# Gas Field Development - Challenges and Current Best Practices to Maximise Value

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# Navigating Challenges in Gulf of Thailand Slimhole Wells with Innovative Technology

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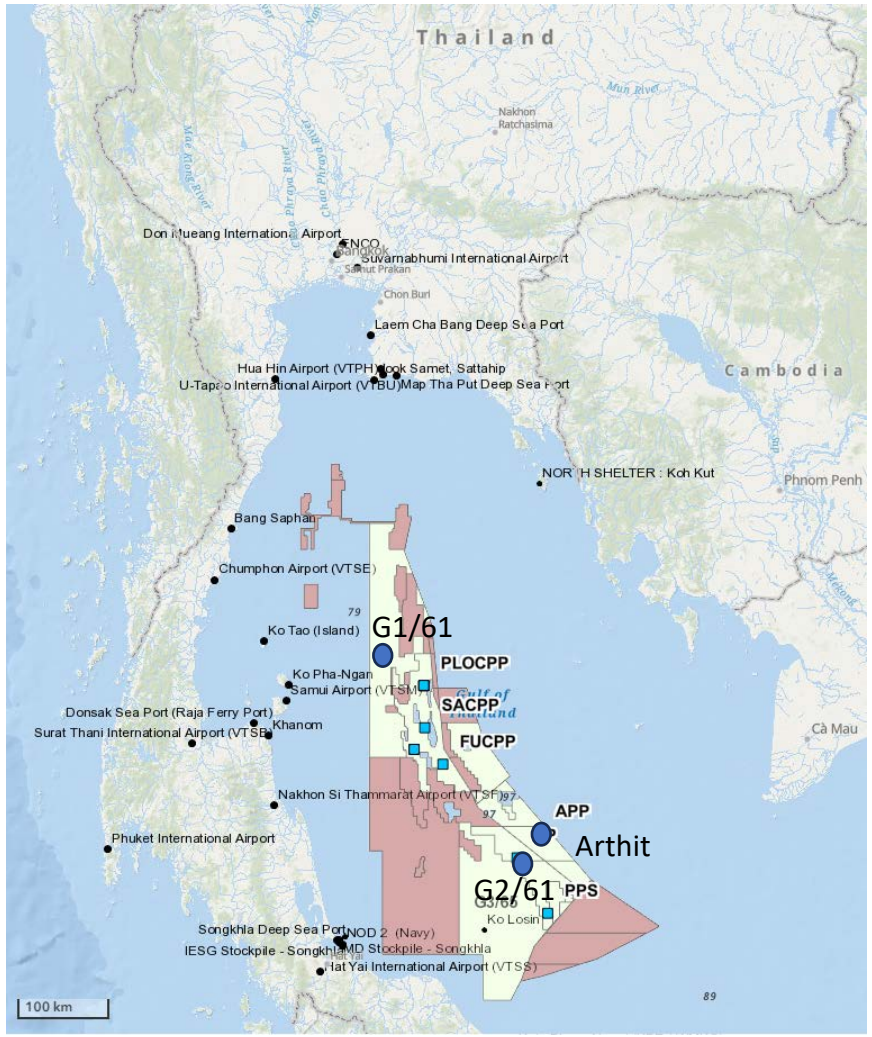
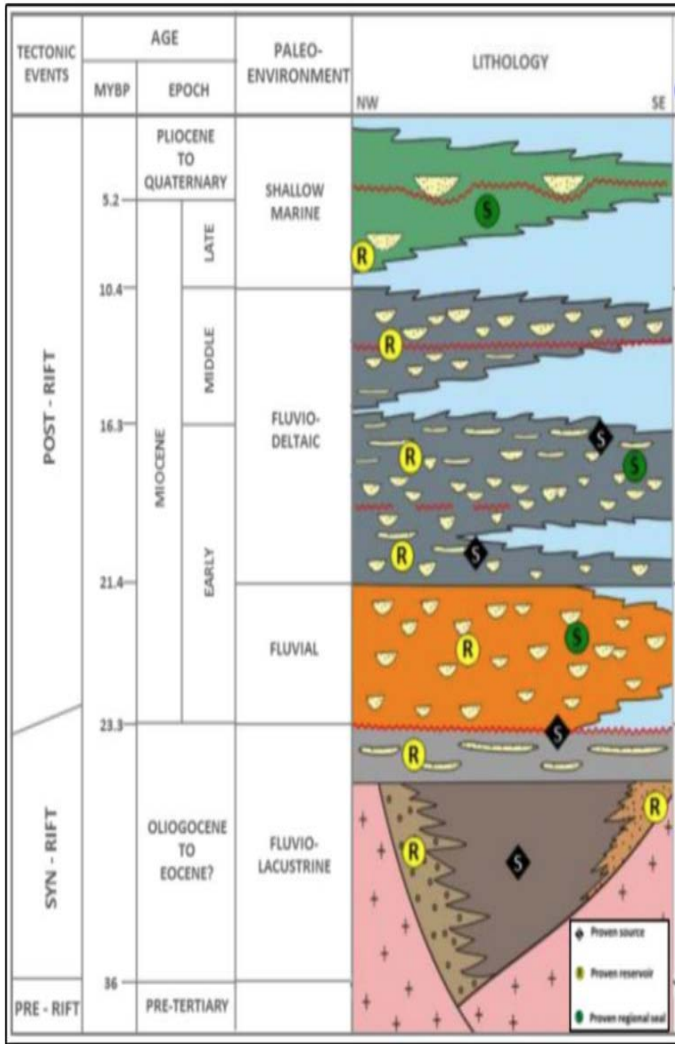
# Agenda

- Gulf of Thailand (GOT) Background
- Slimhole GOT Challenges
- Planning Phase
- Execution Phase
- Conclusion

# Gulf of Thailand (GOT) Background




- Gulf of Thailand located in offshore Thailand where the majority of the fields can be classified as small lateral gas pockets
- The combinations of complex structural and stratigraphic traps form the primary geological closure.
- Commingled production from multilayer reservoirs and a strategic development plan should enable a successful and viable project that where slimhole in Thailand concept has been implemented for decades.

# Slimhole GOT Challenges

1. Increasing activity for long term commitment
2. Increasing drilling rigs (> 10 rigs over a past few years)
3. Increasing personnel and process
4. Subsurface challenges e.g. depleted zones, pore pressure uncertainty
5. How to maintain or improve the project economic


**Planning Stage**

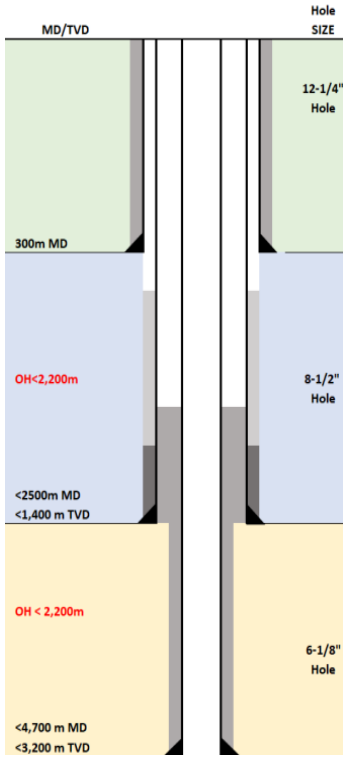
- Well Factory Model
- Well Delivery Process (WDP)

**Execution Stage**

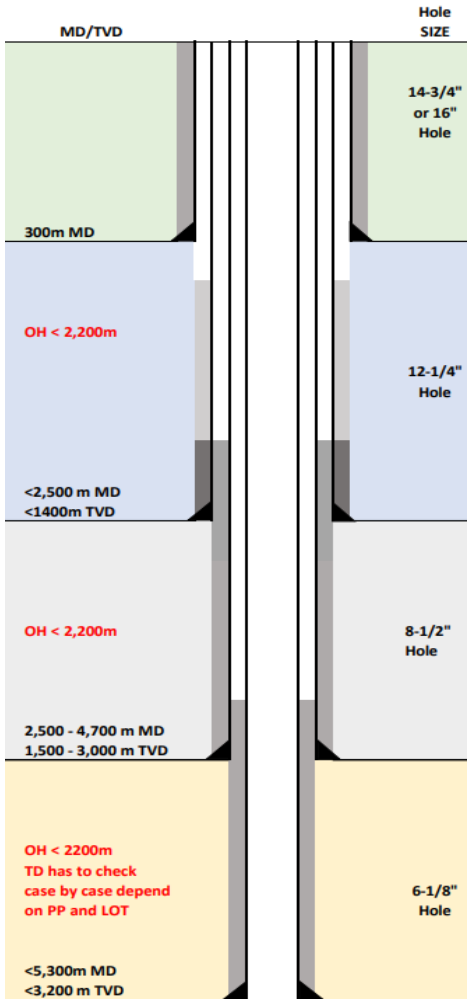
- NPT Analysis
- Solution and Recommendation

# Planning Phase (GOT Factory Model)

3S Cat 1




4S




Strategic objective to

- Optimize value (reserve and well cost)
- Standardize drilling program with the controlled well parameter including open hole length, inclination, max TD, max pore pressure, formation evaluation, well intervention, etc.
- Deliver contractual gas requirement and maximize value of gas and condensate production

However, more challenging wells continue increasing toward the technical limit which might require discussion and agreement with involving parties with the economic justification

# Planning Phase (Well Delivery Process)

**CONVENTIONAL**

- **Individual** storage & planning practice

**WDP**
**Well Delivery Process**

**TRANSFORMED**

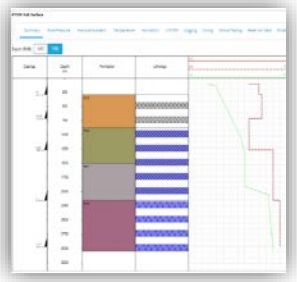
- **Standardized** storage & planning practice
- **Statistically-driven** decision

**30%**
**Well Planning Cycle Time**

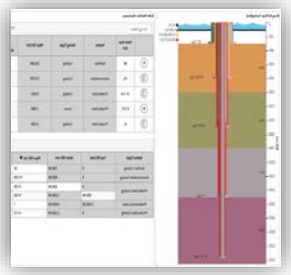
1. Offset Analysis

2. Trajectory

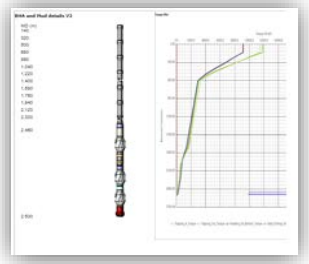
3. Geological Prog.



4. Sections & csg design



5. BHA, TnD, Hyd etc.

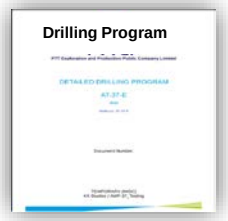


6. Well montage review

7. Risk Assessment report

8. Checklists

9. Digital Program




10. E-Approval

# Execution Phase (NPT Analysis)

| DURATION [d] | 2020 | 2021 | 2022 | 2023 | 2024 | CUMUL |
|---|---|---|---|---|---|---|
| RIG | 2 | 5 | 11 | 10 | 11 | 2 to 11 |
| RIG DAYS | 385.1 | 1049.1 | 2544.9 | 3651.6 | 2402.5 | 10033.2 |
| SEQP-RIG | 6.6 | 9.4 | 55.0 | 111.0 | 59.7 | 241.7 |
| WB-STUK | 3.3 | 14.2 | 89.3 | 84.5 | 40.7 | 232.0 |
| WO-W | | | 48.8 | 120.8 | 31.0 | 200.6 |
| WB-HANG | 6.9 | | 27.2 | 58.5 | 70.2 | 162.8 |
| WB-WC | 1.1 | | 32.8 | 30.6 | 28.3 | 92.7 |
| WB-LOSS | | 1.8 | 17.3 | 37.8 | | 56.9 |
| DHEQP-MWD | 1.2 | | 13.7 | 22.7 | 14.0 | 51.6 |
| WB-TRIP | 1.6 | | 11.5 | 27.9 | | 40.9 |
| WB-PKOFF | 0.8 | | 11.3 | | 21.3 | 33.4 |
| DHEQP-LWD | 1.3 | | | 16.8 | 10.3 | 28.3 |
| WB-TWIST | 3.5 | | | 21.7 | | 25.2 |
| DHEQP-DD | 1.6 | 1.2 | 15.3 | | | 18.1 |
| SEQP-WHXT | | | | | 6.9 | 6.9 |
| WB-OTHR | | | | | 6.9 | 6.9 |
| WB-LOT | | 4.9 | | | | 4.9 |
| DHEQP-RIG | | 4.1 | | | | 4.1 |
| DHEQP-OTHR | | 1.6 | | | | 1.6 |
| DHEQP-TEST | | 1.3 | | | | 1.3 |
| WO-DAY | | 0.9 | | | | 0.9 |
| SEQP-WL | | 0.8 | | | | 0.8 |

- Number of rigs increase over the past 5 years
- Top 3 NPT
  - Rig Equipment
  - Pipe stuck and wellbore related issues
  - WOW

# Execution Phase (Solution and Recommendation)

| No. | Topics | Solution/ Recommendation |
|---|---|---|
| 1. | Rig Equipment | Rigorous rig inspection/ Audit<br>Offline capability such as drill pipe handling, batch drilling, cement, etc |
| 2. | Pipe Stuck/ Wellbore hang-ups | Lubricant (also for T&D, sliding, vibration)<br>Actual drilling parameters adjustment and optimization |
| 3. | Losses | Wellbore strengthening (Fibrous particle, graphite, CaCO3)<br>Standardized approach fitted for rig operation |
| 4. | Pore pressure uncertainty | Strategic 4 string approach, MPD |
| 5. | High Temperature | High temperature downhole tools such as LWD, motor<br>Mud cooler and temperature mitigation procedure |
| 6. | Integrity | High temperature mud and cement additive |

# Conclusion

- Sustain the gas production for national energy security
- Time improvement e.g. LWD plan, offline and SIMOP activity
- Cost improvement e.g. bundle contracts, sharing across assets, multiple suppliers
- Continuous improvement
  - Process using AI/ ML technology to capture events prior to occur
  - High temperature LWD
  - Rotary steerable system