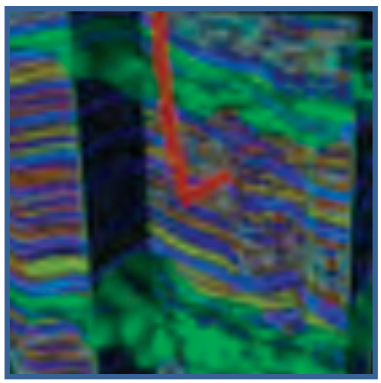


Oil, Gas *and* The 21st Century

By Peggy Williams, Senior Exploration Editor, *Oil and Gas Investor*

When prospectors first started to drill for crude oil in Oklahoma, it was not yet a state and petroleum geology had not yet developed as a science.

Random wildcatting (mixed with a fair amount of luck) yielded excellent discoveries in various parts of Oklahoma, and people began to untangle subsurface relationships.

What soon became abundantly clear was the complexity of Oklahoma's buried oil and gas reservoirs. Drillers were puzzled by great thicknesses of steeply dipping beds beneath the state's diverse landscape. Prospectors were perplexed by the source of oil and its migration into disparate reservoirs. Multiple unconformities in the geologic section created unusual juxtapositions.

Of course, Oklahoma's complexity is one of its strengths. Straightforward areas yield all their prizes quickly; it's the more difficult ones that continue to serve up discoveries for decades.

And that's what has been happening in Oklahoma, which remains a production powerhouse. The state makes 1.6 trillion cubic feet of gas and 60 million barrels of oil a year. It ranks second in the country for natural gas production and fifth for crude oil.

Hunt for Natural Gas

Today's explorers mainly look for natural gas in Oklahoma. The state's oilfields are generally shallow, and drillers have already poked and probed the well-known productive section with some 450,000 wells. Most oil accumulations of size were discovered years ago.

So, where's an explorer with an eye on the big prize to look? Natural gas reservoirs that are extremely deep or hidden in structurally complicated areas are high on the list for elephant hunters. Current deep exploratory activity focuses along the southern flank of the storied Anadarko Basin, one of Mother Nature's great repositories of hydrocarbons. Here, where the Wichita Mountain Front runs through portions of Comanche, Caddo, Washita, Kiowa and Beckham counties, companies drill 18,000-foot-plus tests for Pennsylvanian Atoka, Morrow and Springer sands. Modern wildcatters include Chesapeake Energy, Dominion E&P, St. Mary Land & Exploration and Marathon Oil.

1925

Route 66. Second only to railroads, highways have shaped the face of Oklahoma for the past century. The most famous band of concrete in the country is Route 66, the dream of Tulsan Cyrus Avery.

1926

Petrochemical Pioneer. The manufacture of chemicals from petroleum had its beginning in the southwest at the Tallant gas processing plant in Osage County. Built in 1926 by a Cities Service Co. subsidiary, the plant process was the research answer to red rust produced in transmission to market of natural gas from the Burbank, Oklahoma, field.

Companies drilling in Oklahoma rely on 3-D seismic techniques and advanced computer modeling to find oil and gas.

Infill drilling is also popular in the Anadarko's deep reservoirs. In Beckham County's Mayfield area, wells aim for Morrow and Springer reservoirs; in Caddo's Verden Field, objectives are again Springer. Apache Corp. runs four rigs at Verden, which was discovered in 1976. The company says reservoir compartmentalization in the field has afforded it a wealth of drilling opportunities.

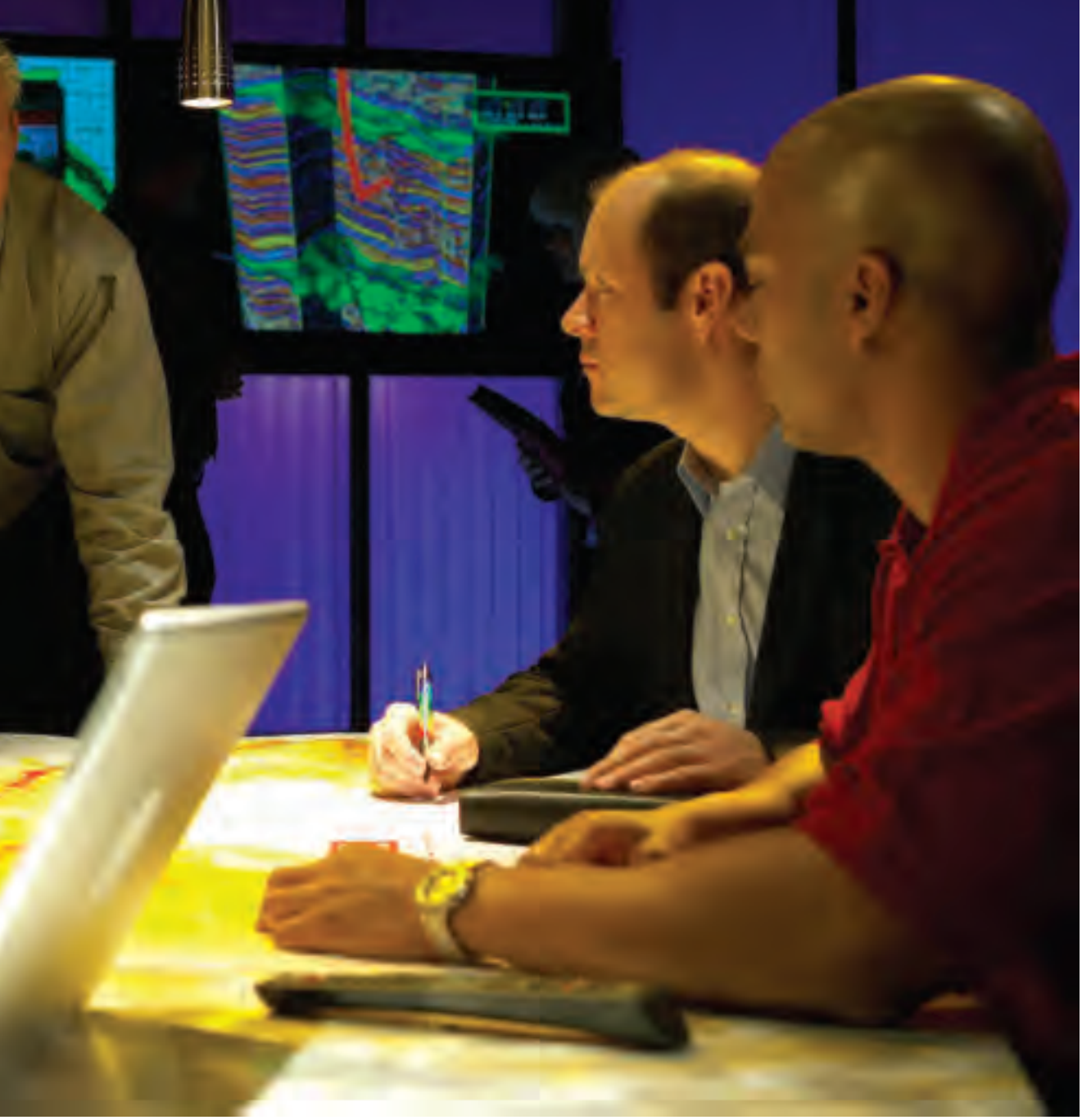
Too, there's a more bread-and-butter approach to natural gas drilling. Drilling for the commodity is concentrated in the Anadarko Basin and Shelf areas, in such reservoirs as the Chester, Morrow, Oswego, Atoka and Red Fork. Companies pick along the edges of existing accumulations and wedge additional wells into developed fields. Exploitation and development activity abounds in such areas as the Strong City District, Mocane-Laverne gas area and Watonga-Chickasha fields.

A good chunk of natural gas activity also centers on coalbed-methane (CBM) plays. At the beginning of 2007, Oklahoma had 4,600 CBM wells. Statewide, such wells produce about 200 million cubic feet of gas per day, some 5% of total gas production. Since development started, Oklahoma's CBM wells have produced a total of 360 billion cubic feet of gas.

These days, drilling in Oklahoma's two major CBM plays concentrates in areas of already established production. In 2006, the state estimated that some 475 CBM wells were completed in the Cherokee Basin in the Rowe, Mulky and Riverton coals, and in the Arkoma Basin in the Hartshorne coals.

Technology and Innovation

Oklahoma has a secure place as an innovator and early adopter of fresh technologies, and that's



demonstrated throughout its oil industry. Improvements in horizontal drilling have created many opportunities, and Oklahoma has been reaping its share of rewards from this technology.

Horizontal drilling works well in Oklahoma because the state is stuffed with the types of rocks that offer prime targets. Reservoirs with low permeabilities and dual porosity systems can be economically produced with horizontal wells, and operators are applying the technology throughout the state's petroliferous geologic section.

Companies are able to tap bypassed or previously inaccessible reserves in old fields with the horizontals. Cleveland sandstones have proved to be amenable targets for horizontal drilling in the western Anadarko Basin, as have Cherokee reservoirs. In Grimes Field in Roger Mills County, for instance, Chesapeake Energy has an on-going horizontal drilling program in the Cherokee.

On the eastern side of the Anadarko, horizontal Hunton and Cottage Grove wells have made some excellent completions.

Unconventional reservoirs such as shales and coals have also benefited greatly from horizontal drilling, particularly in the Arkoma Basin in eastern Oklahoma. The Woodford Shale play has lit up the industry with reports of solid wells in an area that trends from western McIntosh through central Coal counties. In Pittsburg, Haskell and LeFlore counties, horizontally drilled Hartshorne coal wells have been delivering excellent gas rates and reserves. Activity is high in such fields as Scipio Northwest, Canadian, Kinta, Poteau Southeast and Poteau-Gilmore.

Oilfields Redux

Finally, Oklahoma is home to an abundance of mature oilfields, and these are drawing fresh attention and technologies.

New Dominion LLC of Tulsa is carrying out in Oklahoma one of the more interesting oilfield rejuvenation techniques in the U.S.

The company produces high volumes of water from fields thought to be depleted. The water production reduces reservoir pressures, and the pressure drop causes natural gas associated with still-trapped oil to expand. The expansion drives the oil toward the producing wells, where it can be captured.

New Dominion has projects in Hunton and Arbuckle reservoirs. In Oklahoma City Field, the company has been drilling multilateral horizontal wells in the Arbuckle.

Other projects, such as enhanced oil recovery via carbon dioxide injection at Postle Field in Texas County, are also in progress. Whiting Petroleum is expanding the flood in that field.

In southern Oklahoma's Ardmore Basin, Citation Oil & Gas has massive ongoing operations. The company uses a variety of approaches, including 3-D seismic, detailed mapping and engineering studies to site wells in the mature waterfloods in the area, home to an amalgamation of fields discovered in the 1910s and '20s. Active in Oklahoma since 1985, Citation today operates 4,300 wells in the state.

And, notwithstanding the tilt toward natural gas, oil exploration retains a small but relevant place in Oklahoma activity. Chaparral Energy LLC is under way with an exploration program in Harmon County, in the northwestern Hardeman Basin. It is drilling several 8,500-foot Arbuckle tests in the lightly explored area.

Range Resources is also at work on a field rejuvenation project at Tonkawa in Kay and Noble counties. Recently the company acquired 100% interest in the field and is in the midst of an active drilling program. It has reported that it has some 400 shallow well locations in Tonkawa, which is one of Oklahoma's original prolific fields and dates back to 1921.

So, oil or gas, shallow or deep, straight or sideways, there's a lot of drilling and producing going on in Oklahoma. Down the road, the industry looks to remain a cornerstone of the state's identity and of its economy. ■

Castle *on the* Prairie

E.W. Marland

Of all the grand homes built by oilmen in Oklahoma, none approaches the combination of size and ostentation of the castle on the prairie that E.W. Marland built.

Even before building his castle, Marland had proven he was a man of unlimited appetite. He used his fortune to grace Ponca City with an 80-acre formal garden, a golf course and a polo field.

The mansion built in 1928 topped everything. The Italian Renaissance home had 55 rooms, 15 bathrooms, three kitchens, two elevators, one hand-painted ceiling that cost $80,000, an indoor swimming pool, central heat and air conditioning and several Waterford crystal chandeliers that cost $15,000 each. Outside were three lakes, another swimming pool, more polo fields, stables and a Japanese garden. By the time he was finished, the home cost $2.5 million—in 1928 dollars.

Today, the Marland Mansion is an Oklahoma treasure, a monument built for a man of vision who recognized no limits.

1927

Oil Production Peaks. Oklahoma's crude oil production peaked at about 770,000 barrels per day.

1927

"Lucky Lindy." Charles A. Lindbergh was the first person to fly alone nonstop across the Atlantic Ocean.

1928

Oklahoma City Oil Field. The Indian Territory Illuminating Oil Co. and the Foster Petroleum Co. drilled the discovery well of the Oklahoma City Field, the Oklahoma City No. 1.

were drilled vertically with no special problems. The company owns essentially 100% of the play. It is considered too early for reserve projections, but based on good performance, three or four more wells are planned for 2007.

Chaparral claims to be the third-largest producer of oil in the state. Most of that production comes from its enhanced recovery projects. In the Panhandle, the company operates the Camrick Unit, a carbon dioxide (CO_2) injection project, which injects 16 million cubic feet of CO_2 per day, up from 7 million at project start. This increase has caused a production increase from 100 to 1,150 barrels of oil per day.

Also, in Osage County, the company operates the Burbank Unit, an older field with a recovery to date of 315 million barrels of oil. This field is undergoing an enhanced oil-recovery polymer flood, to be followed by CO_2 injection.

St. Mary Land & Exploration Co.

Another firm with a strong Anadarko Basin commitment is St. Mary Land & Exploration Co. The Denver company, with 50 employees in the Tulsa office, has been active in Oklahoma since the mid-1970s and has production across the state.

Currently it is pursuing a drilling program in the Northeast Mayfield Field area, principally in Beckham County, where deep gas wells are typical. These wells are drilled to about 16,500 feet to target the Atoka and Granite Wash formations. The company has plans for roughly 30 wells this year, says Brent A. Collins, director of investor relations.

Costs for these Atoka wells average $4- to $4.9 million each. All of the wells are vertically drilled, with no particular drilling challenges encountered. Well potentials average 4 million cubic feet of gas per day, and anticipated reserves are in the 1.4- to 1.5-billion cubic feet equivalent (Bcfe) range per well.

A second frontier of Oklahoma activity for St. Mary is in the rapidly growing Woodford shale play, in Coal County in the Arkoma Basin. Here, nine wells have been completed, and about 15 additional are planned this year.

The exploited shale formation is found at 8,500 feet, vertical depth. All wells are

Top 10 operators 2005-2006

Operator	Wells Spud in 2005
Chesapeake Operating Inc.	436
Newfield Exploration Mid-continent Inc.	183
EOG Resources Inc.	76
Apache Corp.	66
Dominion Oklahoma Texas Exploration & Production Inc.	60
New Dominion LLC	59
Questar Exploration & Production Co.	58
PetroQuest Energy LLC	52
Cimarex Energy Co.	48
Vectra CBM LLC	46

Operator	Wells Spud in 2006
Chesapeake Operating Inc.	508
Newfield Exploration Mid-continent Inc.	226
New Dominion LLC	95
Apache Corp.	76
Range Production Co.	61
Noble Energy Production Inc.	60
Panther Energy Co.	60
BP America Production Co.	56
Dominion Oklahoma Texas Exploration & Production Inc.	54
Special Energy Corp.	53