MMS Workshop
Possible SOO Regulations Related to HT/HP Equipment
New Orleans, Louisiana

January 23, 2008

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Shell Chief Scientist

Shell
Exploration & Production

HP/HT is a Very Challenging Technical Problem – Especially in DW

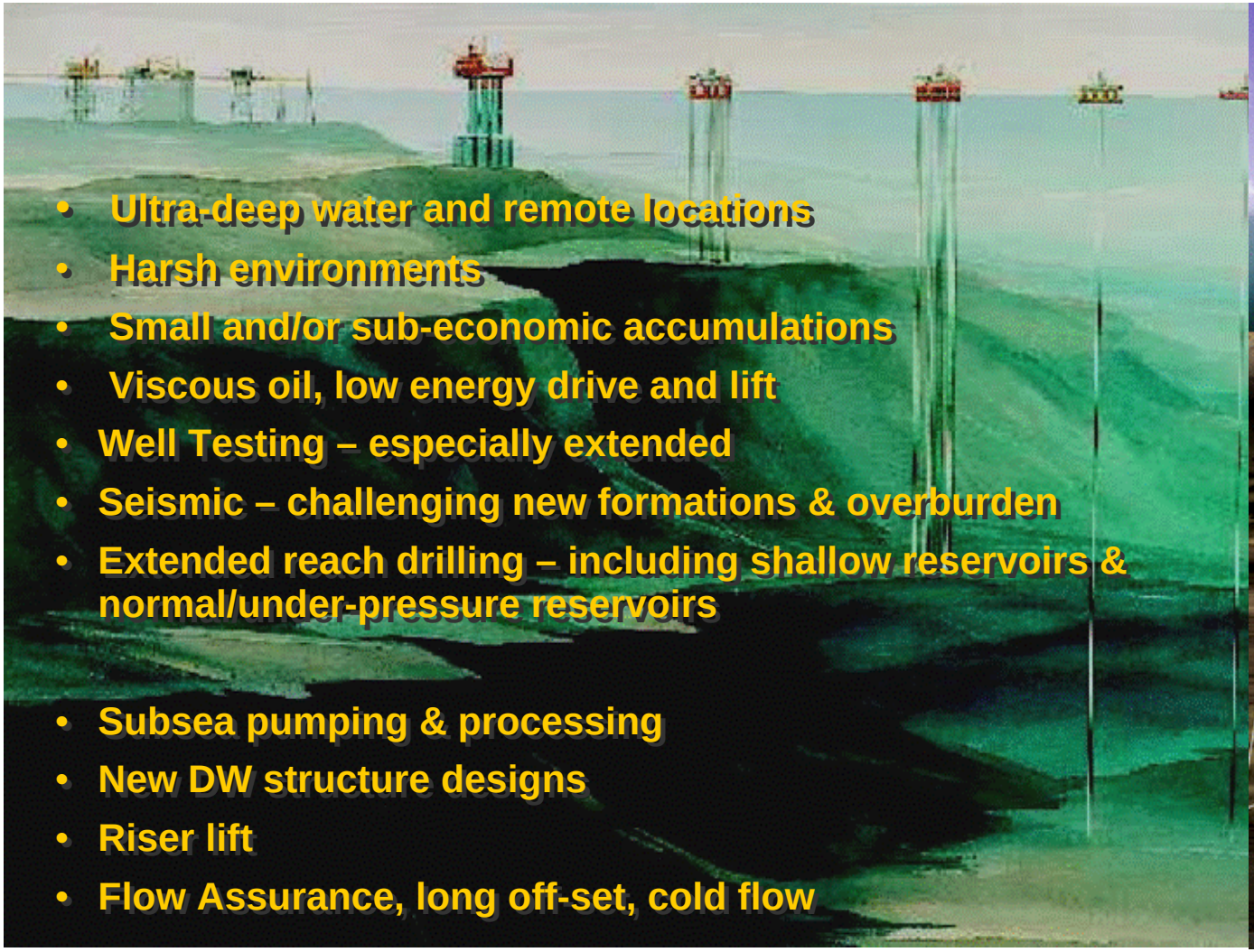
But

It is one of many

Shell
Exploration & Production

Challenges in Deepwater

Deepwater fields getting more complex: no single technology will “unlock” them



Solution:

“Low Cost” – Light weight Spar, Low Motion

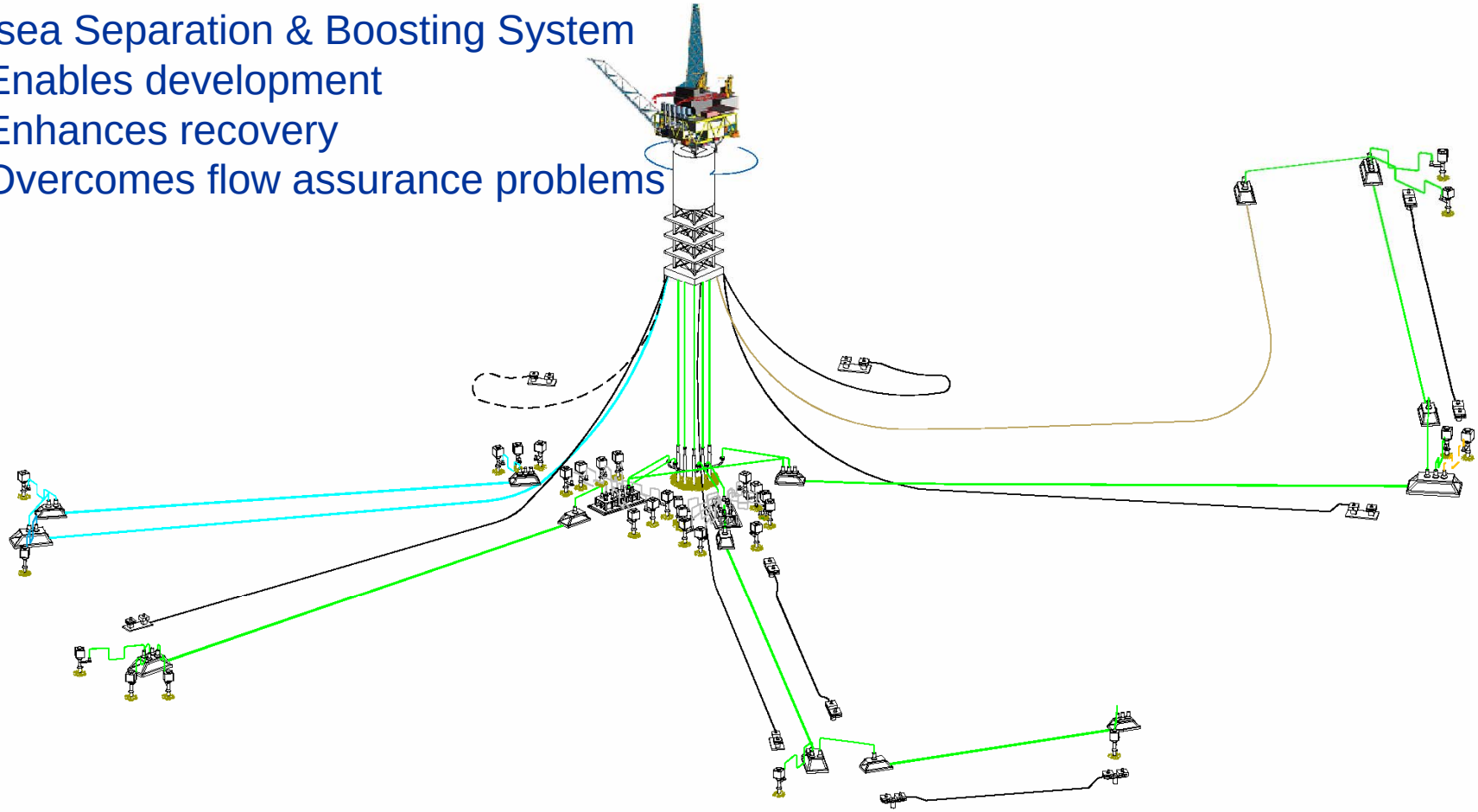
- Single Lift Topsides
- Small Well Bay – 6 slot

Wet Tree Direct Vertical Access & Surface BOPs

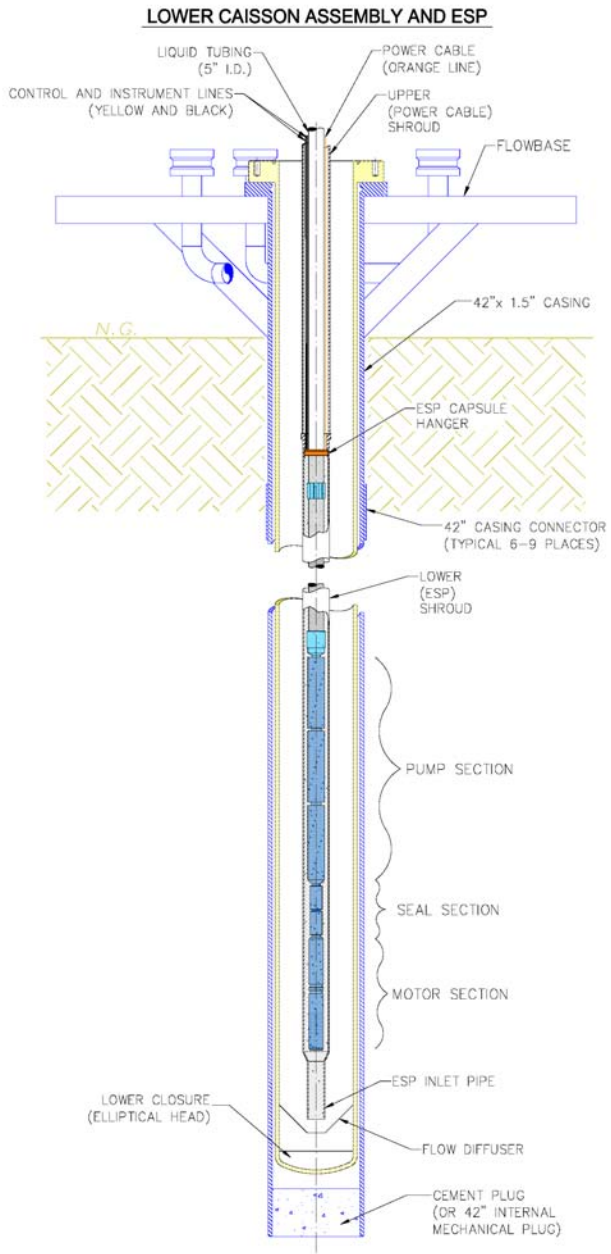
Subsea Separation & Boosting System

- Enables development
- Enhances recovery
- Overcomes flow assurance problems

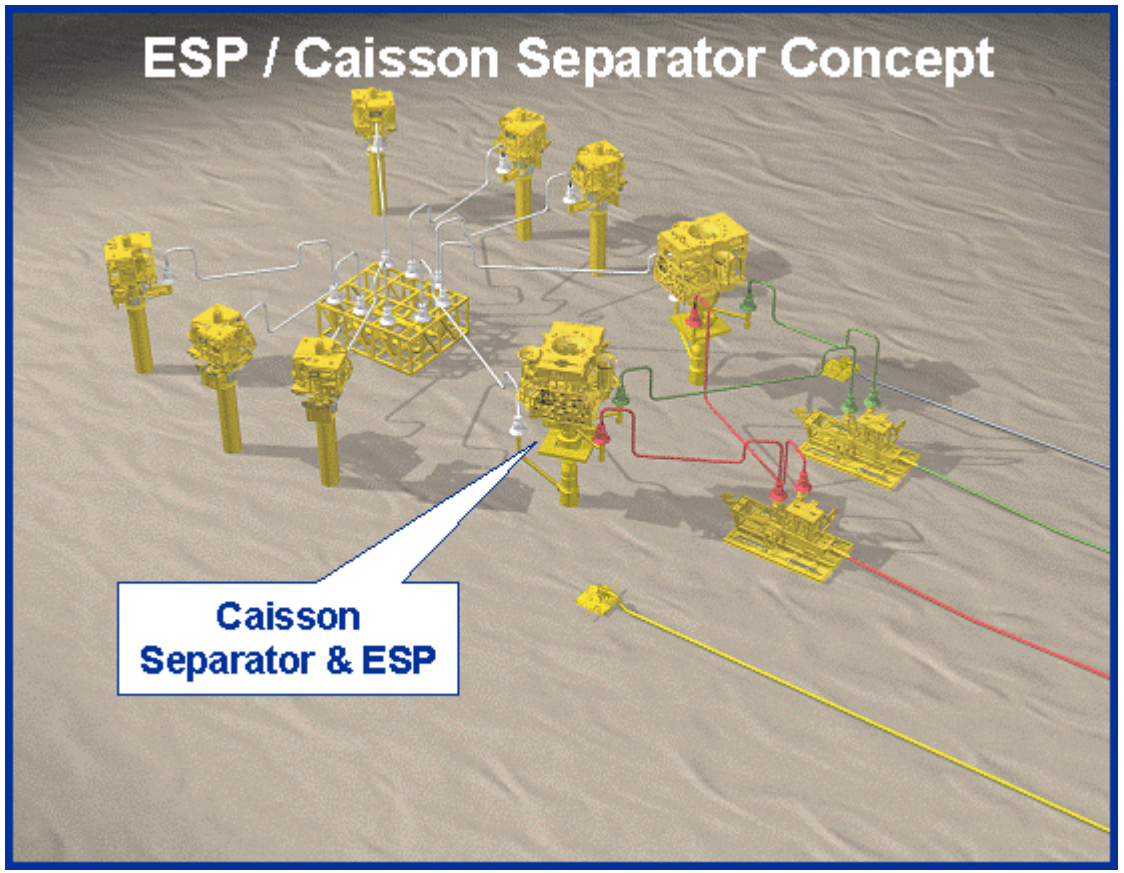
Perdido



Entering the Ultra Deep: Subsea Boosting



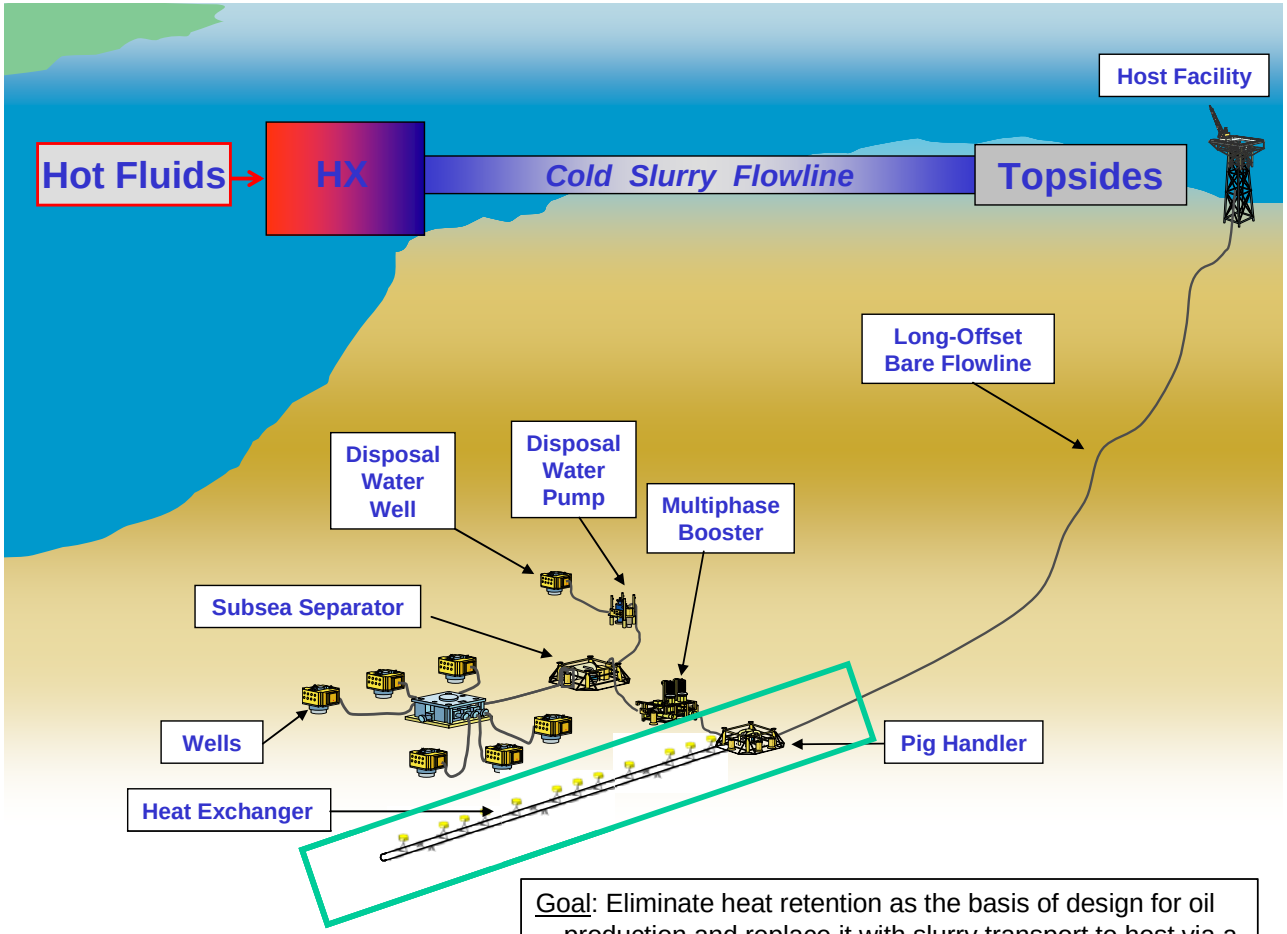
Deeper Water and Heavier Oil



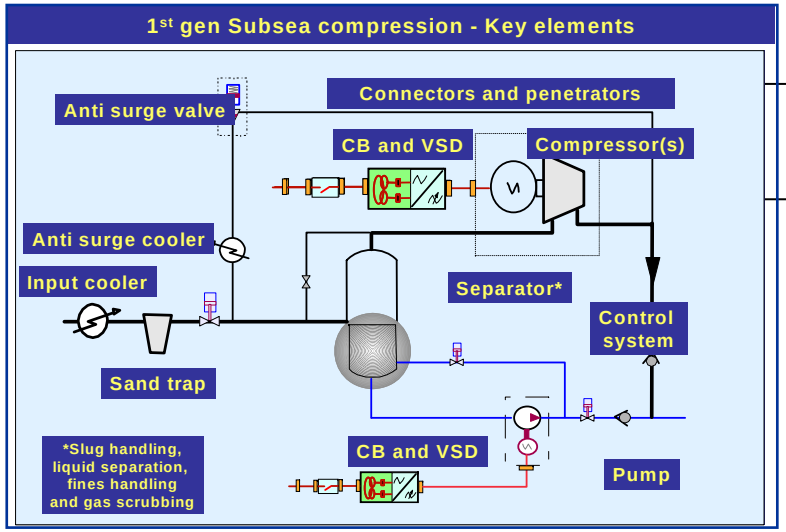
Cold Flow Technology

Technology

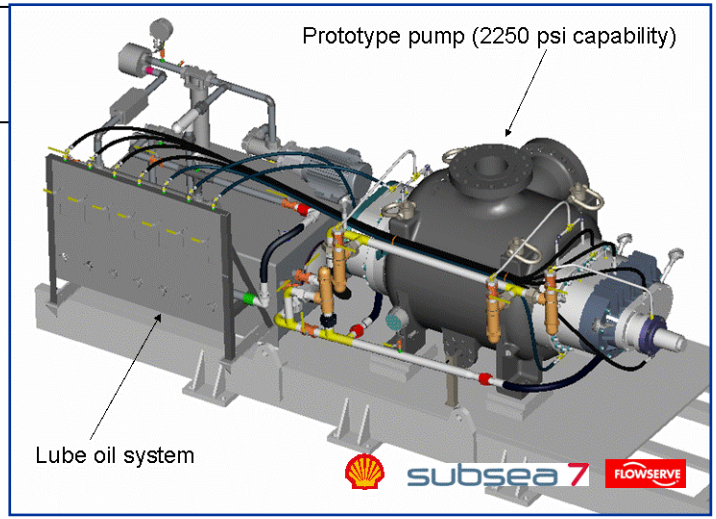
produce hydrocarbons from remote fields via single, bare, long-offset (75 miles) subsea flowlines



Goal: Eliminate heat retention as the basis of design for oil production and replace it with slurry transport to host via a single, long-offset, bare flowline

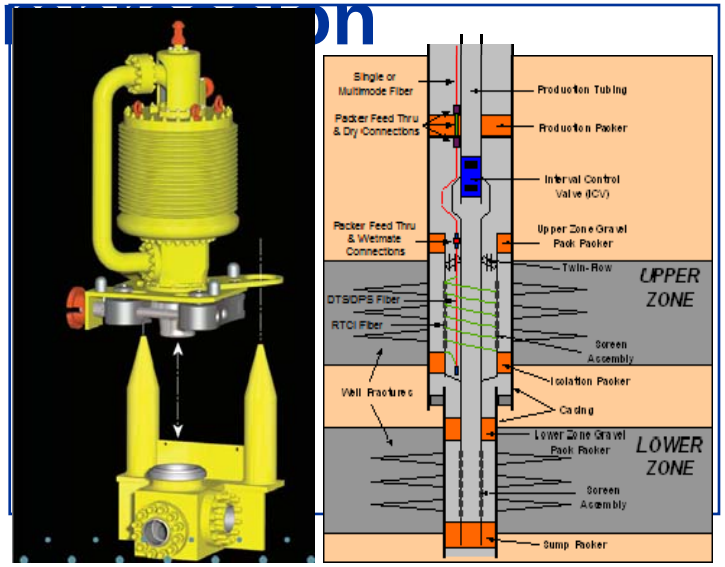


Subsea compression



Subsea high boost twin screw pumps

Subsea multiphase flow meter

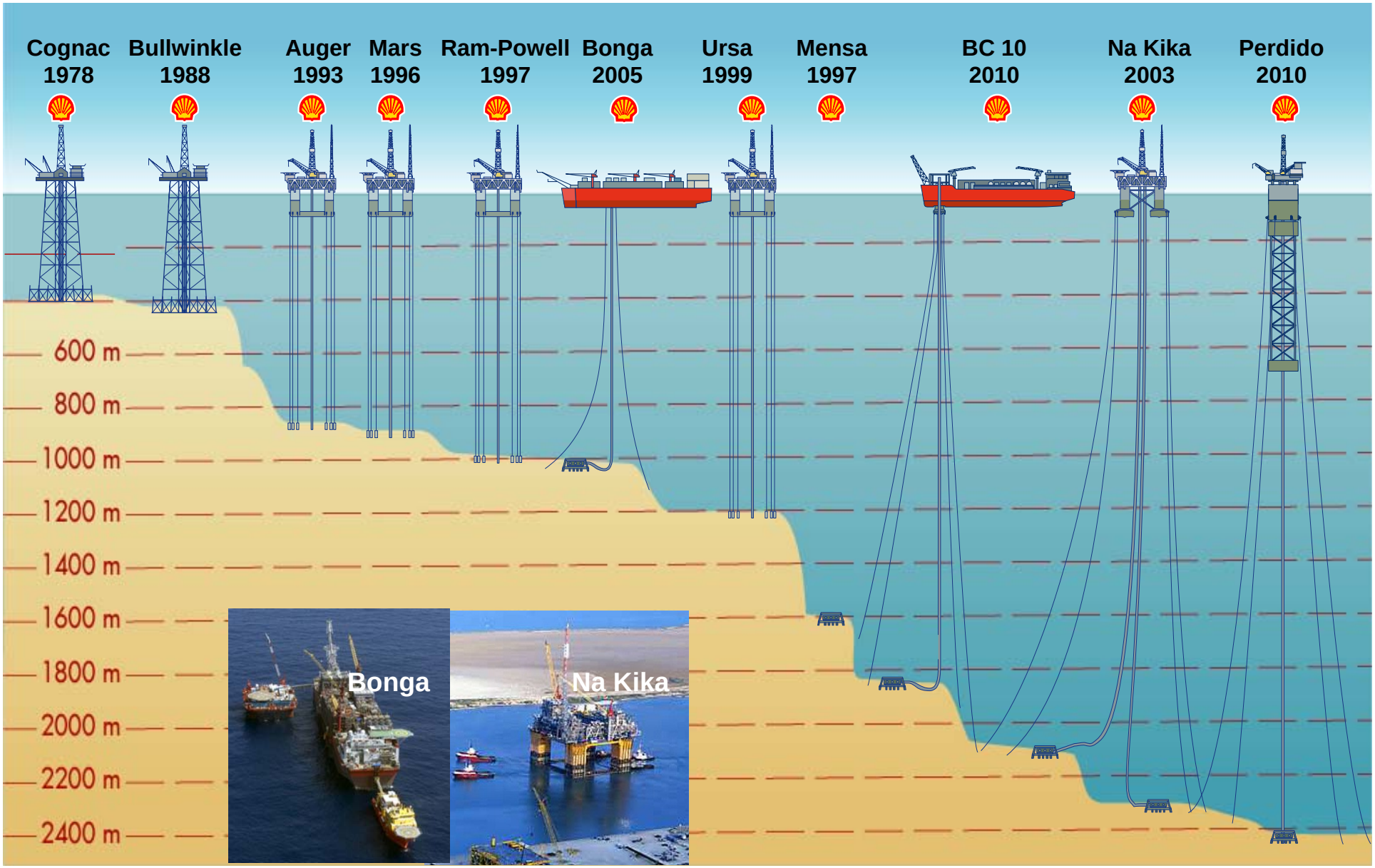


Smart Fields for deepwater

Deep Water

A History of delivering on the Technical Challenges

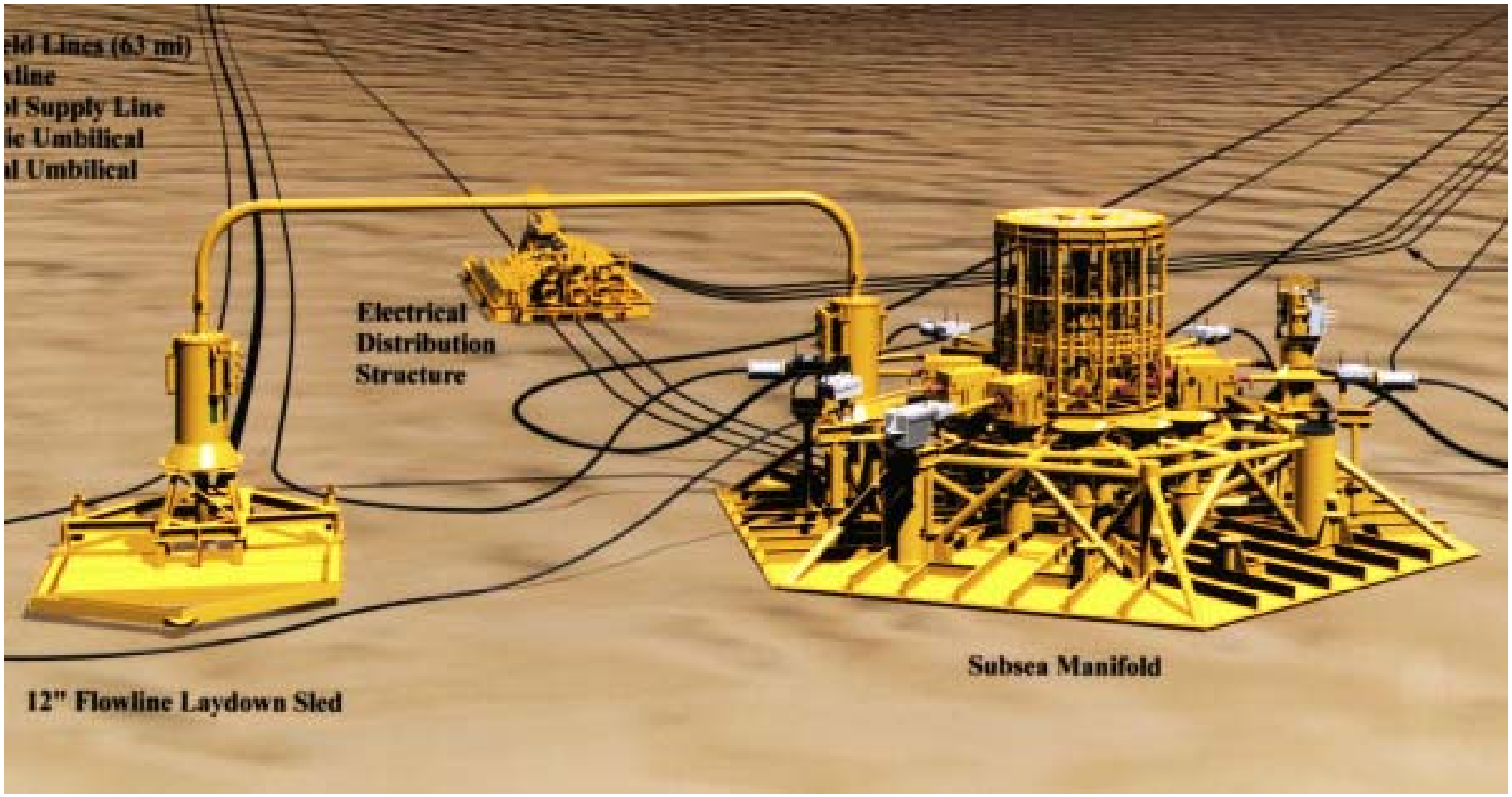
Deepwater Development Milestones



1997 URSA (USA)
Water Depth record for TLP –
1,220m

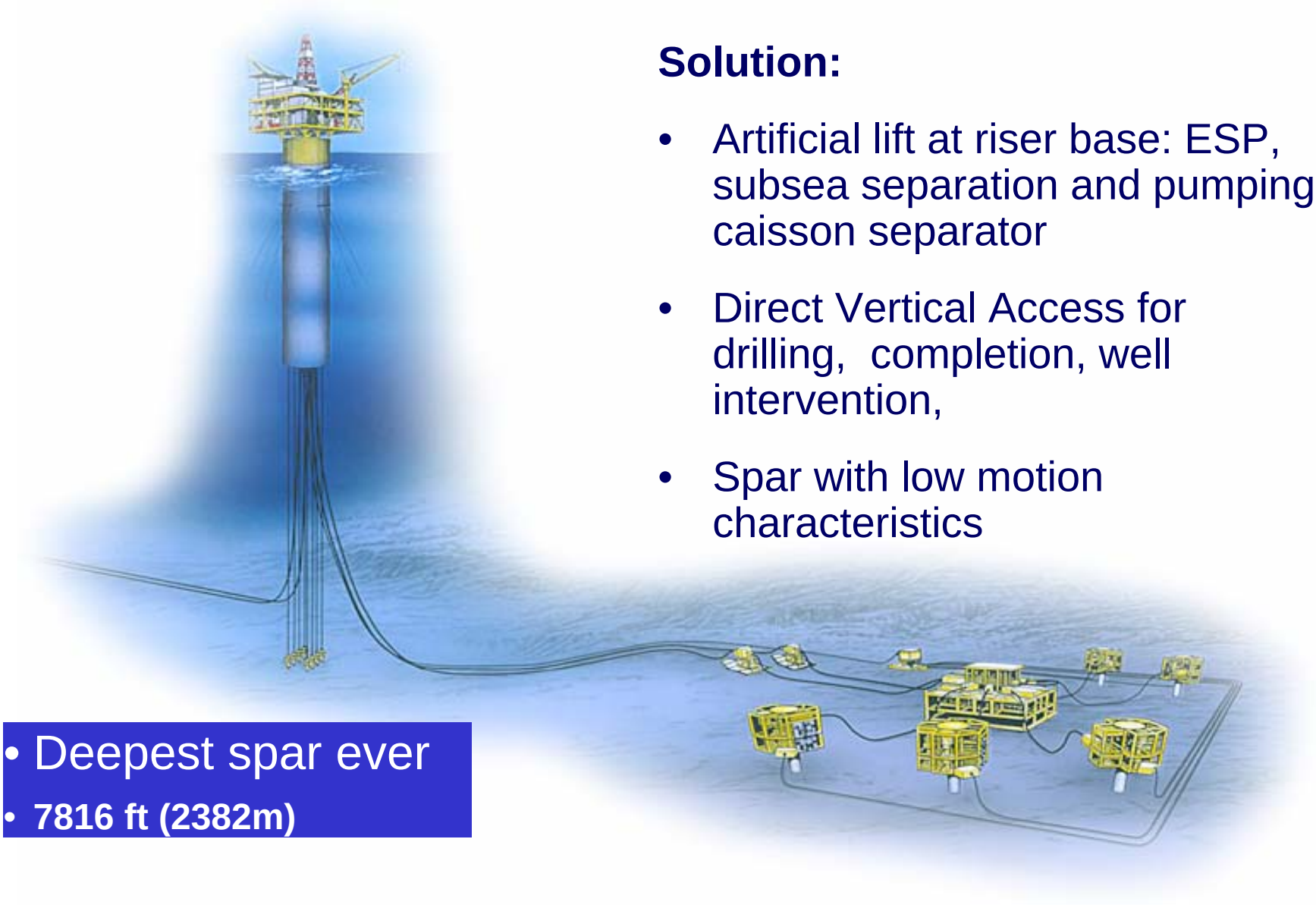
MENSA

Water Depth record for a steel umbilical installation- 1800m




MIGHTY SERVANT 1

Perdido (Western GOM, USA)



Solution:

- Artificial lift at riser base: ESP, subsea separation and pumping caisson separator
- Direct Vertical Access for drilling, completion, well intervention,
- Spar with low motion characteristics

- Deepest spar ever
- **7816 ft (2382m)**

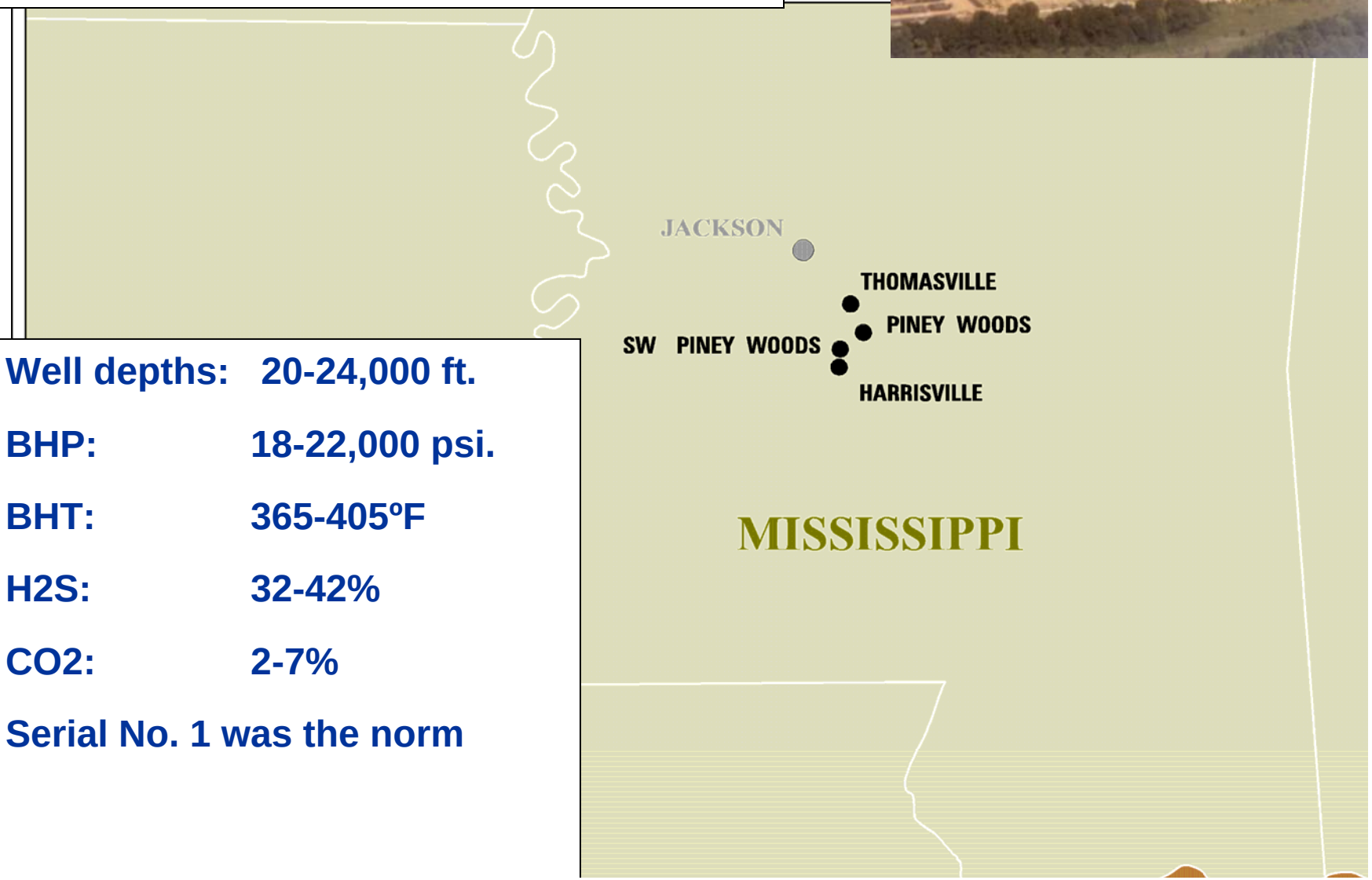
High Pressure / High Temperature

A History of delivering on the

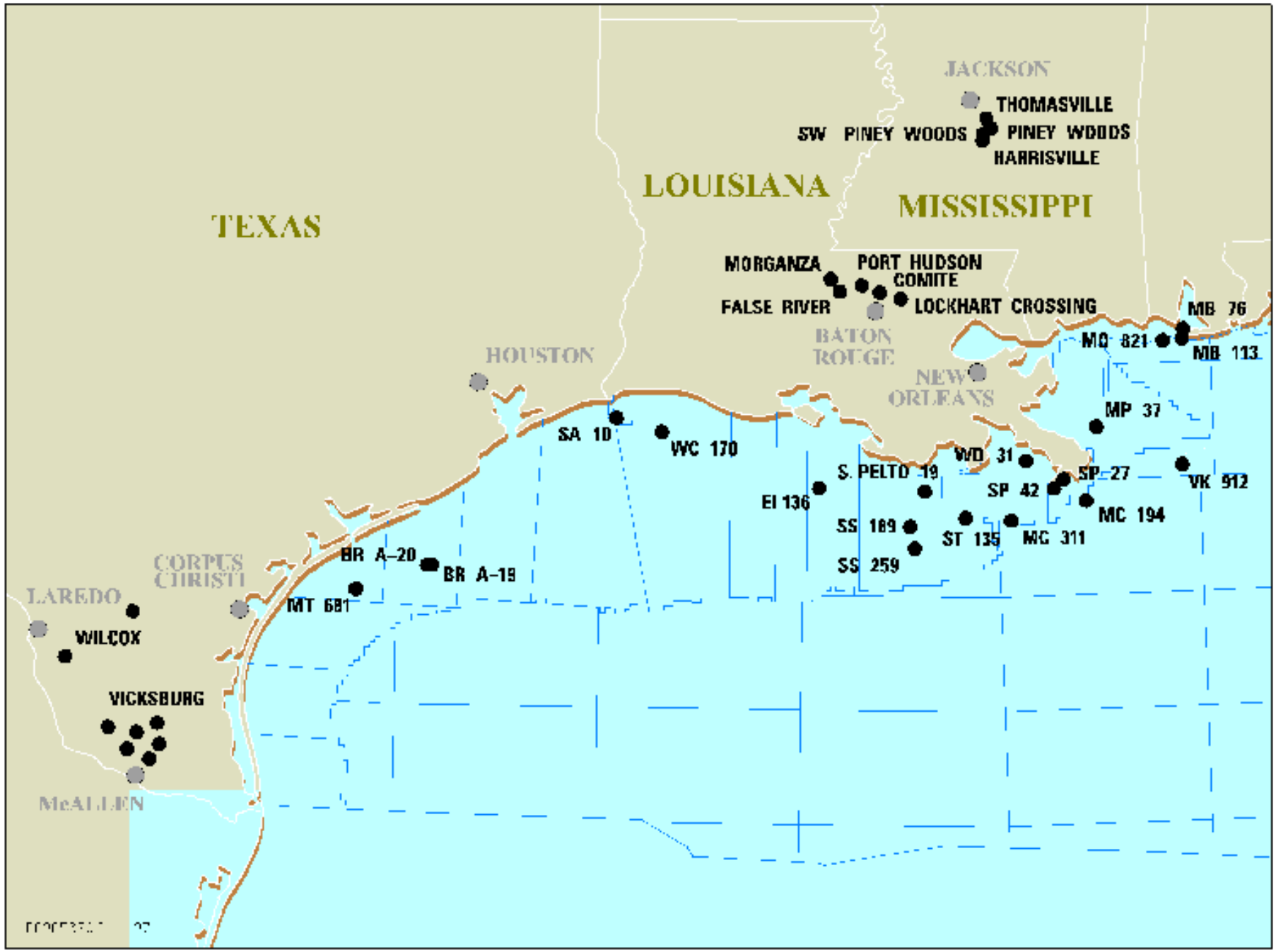
Technical Challenges

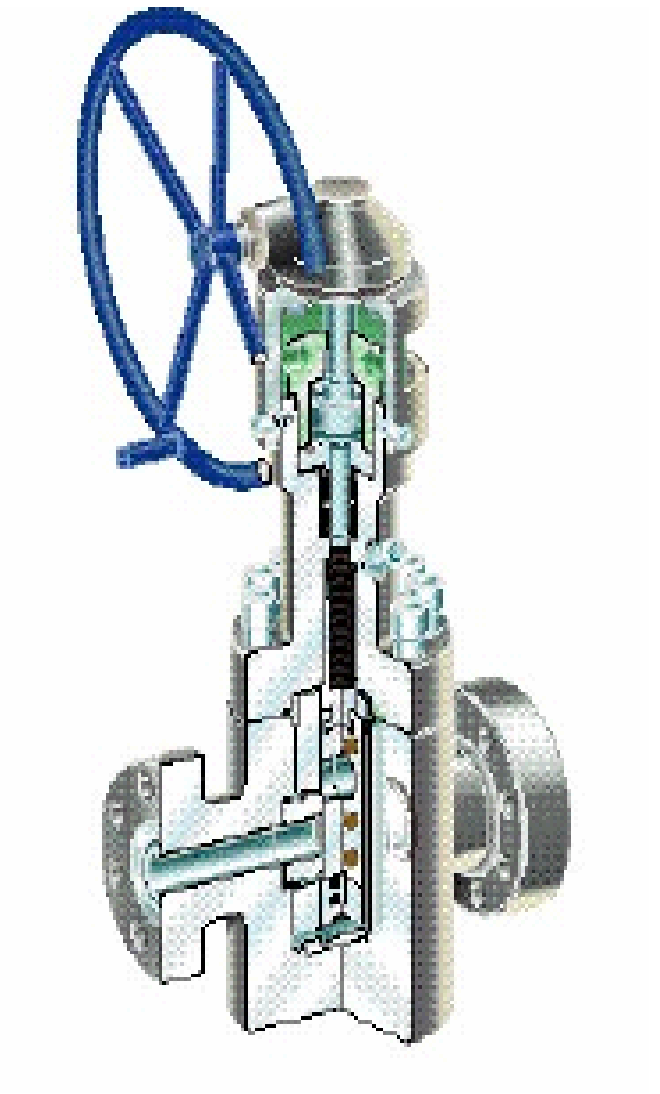
Field	Depth, ft	BHP, psi	BHT, °F	CO_2, %	H_2S, ppm	ϕ, %	κ, mD
Onshore							
• Thomasville	24,000	23,000	410	8	460,000		
• Jackson Dome	16,000	11,000	350	99	20		
• LaBarge	14,000	6,500	280	22	4,500		
• Waterton	17,000	4,800	203	12	360,000	3 - 4	0.05
• Jumping Pound		11,500	1,200	185	6	120,000	
• Caroline	20,000	2,200	230	7	350,000	9	31-259
• Bearberry		5,400	118		900,000		
Offshore							
• Mobile Bay	23,000	13,450	410	3.5	16,000		
• Eugene Island	18,800	15,700	330	2	5		
• Picaroon	17,000	15,000	360	4.5	11		

The 1970s Thomasville/Piney Woods

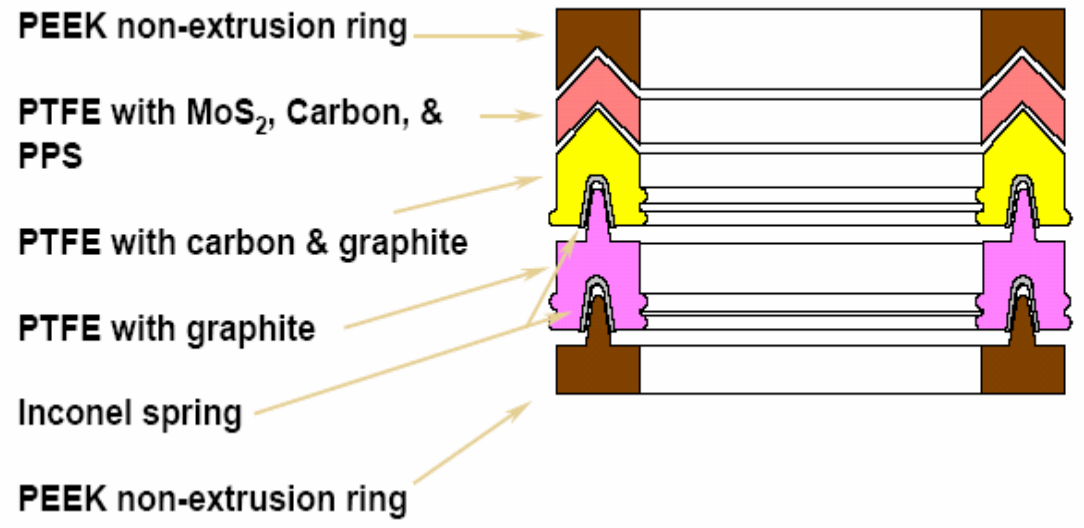


- **Well depths: 20-24,000 ft.**
- **BHP: 18-22,000 psi.**
- **BHT: 365-405ºF**
- **H2S: 32-42%**
- **CO2: 2-7%**
- **Serial No. 1 was the norm**

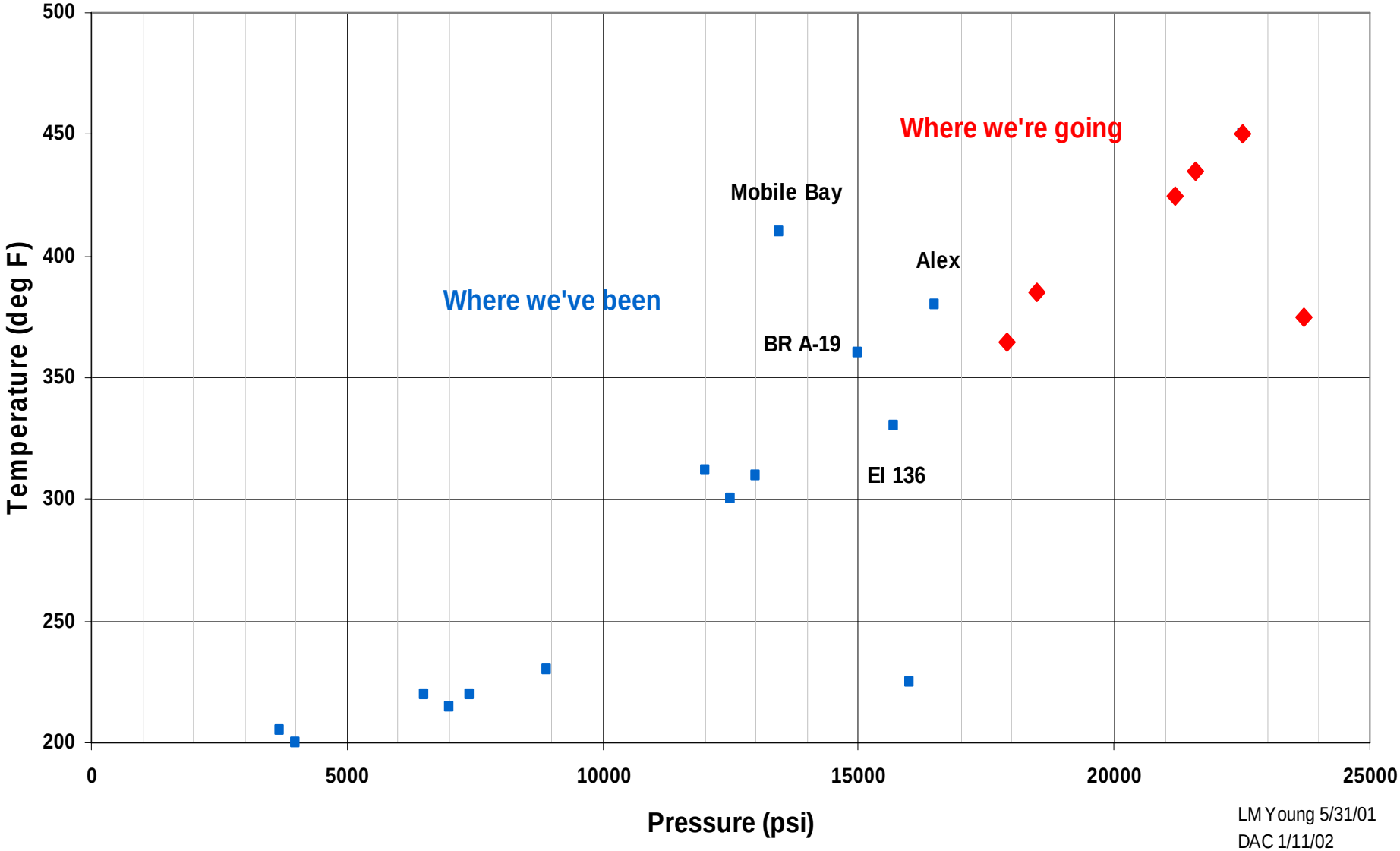

JACKSON
THOMASVILLE
SW PINEY WOODS
PINEY WOODS
HARRISVILLE
LOUISIANA
MISSISSIPPI
TEXAS
MORGANZA
PORT HUDSON
COMITE
FALSE RIVER
LOCKHART CROSSING
MB 76
MQ 821
MB 113
BATON ROUGE
HOUSTON
NEW ORLEANS
MP 37
SA 10
WC 170
WD 31
S. PELTO 19
SP 27
VK 912
SP 42
EI 136
MC 194
SS 189
ST 135
MC 311
SS 259
BR A-20
BR A-19
CORPUS CHRISTI
LAREDO
MT 681
WILCOX
VICKSBURG
McALLEN



HP/HT Extreme Service Valves
20 ksi & 30 ksi



HTHP Offshore GOM



LM Young 5/31/01
DAC 1/11/02

- **Shell supports joint industry (and 3rd party) R&D to assist in solving the challenges of the deepwater reservoirs in the GoM**
- **Shell believes that the existing mechanisms of SOO and SOP are sufficient to manage the development of current discoveries in the GoM**
  - **The current SOP's provide enough flexibility to deliver the timing of Serial #1 technical challenges**
  - **Technical milestones can be included in SOP's**

    Example - A HIPPS (High Integrity Pipeline Protection System) technical study prior to moving forward with the other SOP milestones to first production.
- **Shell does not oppose on an exceptional basis specific prospect-based SOP's for technology solutions with a clear well defined path and milestones to development**