Overview of the Deepwater Geology of the Mexican Gulf of Mexico - Round 1 of Bidding in the Energy Reform

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Baker Hughes, January, 2015
Bidding, Round 1

**Schedule**

**2014**
- Aug / Nov 14: *Definition of the type of contract, Terms and Conditions, and technical terms of the contracts (SENER)*
- Aug / Nov 14: *Definition of fiscal terms and contract variables (SHCP)*
- Aug 14 / Jan 15: Creation of Data Rooms (CNH)

**2015**
- Nov 14 / Jan 15: Draft terms are made public by CNH
- Nov 14 / Jan 15: Feedback on terms and conditions
- Feb / April 15: *Bidding terms and conditions sale (CNH)*
- May / Sep 15: *Opening of Data Rooms (CNH)*
- May / Sep 15: Awarding of contracts (CNH)
Regions of Interest

- Non Conventional
- Perdido Area
- Mexican Ridges
- Southern Deep Waters
- Extra Heavy Oil
- Shallow Waters
- In association with Pemex
- Exploration
- Extraction

SECRETARÍA DE ENERGÍA,
http://www.energia.gob.mx/webSener/rondauno_Ingles/9500.html
## Basins & Blocks Available

### Round One

<table>
<thead>
<tr>
<th>Area</th>
<th>Type</th>
<th>Volume Mmboe</th>
<th>Blocks</th>
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</thead>
<tbody>
<tr>
<td>Perdido Deepwater</td>
<td>Prospective</td>
<td>1,591</td>
<td>11</td>
</tr>
<tr>
<td>South Deepwater</td>
<td>Prospective</td>
<td>3,222</td>
<td>17</td>
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<tr>
<td>Chicontepec and</td>
<td>Reserve 2P</td>
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<td>Non-conventionals</td>
<td>Prospective</td>
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<td>Land, Offshore and</td>
<td>Reserve 2P</td>
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<td>Extra heavy oil</td>
<td>Prospective</td>
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<tr>
<td>Non-conventional</td>
<td>Prospective</td>
<td>142</td>
<td>8</td>
</tr>
</tbody>
</table>

- **169 Contact (Blocks)**

### Farmouts with Pemex

**Nov 2014 - Dec 2015**

- **Land Mature Fields**: Rodador, Ogarrio, Cardenas - Mora
- **Offshore Mature Fields**: Bolontiku, Sinan, Ek
- **Offshore Extra heavy oil**: Ayatsil, Tekel, Utsil
- **Offshore deepwater gas**: Kunah, Piklis
- **Perdido area**: Trion, Exploratus

Background

- **Perdido Foldbelt (PFB) is located in the Western Gulf of Mexico.**
  - Is part of the Cenozoic compressional fold system in the Gulf of Mexico and is distinctive in deformation details and structural style.
  - Contains Upper Jurassic–Eocene age strata folded during the early Oligocene (36–30 Ma), with deformation most likely continuing into the early Miocene.
  - Formed by gravity sliding, it consists of a series of southwest-northeast-trending, parallel, megascopic-scale kink bands and flanks that are cut by reverse faults.
  - Contains Cretaceous to Eocene sedimentary rocks. The “reservoir” facies are:
    - Lower Cretaceous fore-reef carbonate debris analogous to the major productive section in Poza Rica field, Mexico,
    - Upper Cretaceous chalks, and
    - Tertiary turbidite sands related to Wilcox & Frio delta systems from the Rio Grande embayment and several rivers in Mexico.

Jon Frederic Blickwede, T. A. Queffelec
AAPG, 1988, Trudgill et al., 1999, AAPG, Camerlo and Benson, 2006, AAPG
Perdido Fold Belt
US & Mexico
Paleogeographic Cenozoic Map showing Depocenters for the Perdido, US

Waller, 2007, Texas A&M
Sediment Supply, Deepwater Mexico

J. Zamora, 2013
The presence of thick, widely distributed, and massive Wilcox sandstone reservoirs in the deep-water Gulf of Mexico is attributed to a several thousand feet Paleocene sea-level drop.
Wilcoxon Reservoir Characteristics

Very fine grained - coarse silt to fine sand
Moderately to poorly sorted feldspatic litharenites

**Wilcoxon 1** (upper): unconfined inner, middle, and outer distributary fan; high perm tractional facies have best sorting, grain size; compaction of ductile grains.

**Wilcoxon 2** (lower): perms generally higher in channelized fan system; more quartzose, chlorite coatings preserve poro/perm, cementation as overgrowths on quartz grains.
Petroleum Systems in Mexico

- Light oil: 500 mmboe
- Wet gas: 5 tcf
Mexican PFB Discoveries

Trion  
Maximino  
Supremus

Source Pemex

Alfredo Guzman, 2014, AAPG.
Southern Deepwaters

Deepwaters: South General Map

<table>
<thead>
<tr>
<th>Type</th>
<th>Volume** (MMboe)</th>
<th>Blocks (number)</th>
<th>Area (km²)</th>
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<tbody>
<tr>
<td>Prospective Resources*</td>
<td>3,222</td>
<td>17</td>
<td>384-966</td>
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</table>

*Excluding Pemex’s farm-outs and contracts
** Risked volume

Mexican Ridges

Salina Basin

Piklis

Kunah

R1 Extraction
R1 Exploration
Pemex’s farm-outs
Pemex’s current contracts
Seep Studies in Southern Deepwaters

Obstacles to Exploration & Development in Gulf of Mexico

- Seismic imaging
  - Complex structures include fold dominated kink bands and angularly folded strata
- Reservoir quality e.g. Wilcox play shows low porosities & permeabilities
- Ultra deepwater environment
- Salt
- High temperature / high pressure regimes

Location of Salt bodies

Conclusion

Round One brings Mexico in association other operators. With numerous leads, lessons learned, discoveries, and prospective resources based upon hydrocarbon systems analysis, and regional seismic studies, the opportunities in Mexico’s deepwater basins are large and underdeveloped.

The sweeping changes in the Energy Reform allow these plays to be accessible starting with Round One.
References

• Juan Carlos Flores Zamora, 2013, “Integration of Geophysical Interpretation Methods Applied in the Perdido Fold Belt”, NTNU, Trondheim, Norwegian University of Science and Technology.
• Jasso, A.E., Ciudad del Carmen. Puente Zacatal, Símbolos Carmelitas, Mexico, Flickr, photo, 2011