



**Prepared in cooperation with the Afghanistan Ministry of Mines and Industry and the U.S. Trade and Development Agency**

# **U.S. Geological Survey and Afghanistan Ministry of Mines and Industry Cooperative Assessment of Afghanistan's Undiscovered Oil and Gas**

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## **Preface**

Results of the U.S. Geological Survey and Afghanistan Ministry of Mines and Industry cooperative assessment of undiscovered petroleum resources of northern Afghanistan were first released through this presentation on March 14, 2006, at the Afghan Embassy in Washington, D.C. On March 15 the results were presented in Kabul, Afghanistan. The purpose of the assessment and release of the results is to provide energy data required to implement the rebuilding and development of Afghanistan's energy infrastructure. This presentation includes a summary of the goals, process, methodology, results, and accomplishments of the assessment. It provides context for Fact Sheet 2006-3031, a summary of assessment results provided in the presentations.



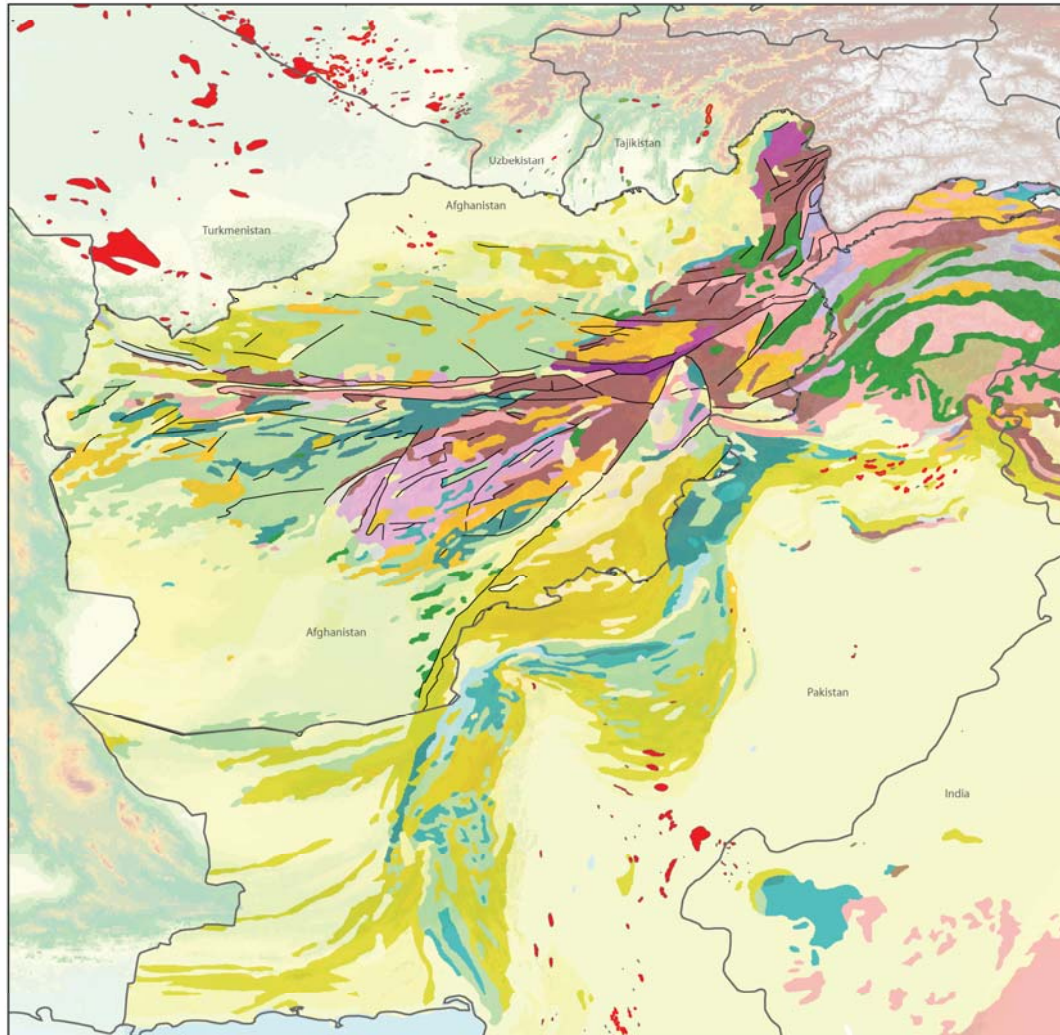
# U.S. GEOLOGICAL SURVEY AND AFGHANISTAN MINISTRY OF MINES AND INDUSTRY COOPERATIVE ASSESSMENT OF AFGHANISTAN'S UNDISCOVERED OIL AND GAS

Reservoir rock

Oil Source Rock



# Oil and Gas Fields and Generalized Geology in the area of Afghanistan



## Legend

- Faults
- unclassified
- Quaternary
- Quaternary sands and dunes
- Quaternary intrusives
- Quaternary volcanics
- Neogene sediments
- Paleogene sediments
- Tertiary sediments
- Tertiary extrusives
- Tertiary igneous
- Cretaceous and Tertiary sediments
- Cretaceous and Tertiary igneous/metamorphics
- Cretaceous sediments
- Mesozoic
- Mesozoic intrusive and metamorphics
- Undifferentiated Jurassic and Cretaceous sediments
- Jurassic metamorphic/sedimentary
- Triassic and Jurassic
- Triassic
- Triassic metamorphic/sediments
- Permian and Triassic
- Permo-Triassic
- Permian
- Permian igneous/metamorphics
- Paleozoic-Mesozoic
- Upper Carboniferous - Lower Triassic sediments
- Carboniferous sediments
- Silurian
- Ordovician-Silurian carbonates
- Ordovician metamorphic/sedimentary
- Cambrian sedimentary/metamorphics
- Paleozoic
- Paleozoic igneous
- Lower Paleozoic
- Precambrian-Paleozoic
- Precambrian
- Other Regions
- Water
- Gas Field
- Oil Field
- Oil and Gas Field

# *Goals of the Assessment of Afghanistan's Undiscovered Oil and Gas Resources*

- Collect Scientific Data and Analyses for Energy Resource Assessment and Development
- Train Afghan Geoscientists to Conduct Future Assessments Independently
- Provide Afghanistan with Information Needed to Manage Their Petroleum Resources
- Provide Basis for Investment in Exploration and Development



# *Data Collected, Analyzed, Interpreted, and Archived*

Geologic Samples

Oil and Gas Samples

Maps

Seismic Profiles

Well Reports and  
Logs

Exploration Reports  
and Literature



# *Training Provided*

Computer Skills

GIS

Petroleum Geology Refresher

Geologic Framework

Petroleum Systems

Geochemistry

Seismic Interpretation

Assessment Methodology





# Products

- Petroleum System Geologic Reports

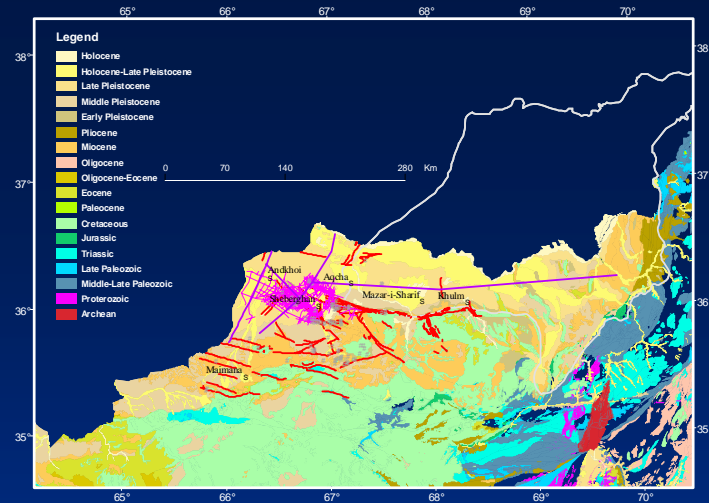
- Assessment Results

- GIS

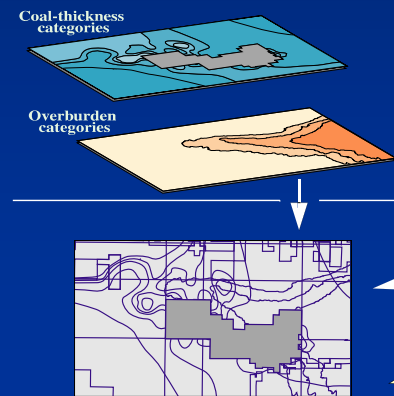
Geologic, Structural, Seismic, Field, Well, Pipeline, Sample Location, and Base Map Layers

- Petroleum Database

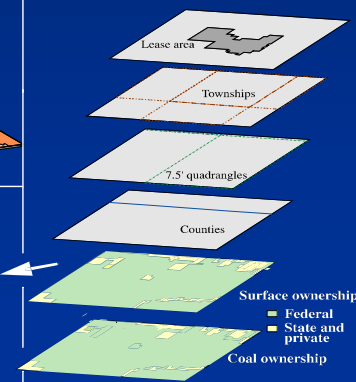
Geochemistry, Seismic, Well Data, and Geology



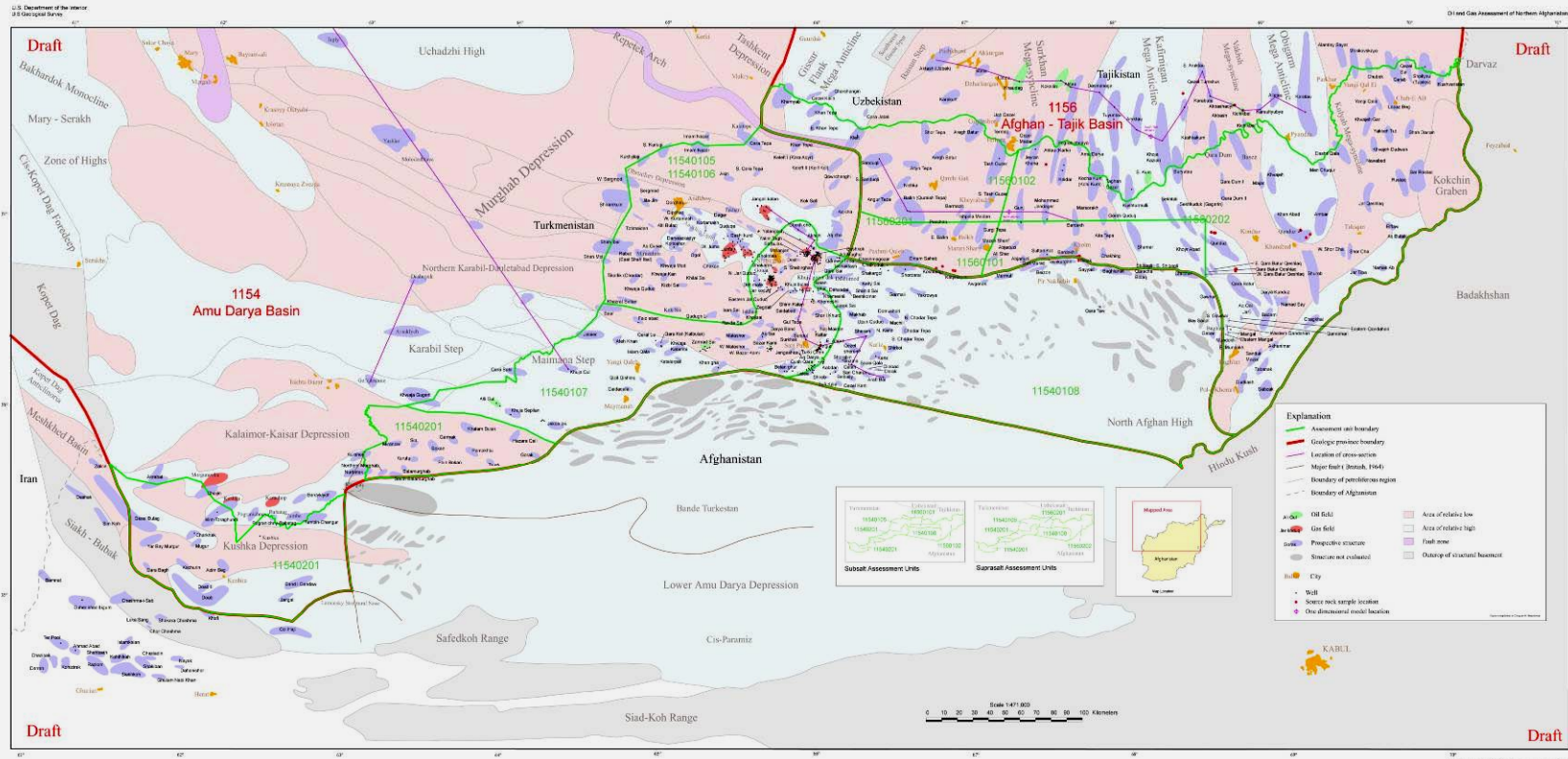
## Interpretive Maps



## Geographic and Cultural Maps



# Petroliferous Regions of Northern Afghanistan and Surrounding Areas



This map is a contribution of the U.S. Geological Survey Energy Research Team, with the U.S. and the Working Group of the Afghanistan Ministry of Energy and Mines. It depicts the petroleum geology of Northern Afghanistan and the Amu Darya Province, Iran, Pakistan, Uzbekistan and Tajikistan. It was made as an assessment of the oil and gas resources of Northern Afghanistan.

This map is preliminary and has not been reviewed by the U.S. Geological Survey and other interested agencies.

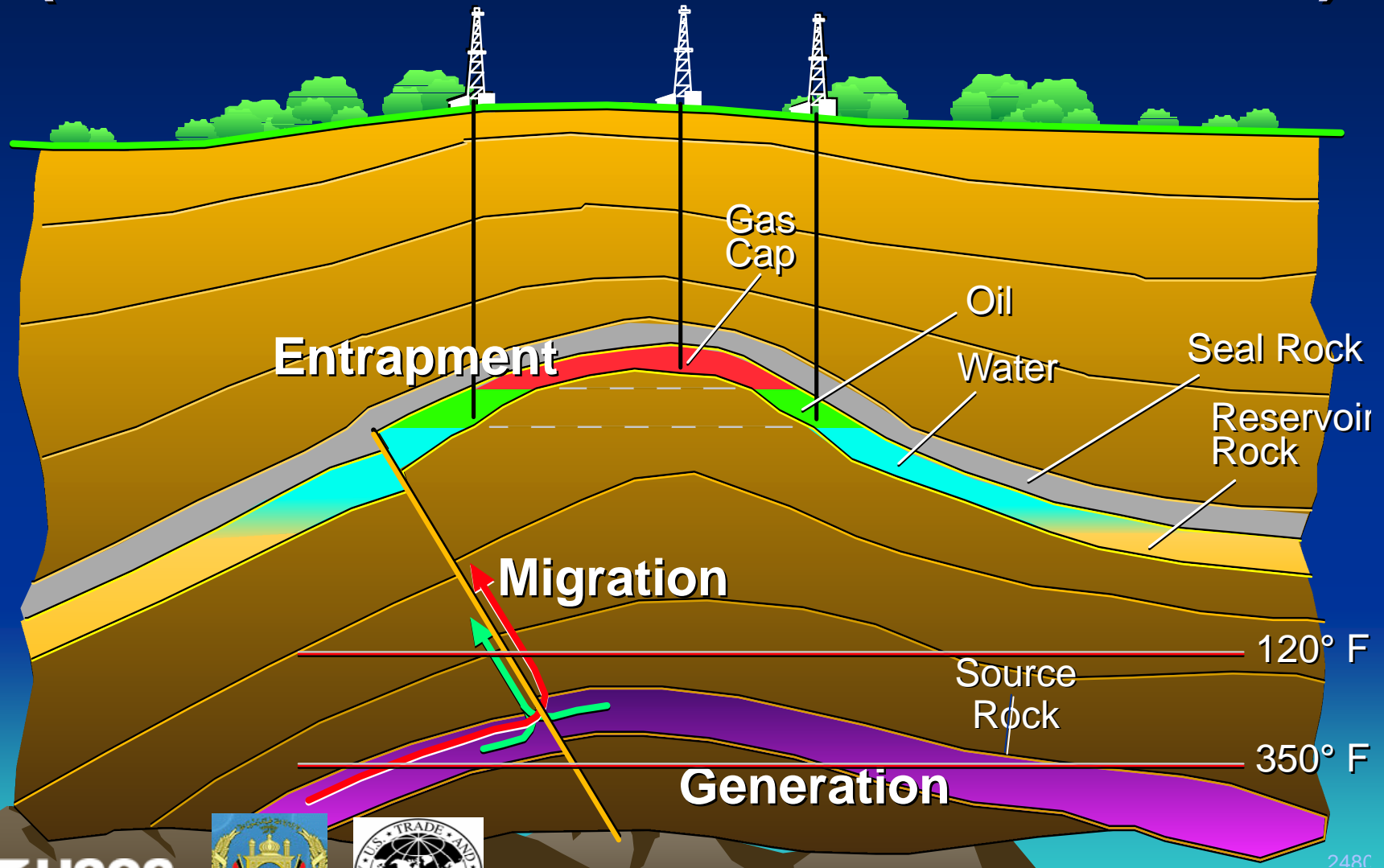
## List of Geologic Provinces, Total Petroleum Systems and Assessment Units

- 1154 Amu Darya Basin Geologic Province
- 115401 Amu Darya Jurassic-Cretaceous Total Petroleum System
- 1154005 Afghanistan Jurassic Evaporite Basin Subsalt Carbonates Assessment Unit
- 1154006 Afghanistan Jurassic Evaporite Basin Subsalt Anticlines Assessment Unit
- 1154007 Afghanistan Jurassic Evaporite Basin Margin Assessment Unit
- 1154008 Afghanistan Afghan High Assessment Unit
- 1154009 Afghanistan Kalamor-Kaisar Jurassic Total Petroleum System
- 11540201 Afghanistan Kushka Zone Assessment Unit
- 1156 Afghan - Tajik Basin Geologic Province
- 115601 Afghan - Tajik Jurassic Total Petroleum System
- 1156001 Afghanistan Subsalt Oxofordian Shelf Assessment Unit
- 1156002 Afghanistan Subsalt Basinal Facies Assessment Unit
- 1156021 Afghanistan Western Supersalt Gerdak Fields Assessment Unit
- 1156022 Afghanistan Eastern Supersalt Thrusts and Fields Assessment Unit

PETROLIFEROUS REGIONS OF NORTHERN AFGHANISTAN AND SURROUNDING AREAS  
by  
Timothy R. Klett, Gregory F. Ulmschek, Amir Zada, Amir Mohammad Selab, Abdul Salam Muttch, Ghulam Naqshband Haidari and Douglas W. Steinschouer  
2006



# Total Petroleum System Processes (Includes Undiscovered Resources)



# USGS Assessment Methodology

- Geologically Based
- Considers Analogous Systems
- Statistically Rigorous
- Produces Consistent Results Worldwide
- Results Statistical Range of Estimates

Total Petroleum Systems (TPS) and Assessment Units (AU)	Field Type	Total Undiscovered Resources											
		Oil (MMB)				Gas (BCF)				NGL (MMB)			
		F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean



# Suprasalt Assessment Units

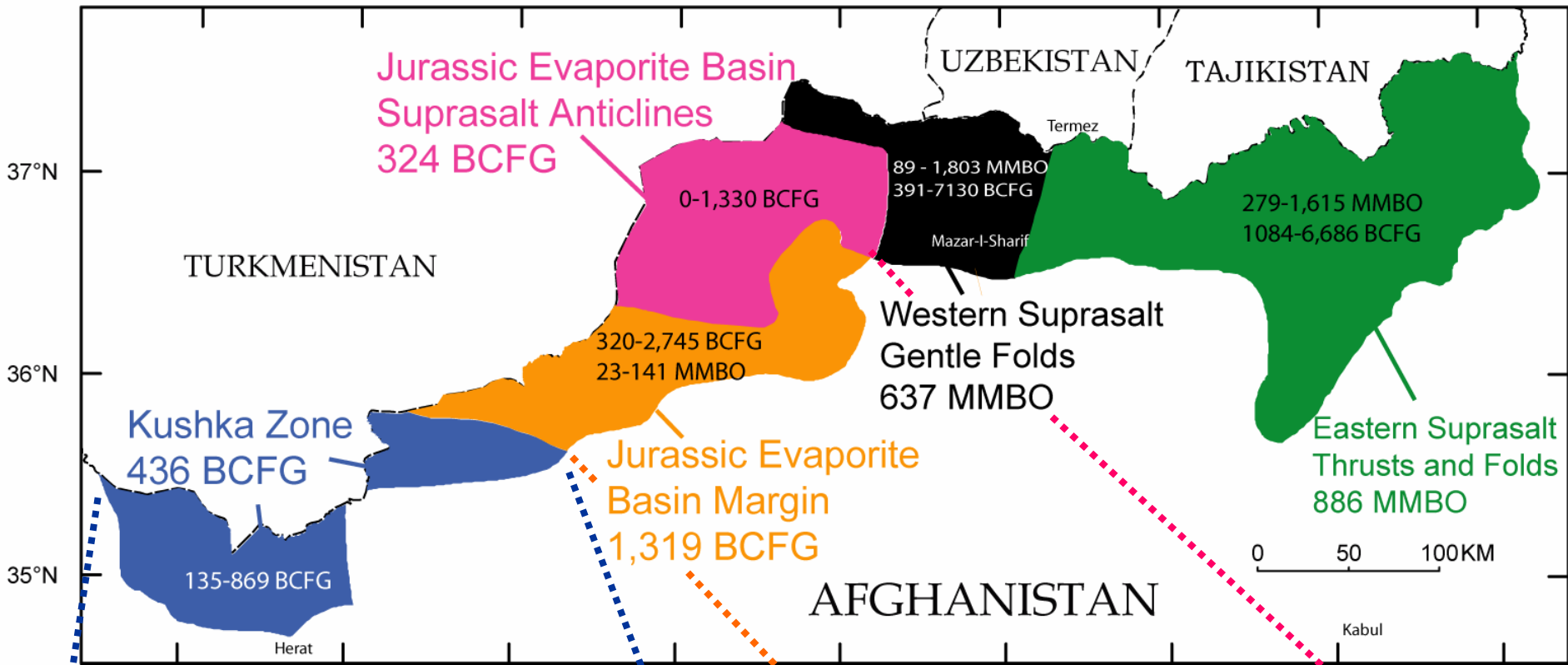
62°E

64°E

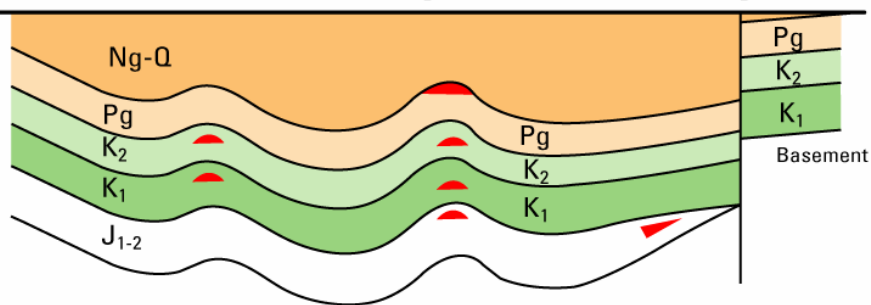
66°E

68°E

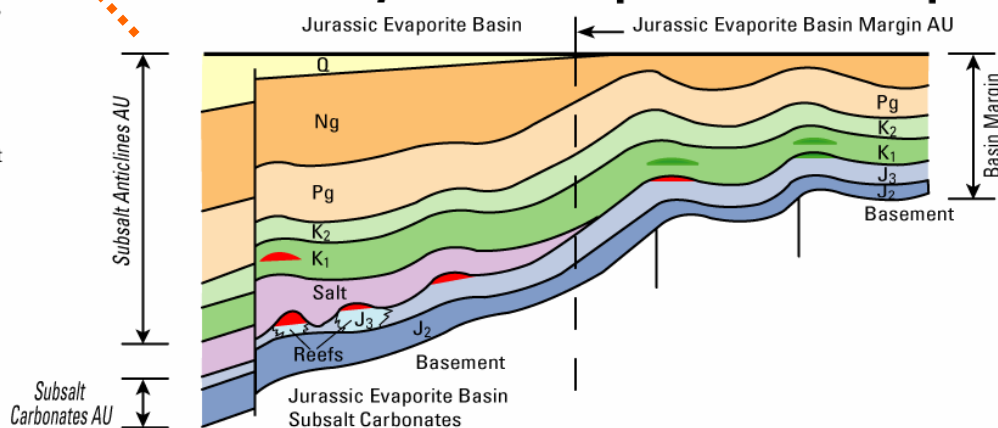
70°E



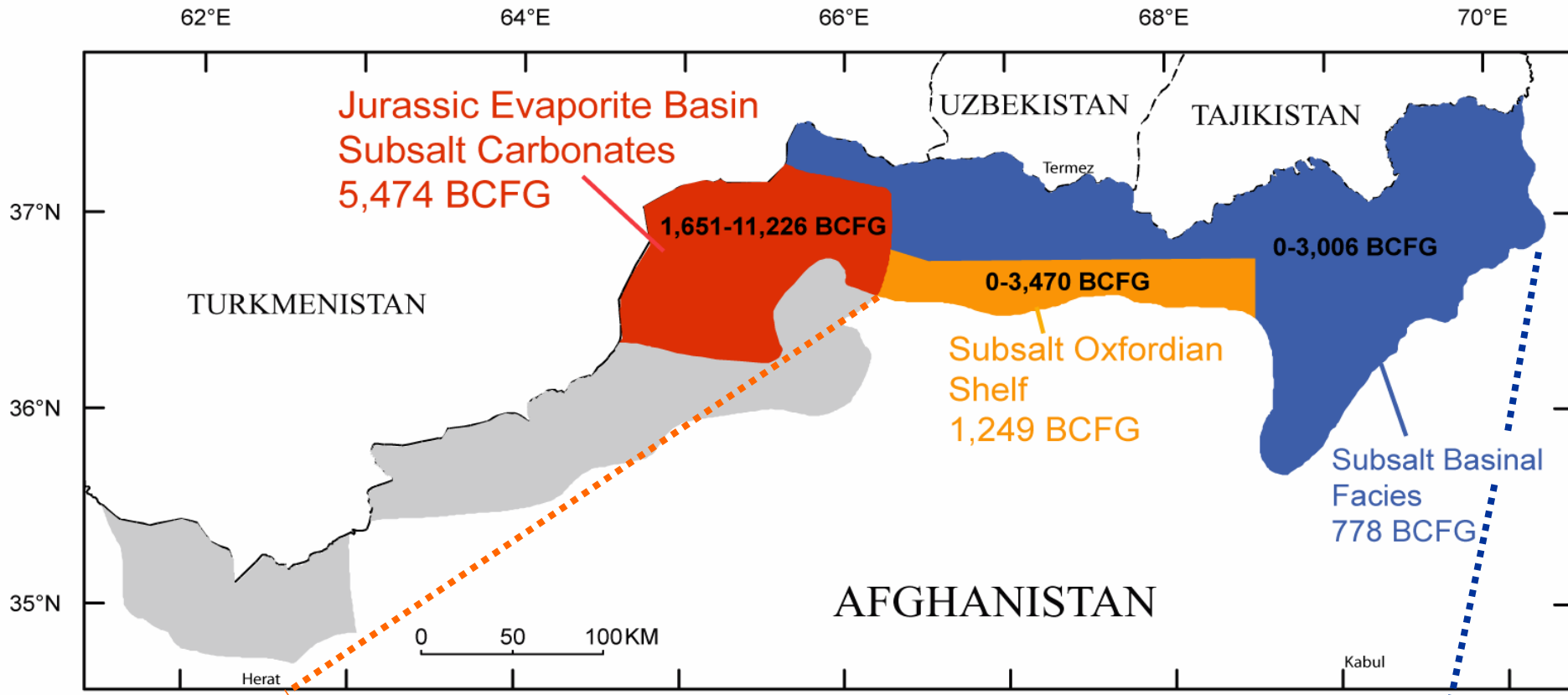
## Kushka Zone AU Exploration Concept



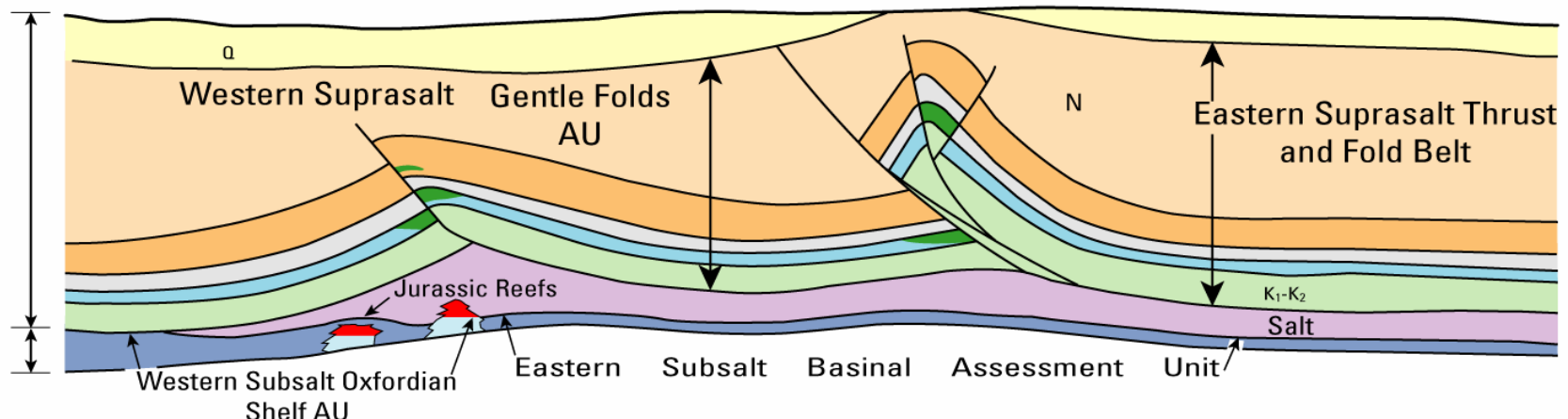
## Amu-Darya Basin Exploration Concept



# Subsalt Assessment Units



## Afghan-Tajik Basin Exploration Concepts



# Reserve Estimates

- 15 Fields Discovered – 1957 to 1984  
– 7 Oil, 8 Gas (~3 Producing)
- Initial Recoverable Reserves  
88 MMBO                      5 TCFG
- Estimated Produced Volumes  
0.17 MMBO?                2 TCFG?
- Remaining Reserves  
87 MMBO?                    3 TCFG?

# Assessment of Undiscovered Resources Expands Resource Base

Total Petroleum Systems (TPS) and Assessment Units (AU)	Field Type	Oil (MMB)				Total Undiscovered Resources Gas (BCF)				NGL (MMB)			
		F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
Total undiscovered petroleum resources, Amu Darya Basin		23	67	141	73	2,106	6,542	16,170	7,553	51	167	433	195
Total undiscovered petroleum resources, Afghan-Tajik Basin		368	1,318	3,418	1,523	1,475	6,280	20,292	8,134	75	294	892	367
Total undiscovered petroleum resources, N. Afghanistan		391	1,385	3,559	1,596	3,581	12,822	36,462	15,687	126	461	1,325	562

Jurassic Evaporite Basin Subsalt Carbonates – Amu Darya

Greatest gas potential – 5,474 BCFG

Eastern Suprasalt Thrust and Folds – Afghan-Tajik

Greatest oil potential – 886 MMBO





# *Where is Afghanistan in the Development Process?*

- 1 – Completed - Assessment of Petroleum Resources in Northern Afghanistan
- 2 – Completed - Certification of Reserves
- 3 – Completed - Petroleum Law



# *Next Steps*

## 4 -Validation of Potential

- Exploratory Seismic Surveys
- Rehabilitation of Existing Wells

## 5 -Leasing Preparation

- Lease Process Training
- Delineation of Lease Blocks
- Preparation of Data Packages
- Lease Round Road Show



# Energy Sources in Afghanistan

Electric Generation in Afghanistan  
450 MW installed 270 MW operating (2003)

## Operating Power Plants

- 1 Natural gas in Mazar-I-Sharif
- 2 Gas turbines running on diesel in Kabul
- ~5 Hydroelectric plants operating

Demand 750 GWh (2003) 3,334 GWh (2015)

Natural gas piped only between Shebergan and Mazar-I-Sharif

Numerous small coal mines operating



# *Geologic and Assessment Team*

## USGS

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Ronald Hill

Michael Pribil

J. David King



*Thank you.*

*<http://energy.usgs.gov>*

