



# Oil & Gas Reserves Studies

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## Unconventional Plays



# Always a trusted name, Ryder Scott certifies oil and gas reserves in unconventional plays.



**A Ryder Scott independent reserves report has always been a widely accepted assurance of asset value by the worldwide oil and gas industry. Our appraisals of unconventional plays, including oil and gas shale properties, are no exception.**

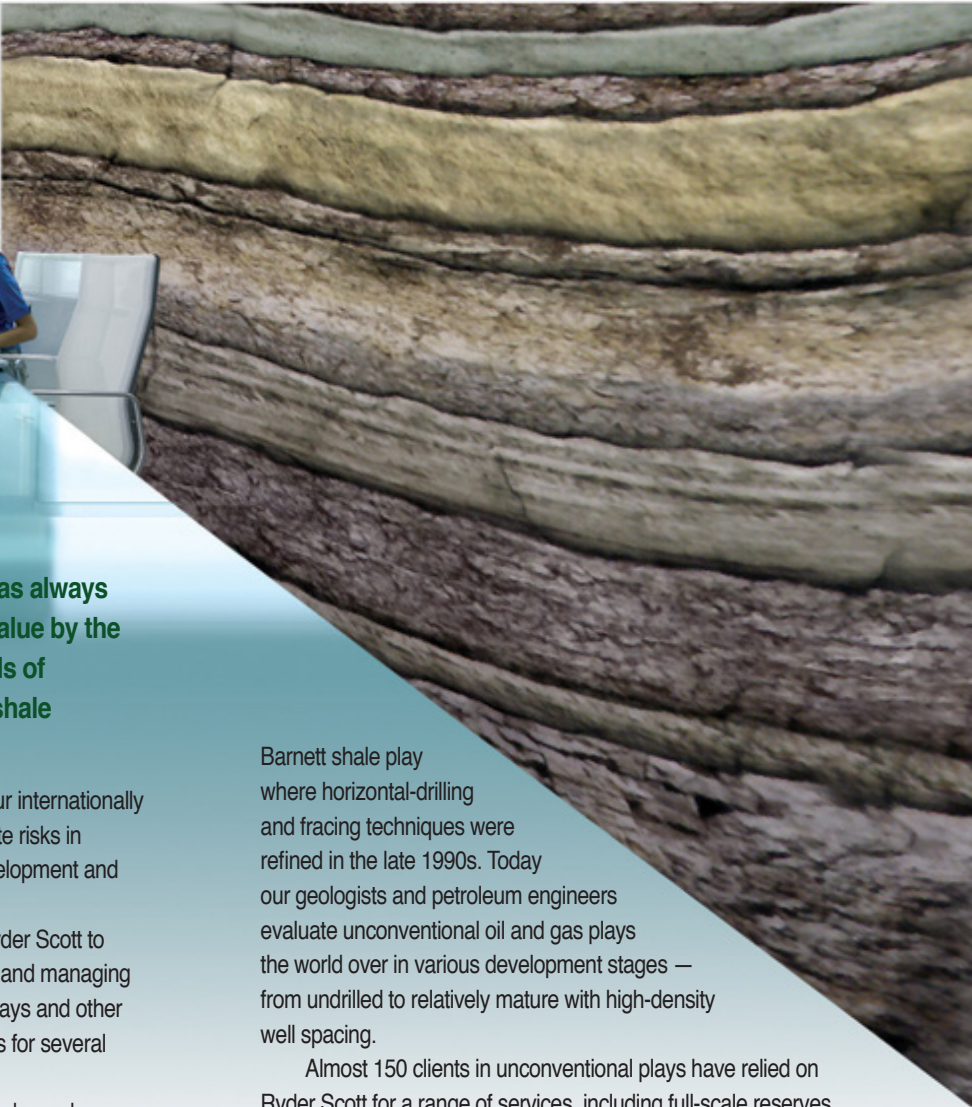
E&P companies and financial institutions rely on our internationally recognized “green book” consulting report to help mitigate risks in committing capital for acquisitions, exploration, field development and redevelopment, infrastructure and refinancing.

National oil companies and governments turn to Ryder Scott to provide indispensable support and advice on evaluating and managing new unconventional oil and gas accumulations. Shale plays and other tight formations are becoming valuable natural resources for several countries.

Our public company clients in unconventional plays depend on Ryder Scott to ensure that reserves disclosures filed with regulatory agencies worldwide comply with reporting requirements.

## **Decades of Shale Experience**

Ryder Scott has grown its expertise by working with clients in their early efforts in the Appalachian and Antrim shales and later in the



Barnett shale play where horizontal-drilling and fracing techniques were refined in the late 1990s. Today our geologists and petroleum engineers evaluate unconventional oil and gas plays the world over in various development stages — from undrilled to relatively mature with high-density well spacing.

Almost 150 clients in unconventional plays have relied on Ryder Scott for a range of services, including full-scale reserves evaluations, audits/process reviews, management advisory services and field development recommendations. We have prepared third-party forecasts of oil and gas production and cash flows from most major developed plays worldwide. Ryder Scott also has issued numerous reports on prospective and contingent resources in early-stage development of unconventional oil and gas reservoirs.

## Scientific Analysis Increases Booked Reserves

At Ryder Scott, we believe that understanding and using science as a basis for development of unconventional reservoirs is key. Our independent evaluations and audits increase bookable reserves and confidence in them. Ryder Scott uses every scientific method available for reserves evaluations of properties in unconventional plays, including the following:

- Core analysis for porosity, water saturation and total organic carbon
- Laboratory desorption and adsorption analysis
- Petrophysical analysis with core data correlations
- Petrophysical analysis with the Passey method
- Geophysical analysis of seismic data
- Microseismic analysis for fractured rock-volume estimates
- Volumetric analysis including free and absorbed components
- Flowing material balance analysis
- Square-root-of-time plots
- PVT analysis
- Rate-transient analysis including modeling transient- vs. boundary-dominated flow
- Numerical simulation
- Frac breakthrough modeling

## Leveraging Knowledge Base

Shortly after project startup, clients immediately benefit from our in-house knowledge base and subsurface data analytics. Ryder Scott has built large regional databases with public and proprietary information to create maps of oil and gas trends with tens of thousands of data points for each shale play.

Database “building blocks” include well locations in sweet and trouble spots, initial and daily production rates, estimated recovery factors and ultimate recoveries correlated with mapping by area and depth. We generate and inventory type curves for comparative analyses to identify best-fit performance analogs. Our analysis of statistical performance data yields predictable, repeatable reserves estimates in analogous areas.

We evaluate and catalog well-test results, fluid properties, drilling-and-completion techniques such as well trajectories, TVDs, lateral lengths, frac stages and proppant amounts. Key geological information, such as thermal-maturity and TOC data, is also stored and indexed.

## Basins and Plays Evaluated

### Partial Summary of U.S. Basins

Anadarko	Delaware	Fort Worth
Appalachian	East Texas	Midland
Arkoma		

### Partial Summary of U.S. Unconventional Plays

Antrim	Lower Huron	SCOOP
Avalon	Mancos	South Texas
Bakken	Manning Canyon	STACK
Barnett	Marcellus	Tuscaloosa Marine
Baxter	Michigan	Uinta
Devonian	Niobrara	Utica
Eagle Ford	Northwest Louisiana	Vermillion
Fayetteville	Northwest Stack	Williston
Gothic	Paradox	Wolfcamp
Haynesville	Permian	Woodford/Caney
Leonard	San Juan	

### Partial Summary of International Unconventional Plays

- Vaca Muerta oil shale play in southwest Argentina
- Exploratory shales in the Copper basin of Australia
- Montney and Duvernay gas plays in Canada
- Horn River basin gas play in British Columbia, Canada
- Lorraine and Utica gas plays in Quebec, Canada
- Canadian portion of Bakken oil shale play in Williston basin
- Horton Bluff shale play in Nova Scotia, Canada
- Simiti gas shale play in Middle Magdalena Valley in Colombia
- Various exploratory unconventional plays in Europe and China



## Clients in Unconventional Plays

Adams Resources Exploration Corp.  
Alta Mesa Holdings LP  
American Oil & Gas Inc.  
Americas Petrogas Inc.  
Anadarko Petroleum Corp.  
Anatolia Energy Corp.  
Anschutz Exploration Corp.  
Ante5 Inc.  
Antero Resources Corp.  
Apache Corp.  
Arena Energy LP  
Atlantic Resources  
Aurora Resources LLC  
Australis Oil & Gas Co.  
Beusa Energy Inc.  
BP America Production Co.  
BTA Oil Producers LLC  
Buckner International  
Caddis Capital LLC  
Cade Oil & Gas LLC  
Calibre Energy Inc.  
Callon Petroleum Co.  
Carrizo Oil & Gas Inc.  
CDX Gas LLC  
Central Petroleum Ltd.  
Chesapeake Energy Corp.  
Chevron Corp.  
CNOOC (China National Offshore Oil Corp.)  
ConocoPhillips Co.  
Continental Resources Inc.  
Cornerstone Natural Resources LLC  
Deutsche Bank AG  
Devon Energy Corp.  
Dominion Resources Inc.  
Enduring Resources LLC  
Energen Resources Corp.  
Energy Corporation of America  
Enerplus Corp.  
ENI Petroleum Co. Inc.  
EP Energy Corp.  
EQT Corp.  
Euro Pacific Capital Inc.  
Exco Resources Inc.  
Fasken Oil & Ranch Ltd.  
Fidelity E&P Co.  
GHA Barnett LLC  
Geo-Jade Petroleum Co.  
Global Natural Resources Corp.  
Goodrich Petroleum Co.  
Great Western Oil & Gas Co. LLC  
Grupo Altavista S.A. de C.V.  
Haimo Oil & Gas LLC  
Headington Oil Co. LP  
Hess Corp.  
HighMount E&P LLC  
Hilcorp Energy  
IDG Energy Investment Ltd.  
Indian Oil Corp. Ltd.  
Intervention Energy LLC  
Ironwood Oil & Gas LLC  
J.P. Morgan Chase & Co.  
Kerogen Resources Inc.  
Korea National Oil Corp.  
Landy Energy Inc.  
Laredo Petroleum Inc.  
Lario Oil & Gas Co.  
Lime Rock Resources  
Lukoil Co.  
Macquarie Bank Ltd.  
Mainland Resources Inc.  
Marathon Oil Corp.  
Marion Energy Ltd.  
MBI Oil & Gas LLC  
Merrill Lynch  
Metalmark Capital Holdings LLC  
Mitsui & Co. Ltd.  
Montana Oil Properties Inc.  
Moss Creek Resources LLC  
Murex Petroleum Corp.  
Murphy E&P Co.  
Newfield Exploration Co.  
Nexen Inc.  
NextEra Energy Resources Co.  
Northeast Natural Energy  
Northern Oil & Gas Inc.  
Oil India Ltd.  
Pan American Energy LLC  
PDC Energy Inc.  
PEMEX (Petróleos Mexicanos)  
PetroFrontier Corp.  
Petrogulf Corp.  
Petroleum Development Corp.  
PetroQuest Energy Inc.  
PrimeEnergy Corp.  
Qatar Petroleum  
QEP Resources Inc.  
Range Resources Corp.  
Reliance Holding USA Inc.  
Repsol YPF SA  
Rimrock Resources Partners LLC  
Riverstone Europe LLP  
Rosetta Resources Inc.  
Royal Dutch Shell PLC  
Sabine Oil & Gas LLC  
Samson Oil & Gas Ltd.  
Sanchez Oil & Gas Corp.  
Sasol Ltd.  
SinoChem Petroleum USA LP  
Sinopec (China Petroleum & Chemical Corp.)  
SM Energy Co.  
Spotted Hawk Development LLC  
Stairway Capital Management LP  
State Commission on Mineral Reserves (Russia)  
State of Ohio Division of Oil & Gas  
State Street Bank & Trust Co.  
Stone Energy Corp.  
Sundance Energy Inc.  
Talisman Energy Inc.  
Tall City Exploration LLC  
Tapstone Energy LLC  
Texakota Oil Co.  
TNK - BP  
Triangle Petroleum Corp.  
Unit Petroleum Co.  
United Energy Group Ltd.  
Unocal Corp. (Union Oil Co. of California)  
Verdad Resources LLC  
YPF (Yacimientos Petrolíferos Fiscales)  
Zavanna LLC  
ZEnergy Inc.

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