Offshore Gas Development in the Gulf of Thailand

Supat Napanoparatkaew
Department of Mineral Fuels
Thailand Petroleum Development

<table>
<thead>
<tr>
<th>Petroleum Fields</th>
<th>Discovery (Fields)</th>
<th>Producing (Fields)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gas</strong></td>
<td>51</td>
<td>19</td>
</tr>
<tr>
<td>Onshore</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Offshore</td>
<td>49</td>
<td>18</td>
</tr>
<tr>
<td><strong>Oil</strong></td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>Onshore</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Offshore</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>79</td>
<td>41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Petroleum Reserves</th>
<th>Proved (P1)</th>
<th>Probable (P2)</th>
<th>Possible (P3)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas TCF</td>
<td>14.0</td>
<td>9.2</td>
<td>8.3</td>
<td>31.5</td>
</tr>
<tr>
<td>Condensate MMBBL</td>
<td>285</td>
<td>230</td>
<td>250</td>
<td>765</td>
</tr>
<tr>
<td>Crude MMBBL</td>
<td>222</td>
<td>118</td>
<td>182</td>
<td>522</td>
</tr>
</tbody>
</table>

CCOP PPM Workshop “Gas Contracts”  
Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Gas Demand and Supply

CCOP PPM Workshop “Gas Contracts”  
Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Gas Demand and Supply Projection

Gas Demand Growth 3% pa. (50% gas for New Power Plant assumption)

To Maintain Gas Supply
- Imported Gas (Piped Gas, LNG)
- Additional Reserve

CCOP PPM Workshop “Gas Contracts” Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Offshore Petroleum Development

Resource Size
Petroleum Type
Market and Price
Infrastructure Distance
Existing or New Operator

CCOP PPM Workshop “Gas Contracts”  Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Subsurface Uncertainty
Subsurface Uncertainty

Traditional

Single Well

Well defined target reservoirs

Directional

Multi Well

Seismic targets

Precise location and number of reservoirs unknown
Subsurface Uncertainty

- Complex geology in the Pattani Basin
- Slim hole completion and commingled production
- Over 1400 wells drilled with Large, detailed database
- Simple statistical approach using net pay and recovery factors.

CCOP PPM Workshop “Gas Contracts”  Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Process Facilities

Process Design
- Gas/Condensate/Water Separation
- Gas Compression/Dehydration
- CO$_2$ removal by membrane or Dew Point Control Unit
- Condensate Stabilization
- Water Treatment System ready for injection or sea drain

CCOP PPM Workshop “Gas Contracts” Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Gas Field Development Project Case

- 4000 km² of 3D Seismic Acquisition
- 29 Exploration and Appraisal Wells
- 28 discovery wells and 1 dry well
- Reserve = 2.6 TCF
- 70 platforms and 400 development wells in 15 years
- Average OGIP per well = 6.5 BCF

- Start with CPP Complex and FSO
- 1st Phase Wellhead Platform = 6
- Contract Volume 330 MMSCFD
- First Gas Delivery: Quarter 3, 2007
- Gas Price 2.5 – 3.5 US$/MMBTU

CCOP PPM Workshop “Gas Contracts”

Sihanouk Ville, Cambodia: 29 Aug. – 2 Sep., 2005
Success Milestone

From highly productive core areas to marginally frontier areas

Improvement Step
- Massive 3D Seismic Acquisition
- Geostatistical Reserves Estimates
- Directional Slim Hole with Conductorless
- Light Weight Platform
- Zero Produced Water Discharge

CCOP PPM Workshop “Gas Contracts” Sihanouk Ville, Cambodia; 29 Aug. – 2 Sep., 2005