

2H Offshore - deep water riser engineering

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Subsea Tree Offset Riser Manifold

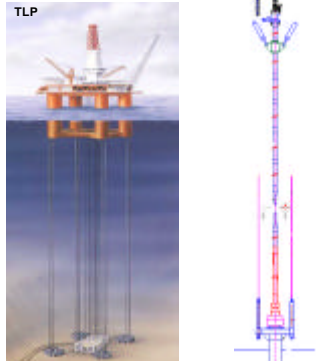
Field Development Solution with Riser and Well Systems Focus

By
Stephen Hatton
2H Offshore Engineering

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Dry Trees




TLP

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TOP TENSION RISERS



HYDRO-PNEUMATIC TENSIONER SYSTEM AIRCAN SYSTEM


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Dry Trees

- Pros
 - Surface BOP & Trees
 - Ease of drilling and WO
- Cons
 - Vessel cost - Heave criticality
 - Riser weight, payload, cost
 - Vessel interface complexity
 - Expansion feasibility
 - Isolation well control
 - Clashing

Good Solution ?

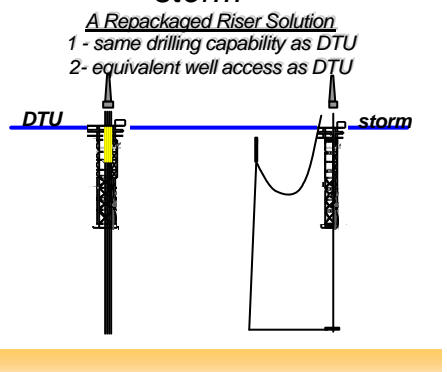


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A Repackaged Riser Solution

1 - same drilling capability as DTU
2 - equivalent well access as DTU

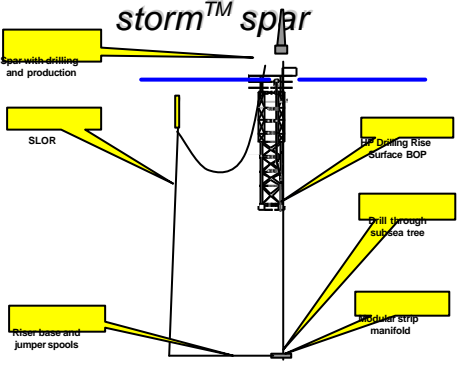


DTU storm

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Spar with drilling and production

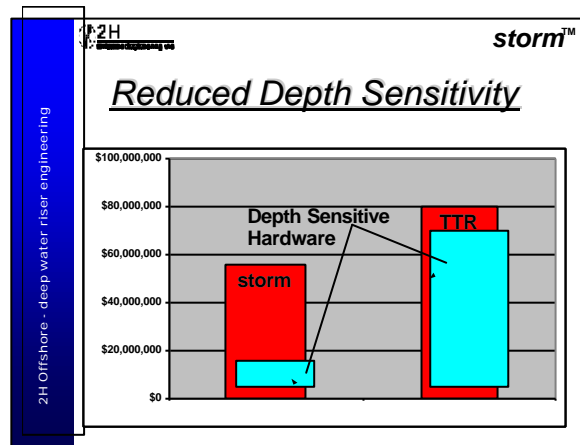
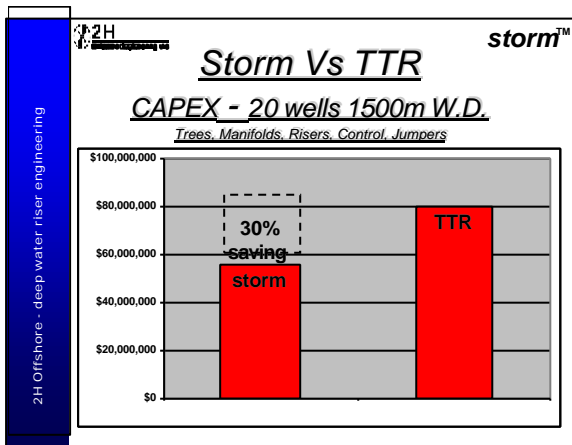
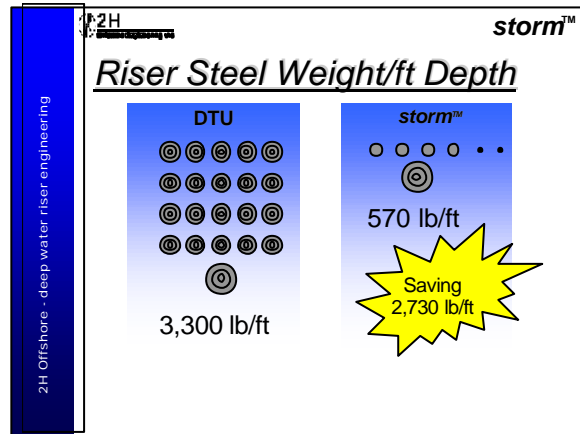
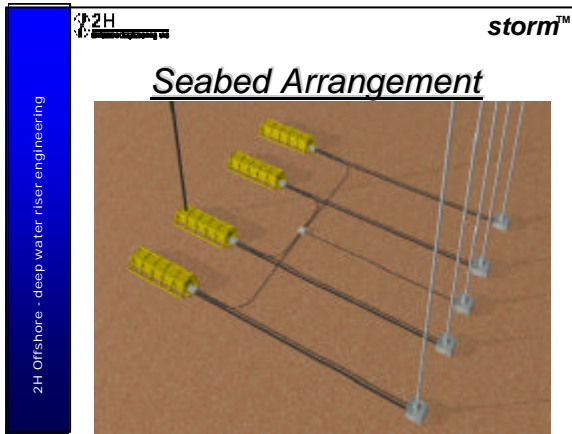
SLOR

Drilling Rise Surface BOP

Drill through subsea tree

Riser base and jumper spools

Driller strip manifold



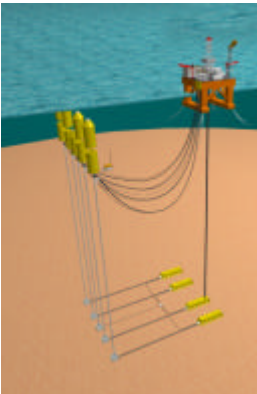
- Other Costs Issues**
- ❑ Reduced hull cost
 - ❑ Reduced deck cost
 - ❑ Reduced derrick and substructure cost
 - ❑ Eliminates heavy lift aircan installation
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- storm™ Spar**
- ❑ Improved safety
 - ❑ Eliminates HP risers
 - ❑ Subsea isolation
 - ❑ Eliminates production wellbay
 - ❑ Separates drilling & production
 - ❑ Eliminates clashing risk
 - ❑ Reduced cost
 - ❑ Reduced hull dia. & length
 - ❑ Low cost risers and subsea equip.
 - ❑ Min. offshore construction
 - ❑ No hull aircons
 - ❑ Flexibility (Expansion / Schedule)
 - ❑ Simplified interfaces
 - ❑ Well count flexibility - expansion 5-25
 - ❑ Predrill option - fast track production
 - ❑ Pre-installation of risers
-
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storm™ Semi

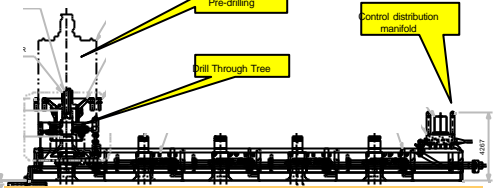
- Advantages as for Spar **PLUS**
- Reduced hull cost (DPL/Hull Steel = 2)
- Improved hull availability
- Conversion possibility
- Improved deck load capacity
- Improved deck space/layout
- Shorter development schedule
- No offshore deck mating
- Installation from semi
- Early production feasibility



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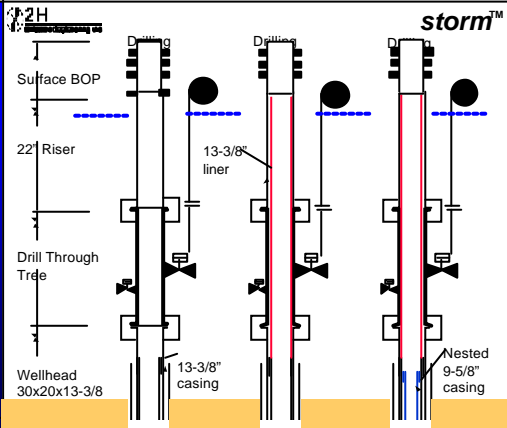
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Modular 'Strip' Manifold



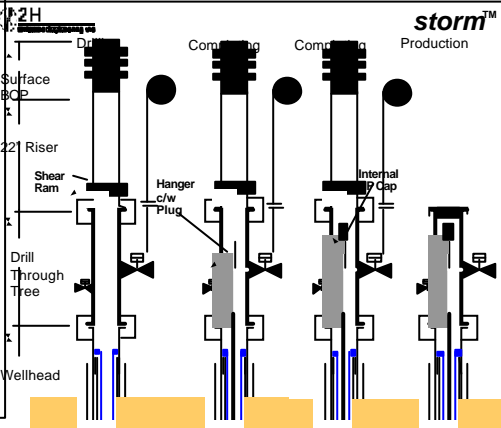
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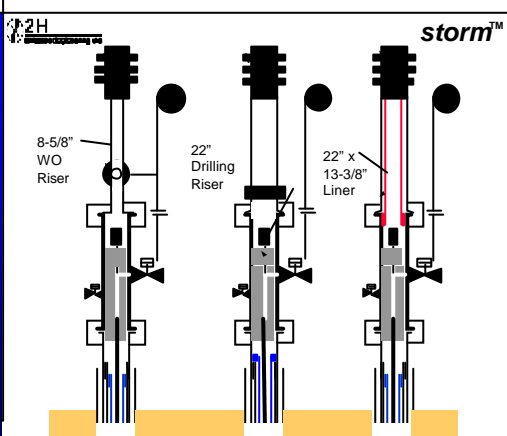
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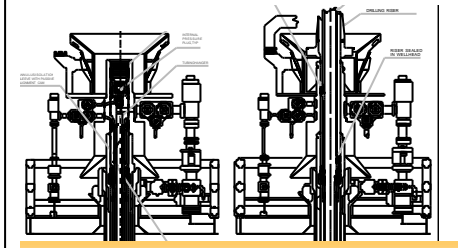
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Drill Through Tree

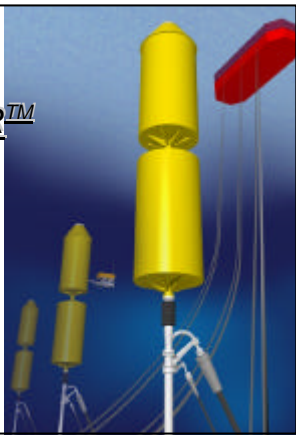


DTT Completed DTT with HP Drilling Riser

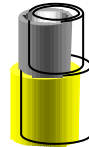
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COR™/SLOR™
TRF JIP

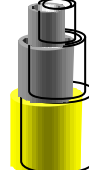
Exxon/Mobil
bp
Total/Fina/Elf
Chevron
Texaco
British Gas
Conoco



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SLOR™
Single Line Offset Riser
Application - GI, WI (Production)

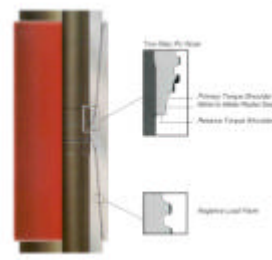


COR™
Concentric Offset Riser
Application – Production
Riser Base Gas Injection
Active Heating
N₂ or Vacuum Insulation

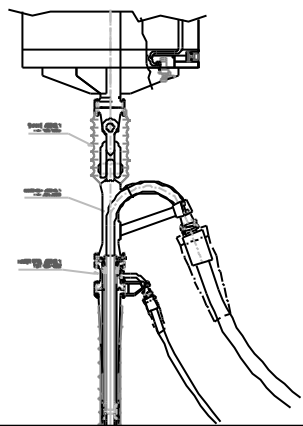
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Modified Casing Connection

- ▣ High Grades P110
- ▣ Proven Metal Seal
- ▣ Fast Make-up
- ▣ SCF 2.5 - 4.5
- ▣ Environmental seal

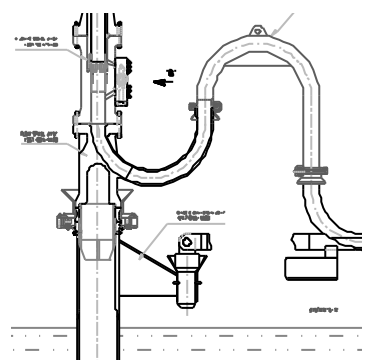


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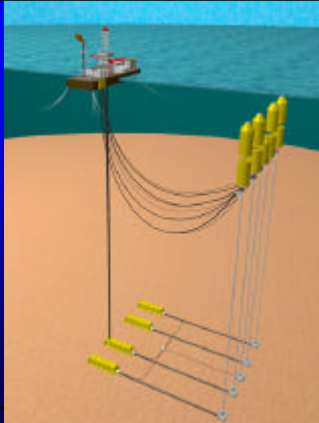
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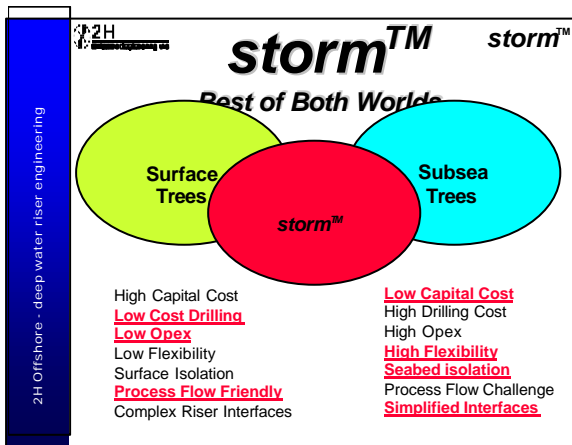
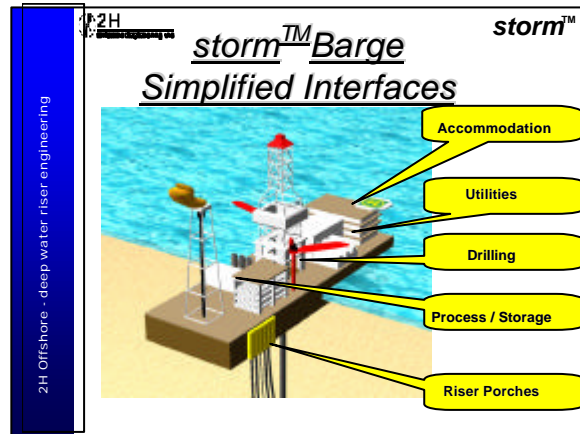
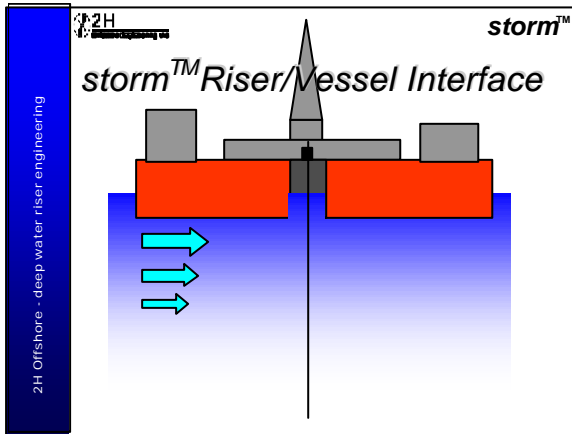


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storm™
Storm Barge
West Africa



- storm™ Summary
- Riser & well system focus solution
 - Re-packaged proven hardware
 - Simplified interfaces
 - Safe Solution
 - Addresses key development costs
 - Drilling and well construction
 - Offshore construction (flowlines / risers)
 - Well intervention and WO
 - High flexibility (Wellcount, vessel type, EPS)
 - Cost effective (CAPEX and OPEX)
 - Deep and ultra deep water solution
 - GoM, Brazil, West Africa application
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