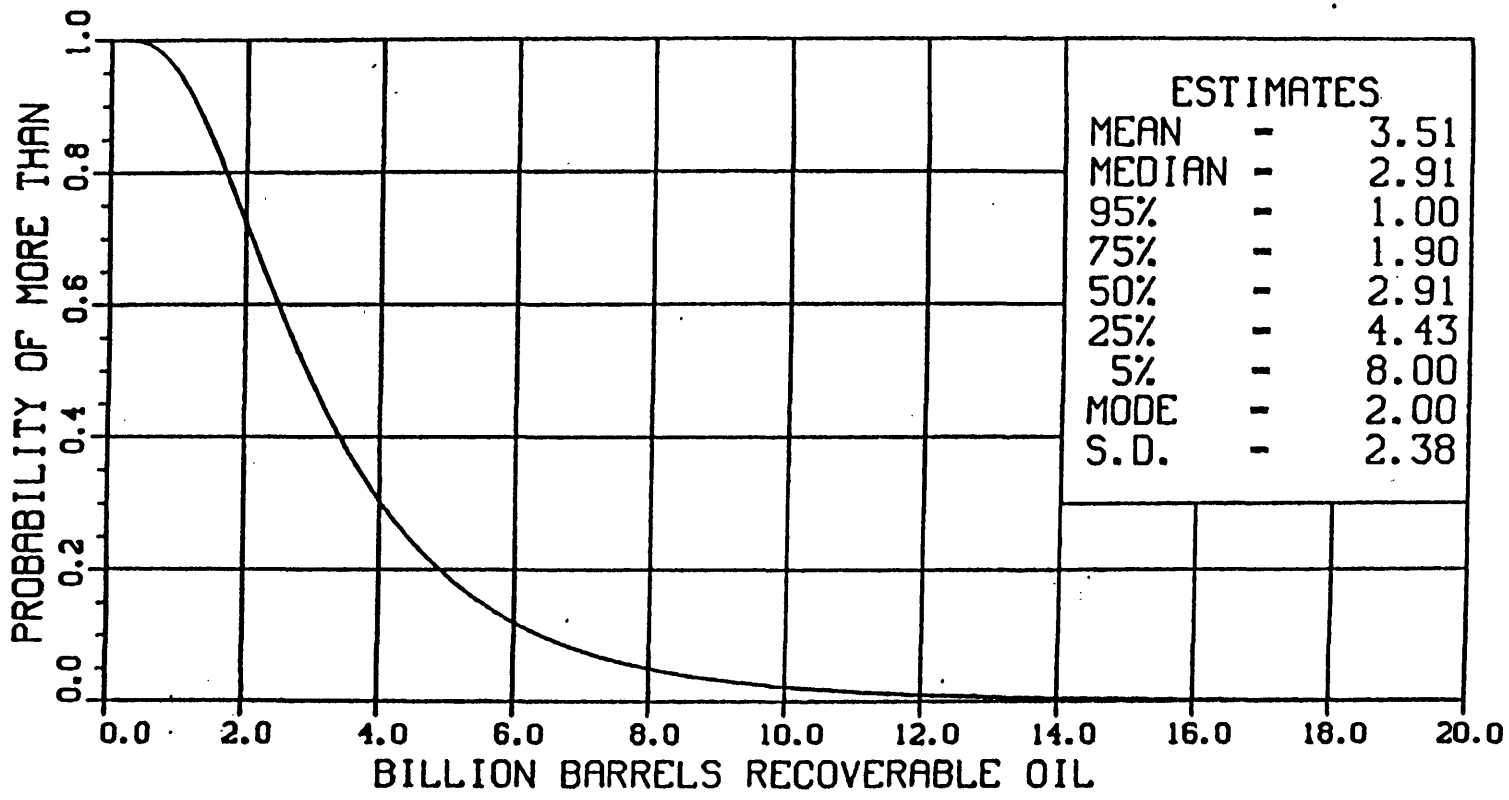


UNCOND

AREA E

Figure 12.-- CHINA, TIBET PLATEAU

RECOVERABLE OIL ASSESSMENT DATE : FEB 17, 1983



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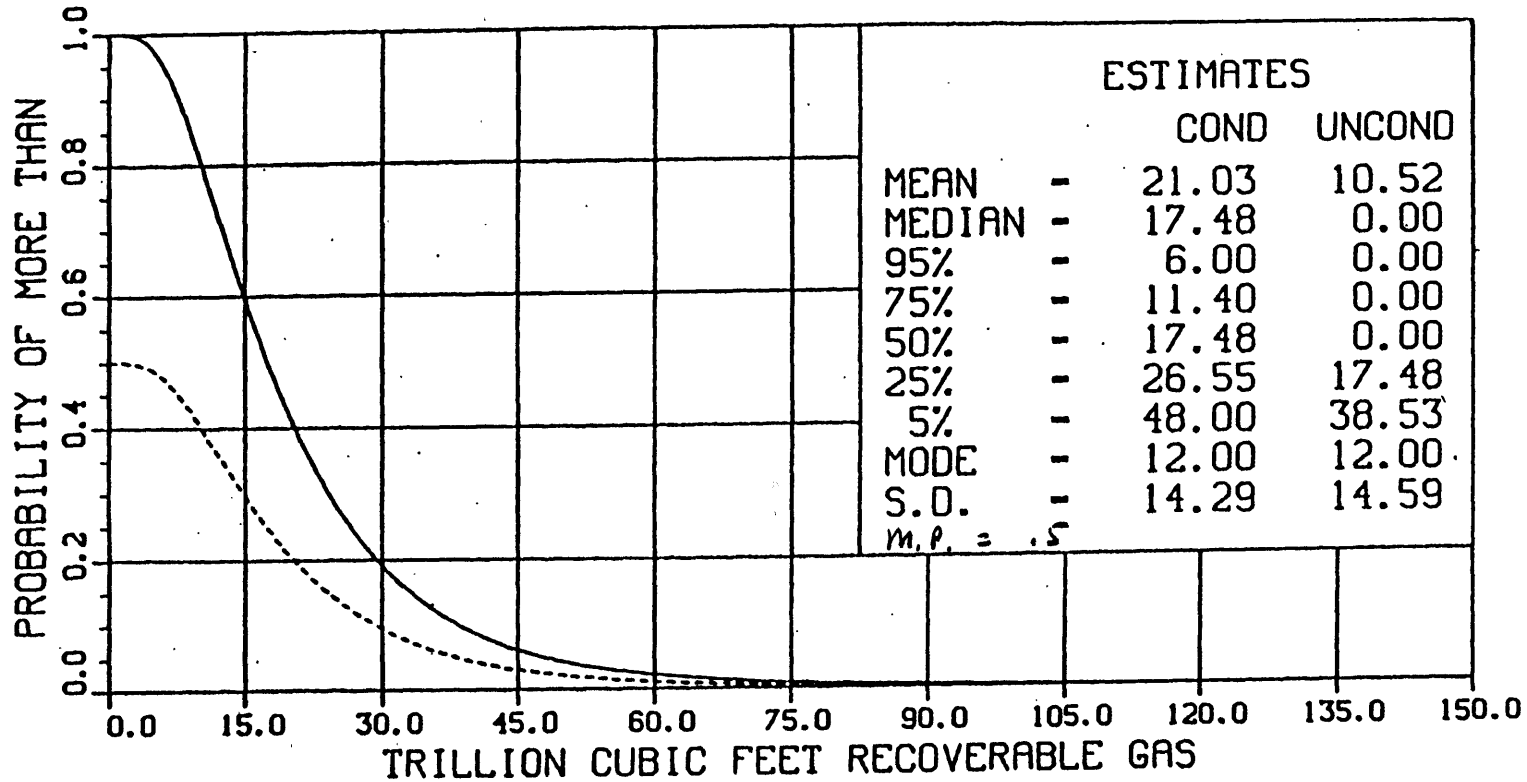
AREA E

Figure 13.--CHINA, TIBET PLATEAU

RECOVERABLE TOTAL GAS ASSESSMENT DATE : FEB 17, 1983



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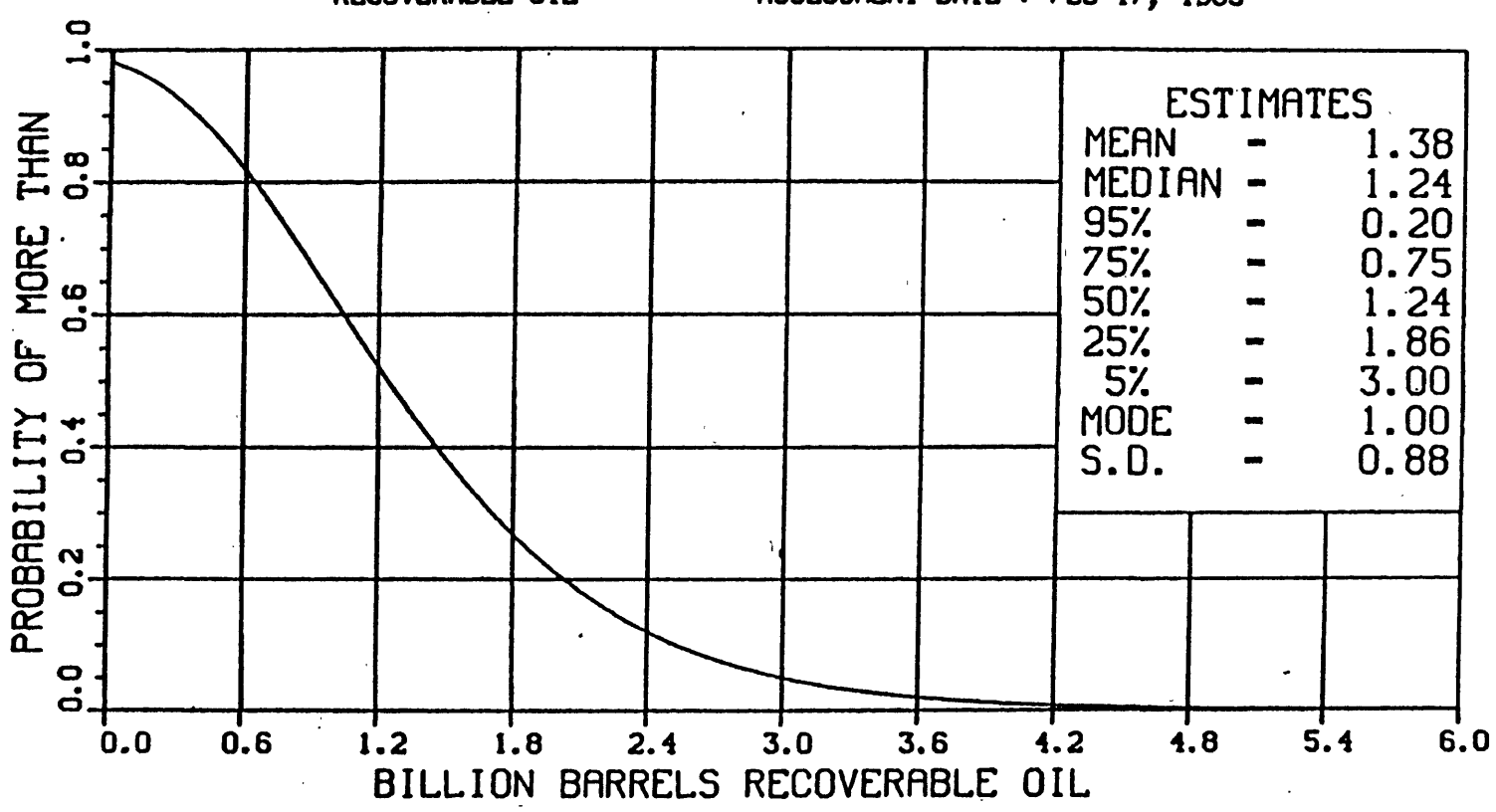
AREA F

Figure 14.-- CHINA, ERLIAN AND HAILAR BASINS



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AREA F

Figure 15.--CHINA, ERLIAN AND HAILAR BASINS

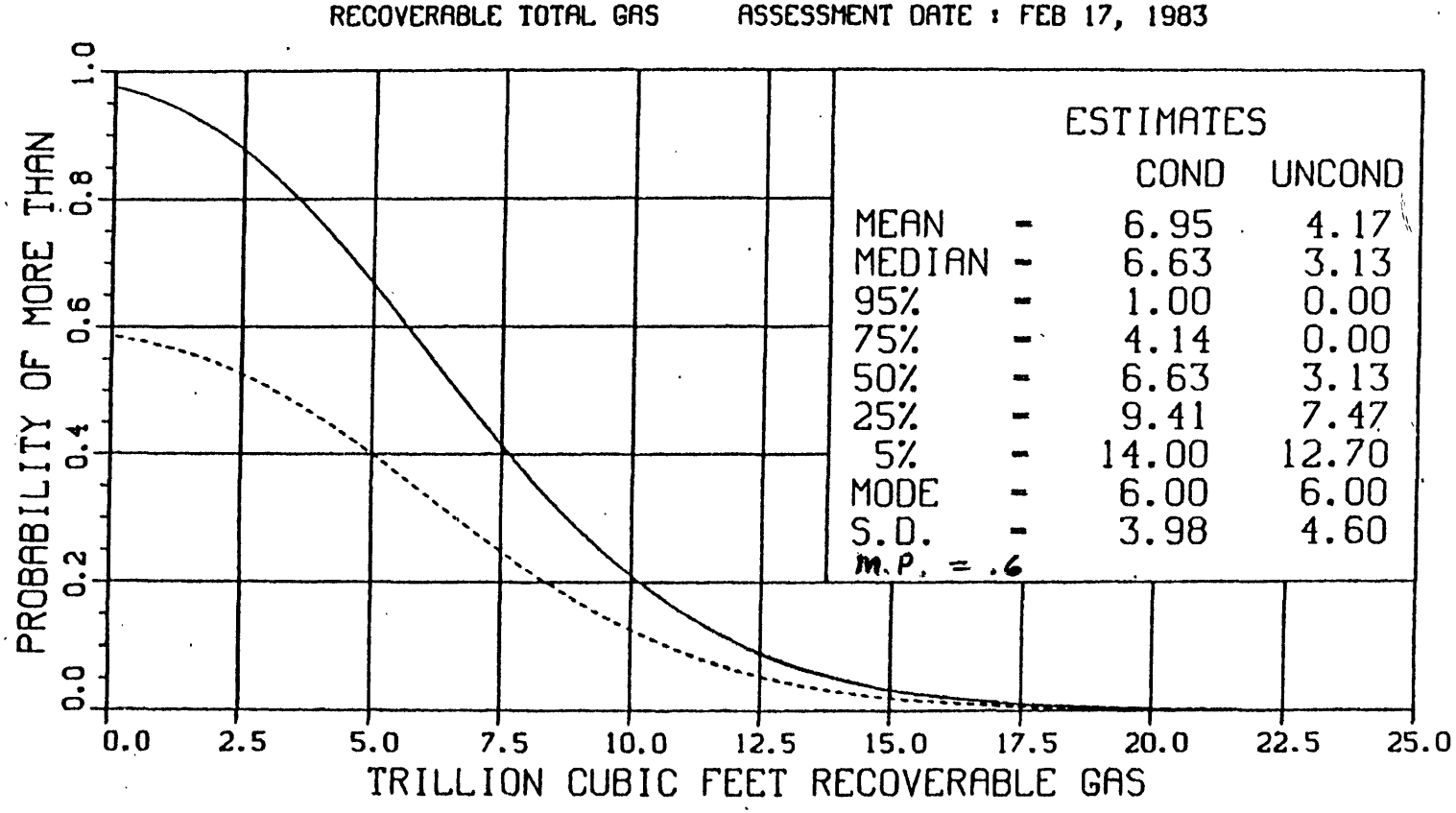

Table 2.--Supplementary and comparative data supporting the resource assessment for onshore China [1/]

	Crude oil (BB)	Natural gas (Tcf)
Cumulative production to 1981[2/]		
Songliao Basin	4.1	1.1
North China basins and Jiuquan Nanyang Basins	2.6	1.1
Northwest China basins	0.6	+ [3/]
South central China basins	0.3	2.2
Tibet Plateau	?	?
Erlian and Hailar Basins	neg.	neg.
Total	7.5	4.4
Measured reserves to 1981[2/]		
Songliao Basin	6.0	+ [3/]
North China basins and Jiuquan Nanyang Basins	7.0	+ [3/]
Northwest China basins	2.0	+ [3/]
South central China basins	1.3	10.0
Tibet Plateau	+ [3/]	?
Erlian and Hailar Basins	?	?
Total	16.3	10.0

Original recoverable resources (ultimate) of the above provinces[4/]

	Oil	Gas
Cumulative production	7.5	4.4
Measured reserves	16.3	10.0
Undiscovered resources (mean)	35.0	168.0
Total	59	182

Total oil and gas = 89 BBOE

1/ Cumulative production and reserves are composited estimates from various sources.

2/ Very little information is available on cumulative production and reserves.

3/ Quantity positive but data unavailable.

4/ Does not include an estimate of inferred reserves.

COMMENTS

- Very little published information is available on exploratory well density and locations, production history of individual fields, production and reserve data, and detailed reservoir analyses.

Northwest China basins

- The Zhungeer, Tulufan, Chaidamu, Tarim, Jiuquan, Wuwei, Qinghai, Minhe, and Ordos Basins are combined in the resource assessment because they are are generally similar in structure and stratigraphy.
- The main area of resource potential in Paleozoic rocks appears to be in western China, particularly the Tarim basin.
- The main analog used for most of these basins is the Uinta basin, U.S.A.
- These basins appear to be generally oil prone, but the deeper plays may be gas prone.
- Much of the area is remote and sparsely populated with severe climatic and transportation problems.

Songliao Basin

- A molasse facies play may be present in the eastern part of the basin.
- The basin is strongly oil prone with absence of gas caps in the oil fields.

North China basins

- Oligocene rocks contain a rich petroliferous section.
- Eocene and Cretaceous reef limestones are present.
- Paleocene and Cretaceous sandstone reservoirs are present.
- Several of the important fields produce from buried hill structures with fractured and porous reservoirs of late Precambrian and Paleozoic ages.
- Offshore BoHai appears to be the most promising area.
- Most fields produce only oil, but gas is produced from Eocene, Paleocene, and Cretaceous reservoirs in two fields.

South Central China basins

- These basins were combined in the resource assessment because Tertiary rocks are generally thin or absent.

- Good source rocks are present in the middle and upper Paleozoic and Triassic section but may be over-mature.

- The presence of Triassic salt in the southern Sichuan basin is an important factor in explaining the large gas accumulations there.

- Middle and upper Paleozoic and Triassic carbonate mounds and reefs are present in the Dian-Qian-Gui region; however, these are difficult to map in the subsurface, good regional seals may not be present, and source rocks are reported to be over-mature.

Tibet Plateau

- This province is a high-altitude region of sparse population and severe climatic and transportation problems. The region appears to be only moderately promising; however, it is very large, the stratigraphic section is very thick and much of it is marine, several deep and narrow Tertiary basins are present, and the province is essentially unexplored.