

Monday, October 11, 2010

Westchase Hilton • 9999 Westheimer  
Social Hour 5:30–6:30 p.m.  
Dinner 6:30–7:30 p.m.

Cost: \$28 Preregistered members; \$35 non-members & walk-ups

To guarantee a seat, you must pre-register on the HGS website and pre-pay with a credit card.

Pre-registration without payment will not be accepted.

You may still walk up and pay at the door, if extra seats are available.

# HGS General Dinner Meeting

Michael G. Moore

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Houston, TX

HGS General Dinner Meeting

## Exploration, Appraisal, and Development of Turbidite Reservoirs in the Western Atwater Foldbelt, Deep Water Gulf of Mexico

The Western Atwater Foldbelt (WAFB) (Figure 1) in the deep water Gulf of Mexico has yielded several large oil fields that have a total resource potential of more than two billion barrels. Oil has accumulated in Middle and Lower Miocene age submarine fan reservoirs draped over large, salt-cored, faulted compressional anticlines and 3-way closures against salt welds. The WAFB produces from six fields at the rate of about 400,000 BOPD with a cumulative production of more than 300 million barrels of oil. It has developed into an important oil-producing province that contributed about a quarter of the total oil produced in the Gulf of Mexico during 2009 (Figure 2).

Early exploration in the WAFB focused on large compressional structures partially visible beneath the southern edge of shallow salt. BHP Billiton and BP formed a partnership leading to the

trend-opening discovery on the Neptune structure in 1995 and major discoveries at Atlantis and Mad Dog in 1998. Subsequent discoveries have been made at K2 (1999), Shenzi (2002), Tahiti (2002), Puma (2003), Knotty Head (2005), Pony (2006), Friesian (2006) and Heidelberg (2009). As seismic imaging has continued to improve, exploration has focused on deeper subsalt targets. The WAFB is still actively being explored with four recent exploratory wells and continued leasing activity in the 2010 GOM lease sale. The exploration success rate in the WAFB has been about 60%.

Exploration success in the WAFB has led to an extensive appraisal program to confirm the presence of economic resources. This has proved challenging due to the effect of shallow salt on seismic

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imaging leading to uncertainties with regard to fault location and density. As a result, multiple appraisal penetrations are required for each structure, with an average of ten per producing field. Operators have had to drill additional appraisal wells after the start of production in most WAFB fields. Appraisal drilling has added significant resources on the north side of Atlantis and the west and south sides of Mad Dog.

Initial production from the WAFB began at the Mad Dog Field in January 2005. Other fields that have come on production include K2 (May 2005), Atlantis (October 2007), Neptune (July 2008), Shenzi (March 2009), and Tahiti (May 2009). Early production data suggest the following:

- 1) Good initial production rates with about half of the development wells flowing at a rate of more than 15,000 BOPD.
- 2) It will be a challenge to maintain production rates due to structural complexity, reservoir energy issues, and stratigraphic complexity in some areas.
- 3) Areas of poor subsalt seismic imaging result in increases in the difficulty of predicting well results. As a result, some production wells have been sidetracked, but fewer than planned.

Development wells are very expensive in the WAFB, so it is important to use lessons learned from early production to optimally locate future wells in order to efficiently drain the remaining resources in each field. ■

**Biographical Sketch**

**MIKE MOORE** has worked as a geologist in the Gulf of Mexico region for more than 30 years. He has a strong background in exploration, appraisal, and development of deep water turbidite reservoirs.



Mr. Moore is from New Hampshire, where he developed an interest in geology by cracking open rocks left behind by retreating Pleistocene glaciers. He graduated from the University of New Hampshire in 1976 with a B.S. degree in geology and went on to attend the University of Alaska at Fairbanks, where he mapped Carboniferous limestone turbidites along the Yukon River in east-central Alaska for his thesis. He graduated in 1979 with a M.S. degree in Geology and went to work for Exxon in New Orleans holding several exploration and development positions, mainly working the Gulf of Mexico.

Mr. Moore joined BHP Billiton in 1993 and in 1995 became a member of a team exploring the Western Atwater Foldbelt and participated in discoveries at Neptune, Atlantis, Mad Dog, and Shenzi. He was a member of the initial appraisal team for Atlantis and Mad Dog fields. He is currently doing regional mapping in the Western Atwater Foldbelt area of the deep water Gulf of Mexico.

