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Continuous Gas in Northwestern Depression/Central Uplift Assessment Unit 31420301

Continuous Gas in Northwestern Depression/Central Uplift Assessment Unit 31420301

Sichuan Basin Geologic Province 3142

Geologic Summary

Detailed map of this assessment unit

Assessment Input Data

Assessment Results

☐ This assessment unit was not
☐ assessed quantitatively.

USGS PROVINCE: Sichuan Basin (3142) **GEOLOGIST:** R.T. Ryder

TOTAL PETROLEUM SYSTEM: Xujiahe-Xujiahe/Shaximiao (314203)

ASSESSMENT UNIT: Continuous Gas in Northwestern Depression/Central Uplift (31420301)

DESCRIPTION: The assessment unit is characterized by a continuous-type gas accumulation trapped in a deeply buried, overpressured pod of mature Upper Triassic source rocks in the northwestern depression and adjoining central uplift of the basin. Upper Triassic fluvial sandstone units are the dominant reservoirs. Drilling depths to the accumulation range from about 2 to 4 km.

SOURCE ROCKS: The source rocks are gas-prone carbonaceous shale and thin coal beds of paludal-lacustrine origin in the Upper Triassic Xujiahe Formation. The Xujiahe Formation is as thick as 3000 m in the northwestern depression and it thins to less than 500 m on the central uplift. The source rock sequence is about 400 to 1000 m thick in which the total organic carbon (TOC) averages about 1.2 percent. The net thickness of coal beds in the Xujiahe Formation ranges from about 5 to 8 m.

MATURATION: The source rocks have been mature with respect to gas generation since about Late Cretaceous time. Any oil that was generated has been thermally converted to gas. Vitrinite reflectance (%Ro) values for Upper Triassic coal beds exceed 2.0 in the northwestern depression and range from about 1 to 1.5 on the central uplift. Approximately 1 to 3 km of uplift and erosion has occurred in the western Sichuan basin since the early Paleogene. A geothermal gradient of about 20 to 25°C/km probably accompanied gas generation.

MIGRATION: Natural gas has remained essentially in the pod of mature Upper Triassic source rocks. However, local to modest tectonic fracturing of the Mesozoic sequence allowed some vertical migration of gas into Jurassic sandstone reservoirs.

RESERVOIR ROCK: Primary reservoir rocks consist of fluvial and fan deltaic sandstone of the Xujiahe Formation. This sandstone was derived largely from the Longmenshan tectonic zone that flanks the northwestern margin of the basin. Fluvial sandstone in the Middle Jurassic Shaximiao Formation, derived from the Longmenshan and uplifts along the northern margin of the basin, constitute additional reservoirs. The reservoir quality of the sandstones is generally poor (average porosity ~5 percent and average permeability no greater than 1 mD) and, thus, usually tectonic fractures are required to improve gas deliverability.

TRAPS AND SEALS: The accumulation is trapped in a regionally extensive overpressured pod that encompasses the northwestern depression and the adjoining central uplift. Faulted anticlines formed during Himalayan tectonic events appear to be production “sweet spots” in the continuous accumulation. Jurassic and Cretaceous nonmarine mudstone and shale provide the regional seal.

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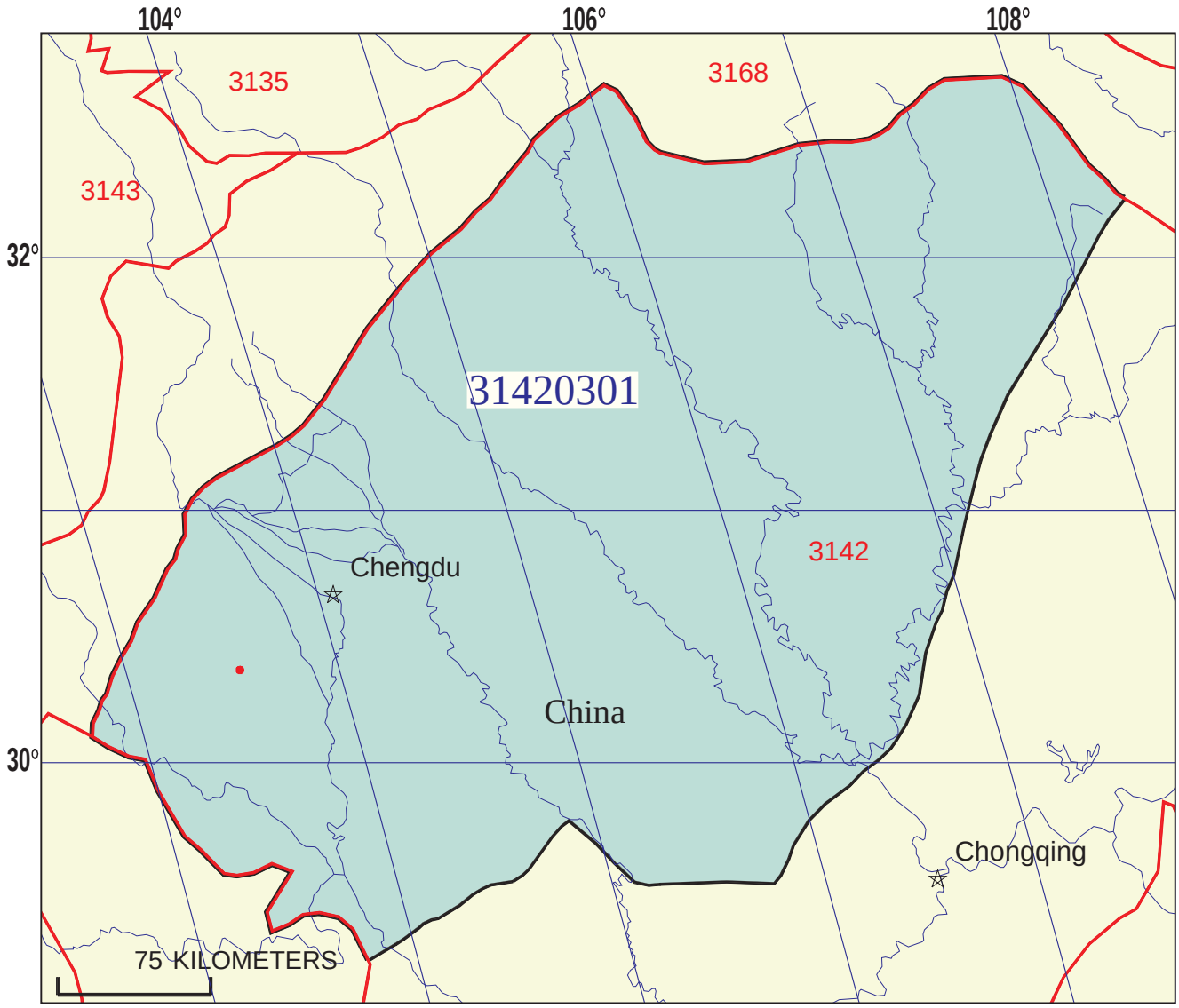

Continuous Gas in Northwestern Depression/Central Uplift Assessment Unit - 31420301

EXPLANATION

- Hydrography
- Shoreline
- 3142 Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 31420301 Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:…….. 12/16/99
Assessment Geologist:…….. R.T. Ryder
Region:…….. Asia Pacific Number: 3
Province:…….. Sichuan Basin Number: 3142
Priority or Boutique…… Boutique
Total Petroleum System:…… Xujiahe-Xujiahe/Shaximiao Number: 314203
Assessment Unit:…… Continuous Gas in Northwestern Depression/Central Uplift Number: 31420301
* Notes from Assessor Two known producing areas.

CHARACTERISTICS OF ASSESSMENT UNIT

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

What is the minimum field size?……. _____ 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: _____ Gas: _____
Established (>13 fields) _____ Frontier (1-13 fields) _____ Hypothetical (no fields) _____

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……	
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	

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

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

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) _____ median no. _____ max no. _____
Gas fields:……min. no. (>0) _____ median no. _____ max no. _____

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 _____ median size _____ max. size _____
Gas in gas fields (bcfg):……min. size _____ median size _____ max. size _____

Assessment Unit (name, no.)

_____

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……			
NGL/gas ratio (bngl/mmcfg)……			

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……			
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) ……			
Depth (m) of water (if applicable)……			

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

Assessment Unit (name, no.)

_____

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

1. _____ represents _____ areal % of the total assessment unit

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

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