



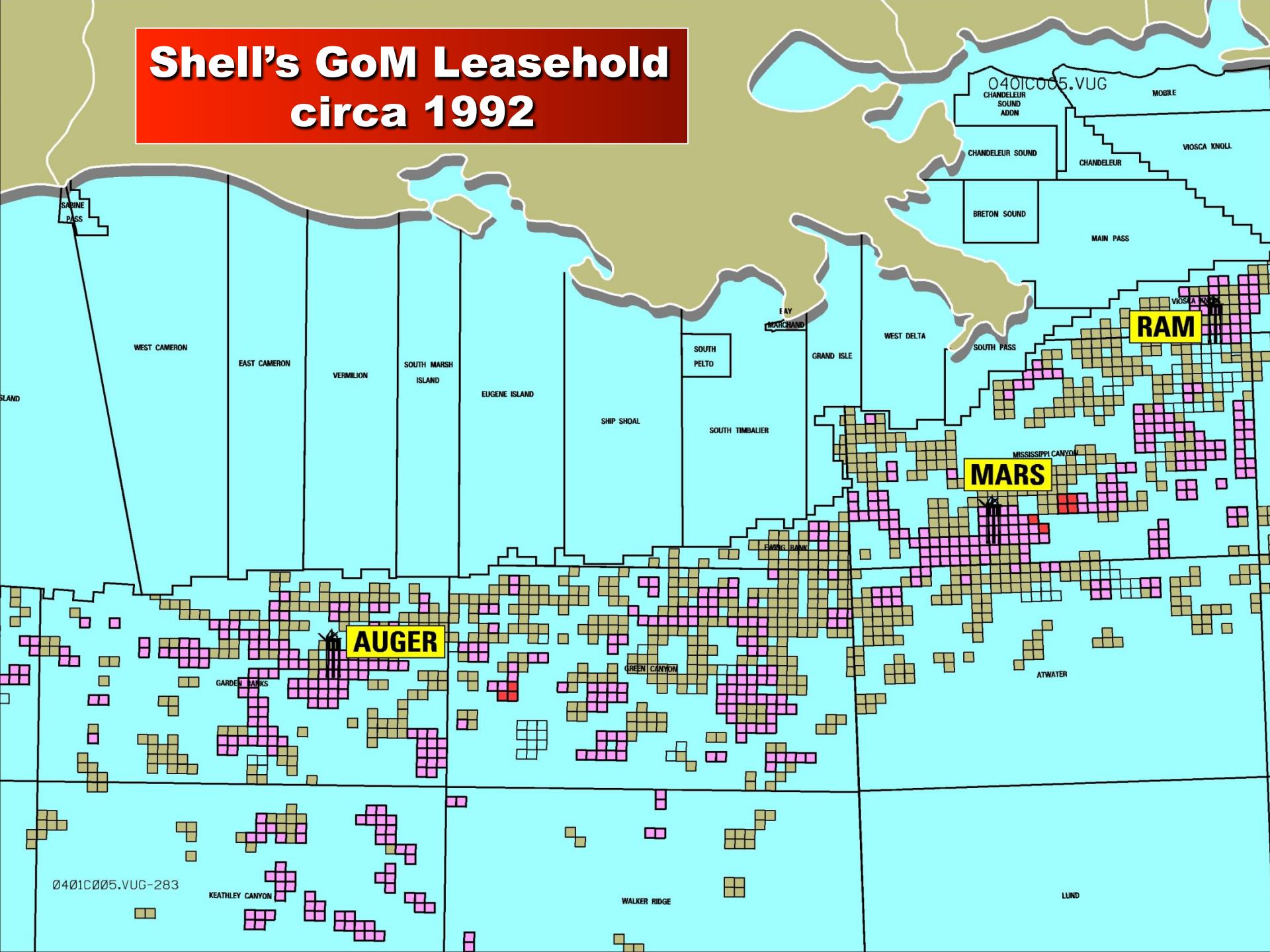
A History of Shell's Gulf of Mexico Deepwater Subsea Production System Development Strategy

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Prepared by
Multiple SUT Houston Volunteers

Development Strategies Shell

Shell's GoM Leasehold circa 1992



Shell's GoM Subsea Well-Count in 2005

Project	Water Depth	No. of Wells	1st Prod'n	Host	Generation
Tahoe 1	1,500	1	1994	MP 252A - Bud	"Learn by Doing"
Popeye	2,100	2	1995	ST 300A - Cougar	
Rocky	1,755	1	1995	GC 65A - Bullwinkle	
Mars	2,940	1	1996	MC 807A - Mars TLP	
Tahoe II/S.E. Tahoe 1	1,200 - 2,800	5	1996	MP 252B - Bud Lite	"Building on Success"
Popeye II	2,100	1	1997	ST 300A - Cougar	
Mensa	5,300	3	1997	WD 143A	
Macaroni	3,700	3	1999	GB 426A - Auger TLP	"Develop Standard Equipment"
Angus	2,000	3	1999	GC 65A - Bullwinkle	
Europa	3,900	4	1999	MC 807A - Mars TLP	
King	3,285	1	2000	MC 807A - Mars TLP	
Serrano/Oregano	3,400	4	2001	GB 426A - Auger TLP	"Applying the Standards"
Crosby	4,400	3	2001	MC 899 - Ursa TLP	
Einset	3,500	1	2001	S.E. Tahoe / MP 252B - Bud Lite	
Manatee	1,940	2	2002	Angus / GC 65A - Bullwinkle	
Serrano/Oregano II	3,400	2	2003	GB 426A - Auger TLP	
Mensa A4	5,400	1	2003	WD 143A	
Nakika	5,800 - 7,600	12	2003	MC 383 etc - Nakika FPS	
Princess I	3,650	3	2003	MC 899 - Ursa TLP	
Habanero	2,013	2	2003	GB 426A - Auger TLP	
Llano	2,600	2	2004	GB 426A - Auger TLP	
Glider	3,500	2	2004	GC 158 - Brutus TLP	
Total Well-Count		59			

Subsea Developments for Satellites & Smaller Fields

- **Challenges**
 - **Staff & Organization**
 - **Knowledge**
 - **Technology**
 - **Business Drivers (Cost, Schedule)**

Subsea Strategy became integral part of “Corridor” Approach for the GoM

- **Leverage limited resources**
- **Standardize Processes**
- **Develop Technology**
- **Standardize Hardware**
- **Accelerate Learning**

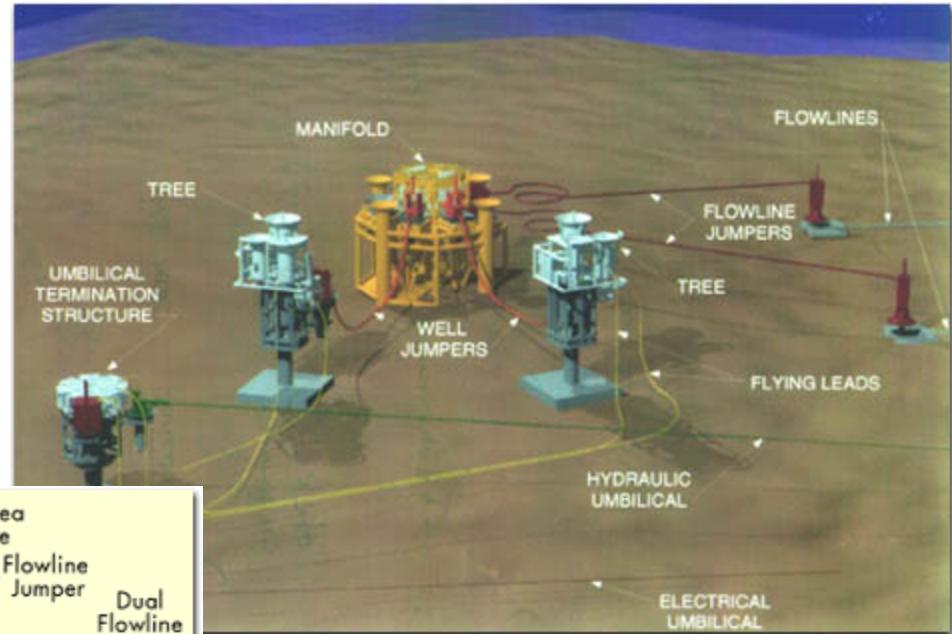
Learn by Doing



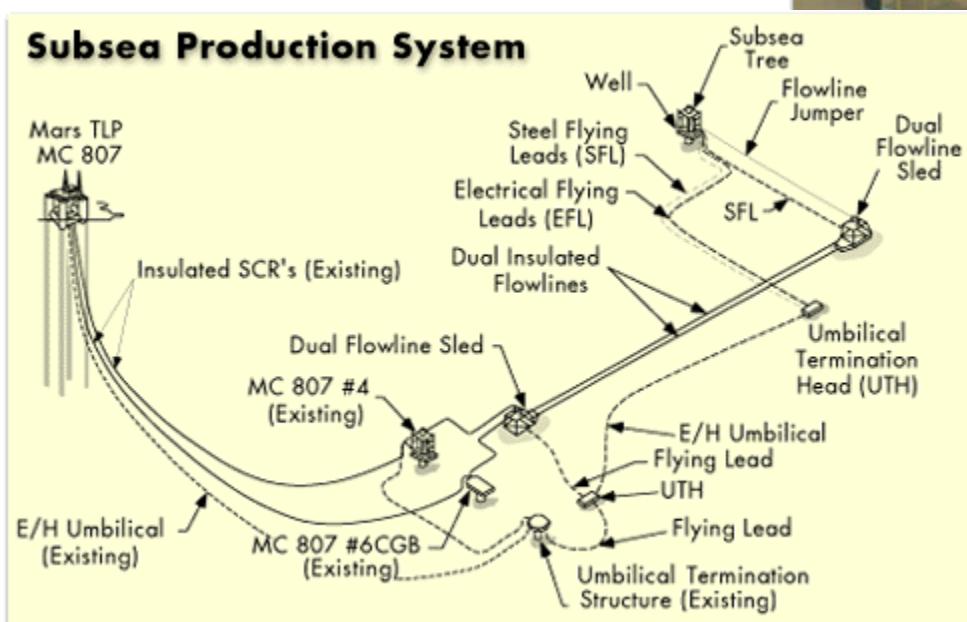
“Learn by Doing”

Popeye

- Manifold, 2 wells, gas, 2,100'



Subsea Production System



Mars

- 1 well, oil, 2,940'

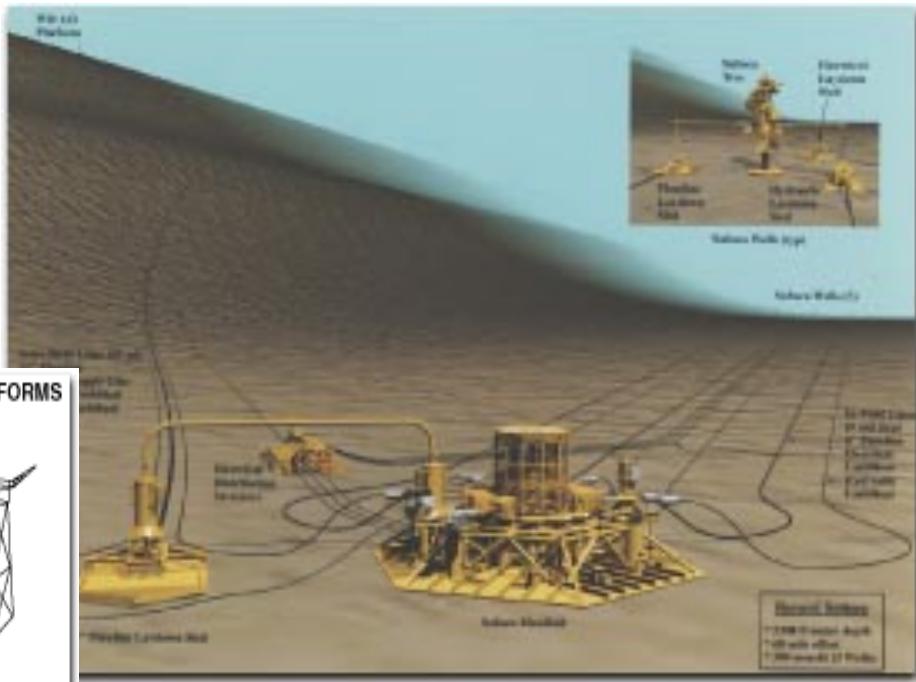
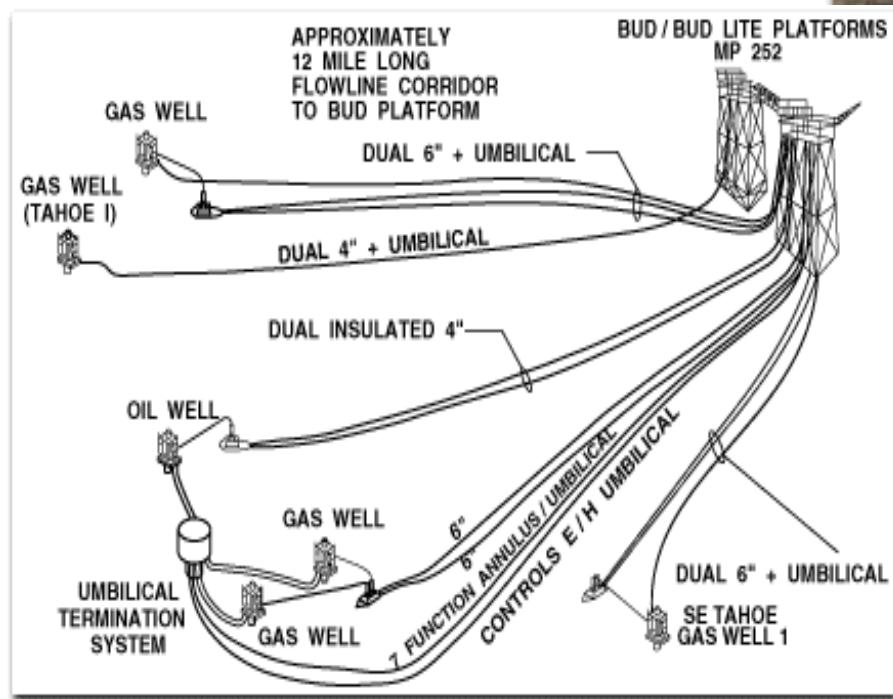
Building on Success



“Building on Success”

Mensa

- Manifold, 3 wells, gas, 5,300'



Tahoe II / SE Tahoe

- 5 wells, gas/oil, 1,200 - 2,800'

Developing Standard Hardware



Shell Standard Subsea Deep Water System Components

ROV Tree Cap

Flowline Jumper

Vertical Tree System

Slimbore/Monobore
Tubing Hanger

Tubing Spool

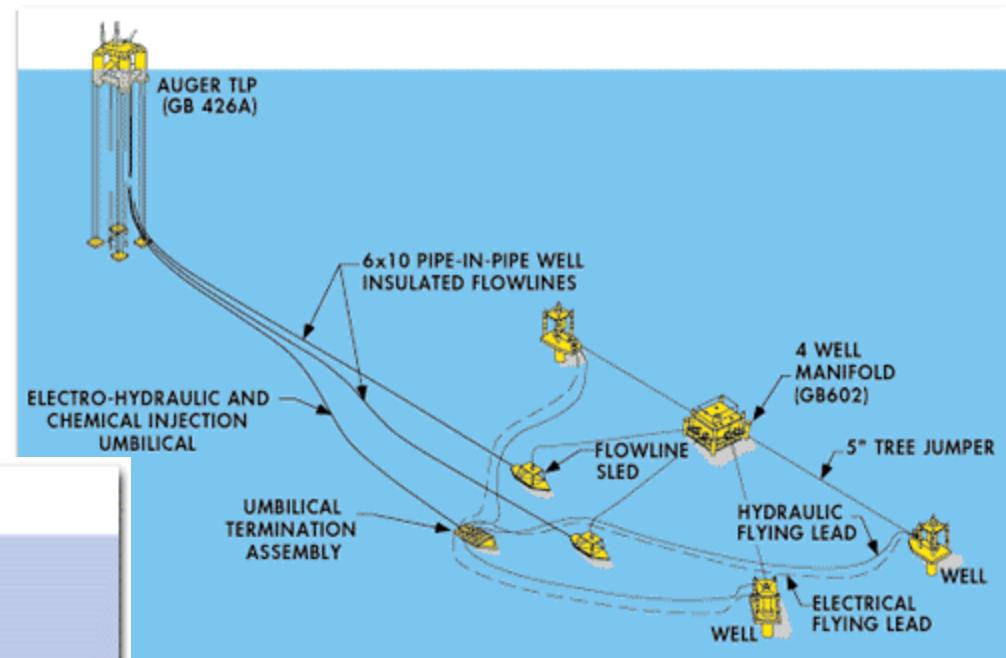
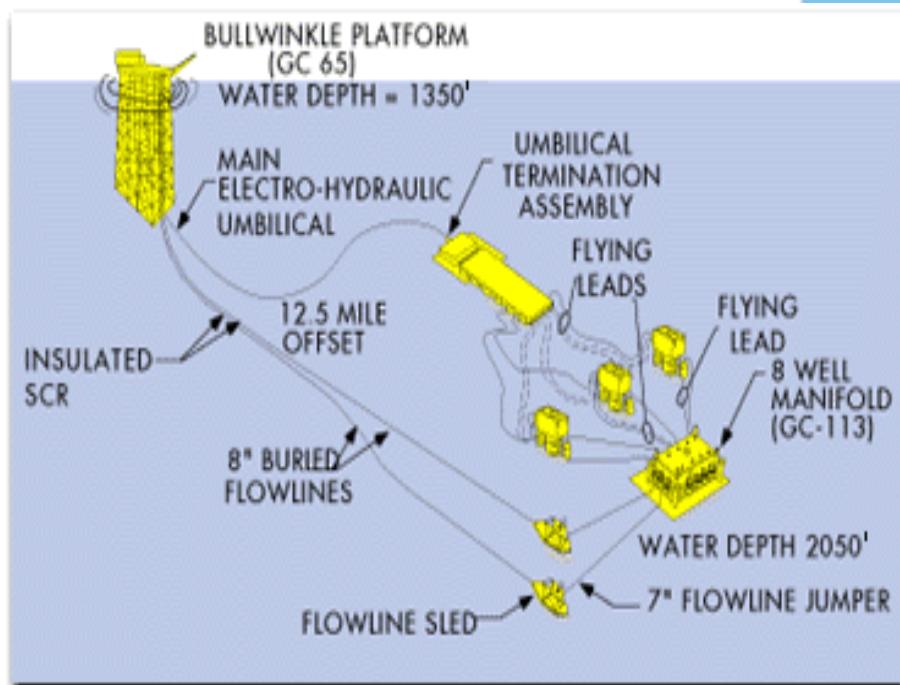
Manifold or Sled

Well Jumper

“Developing Standard Hardware”

Macaroni

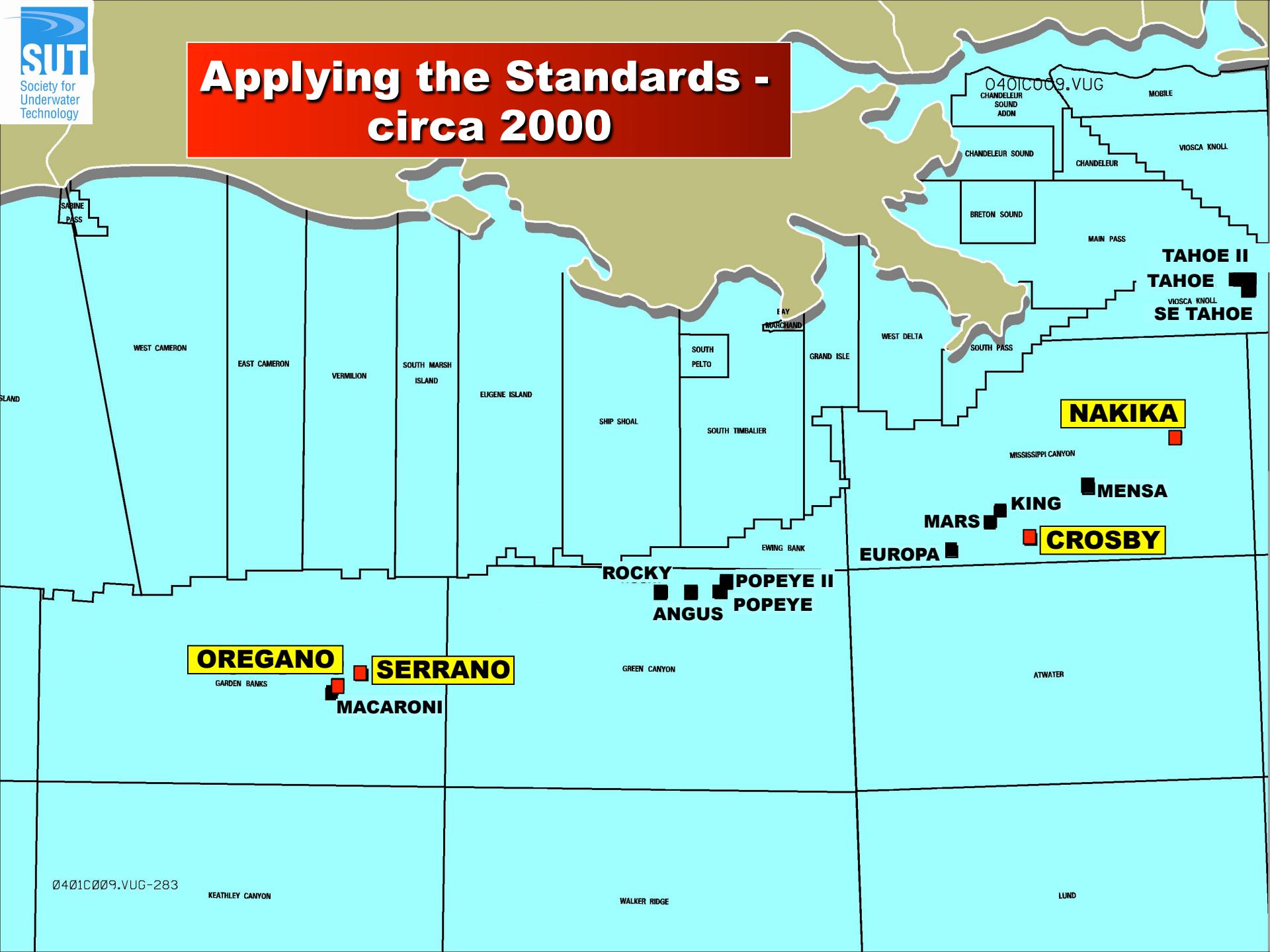
- Manifold, 3 wells, oil, 3,700'



Angus

- 3 wells, oil, 2,000'

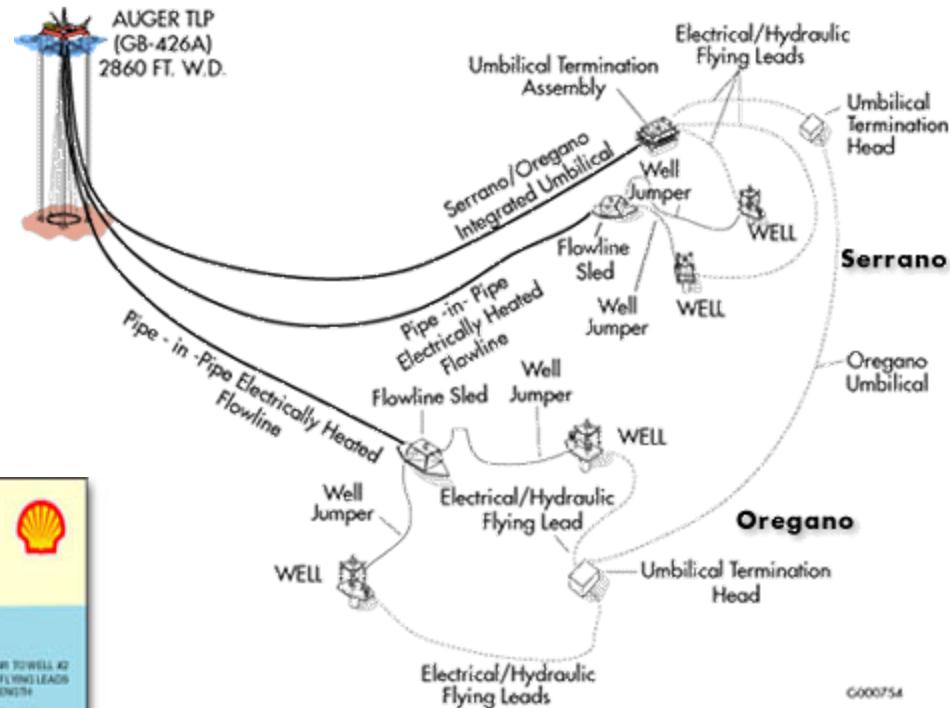
Applying the Standards - circa 2000



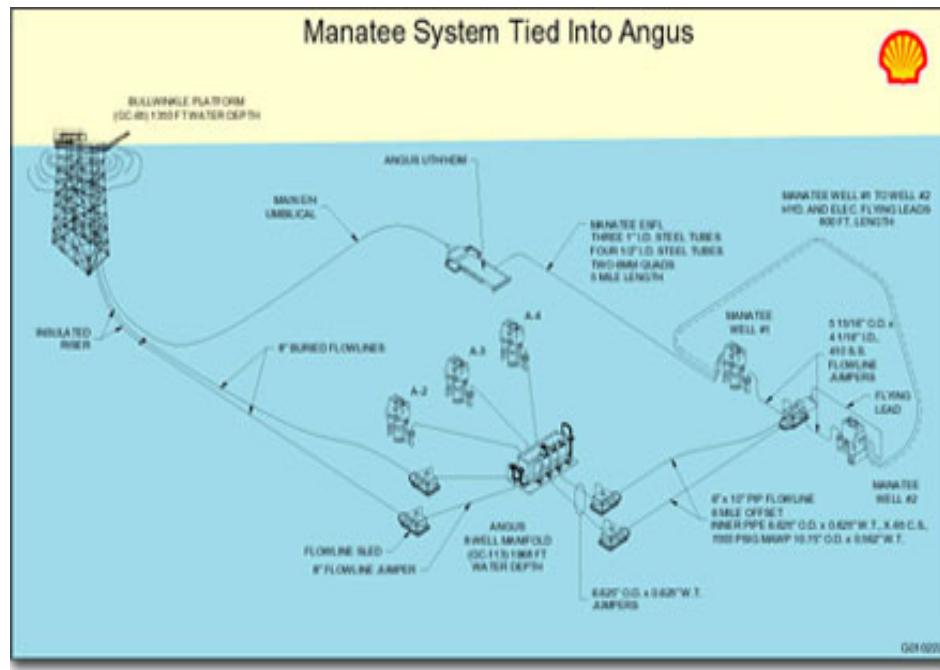
“Applying the Standards”

Serrano/Oregano

- 4 wells, oil, 3,400'



Manatee System Tied Into Angus



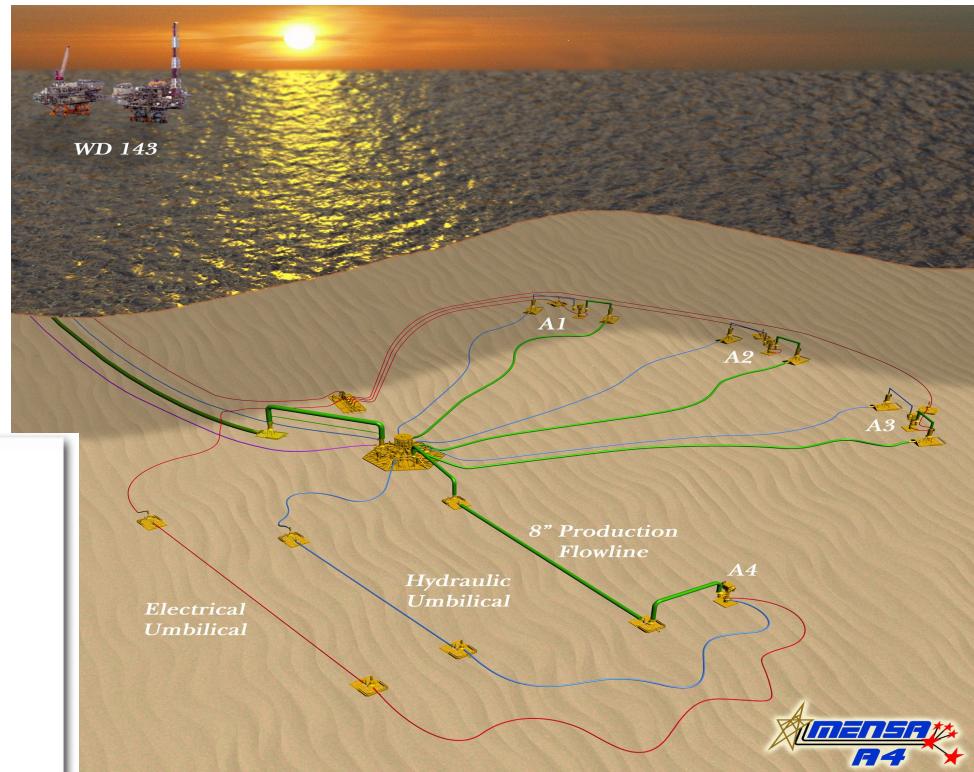
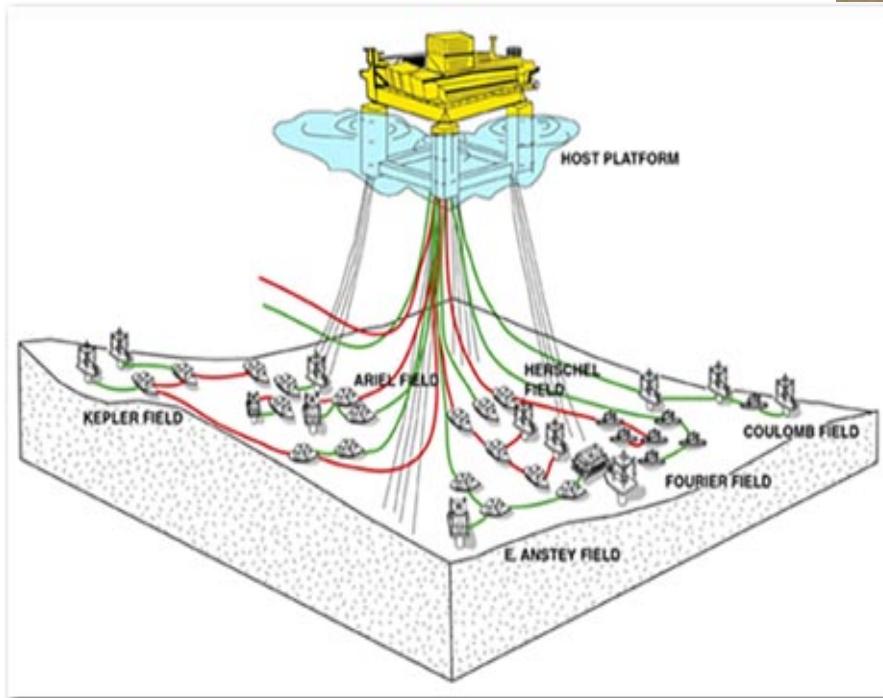
Manatee

- 2 wells, oil, 1,940'

“Applying the Standards (cont’d)”

Mensa A4

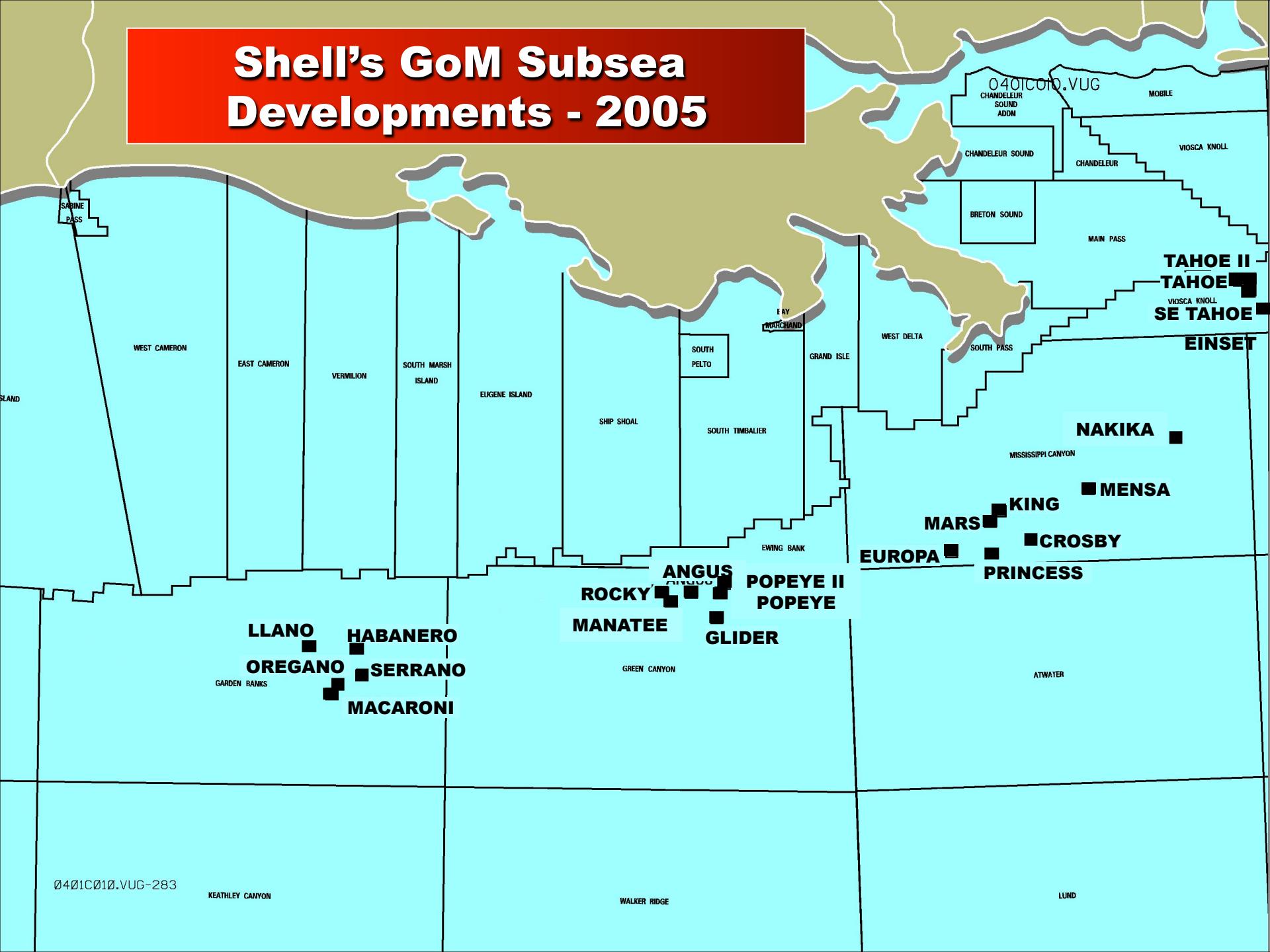
- 1 well extension, gas, 5,300'



Nakika

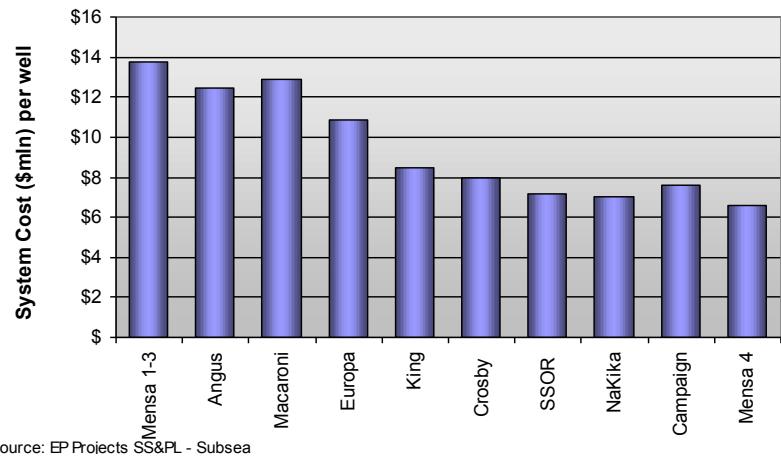
- 12 wells, gas/oil, 7,600'

Shell's GoM Subsea Developments - 2005



Continuous Performance Improvement

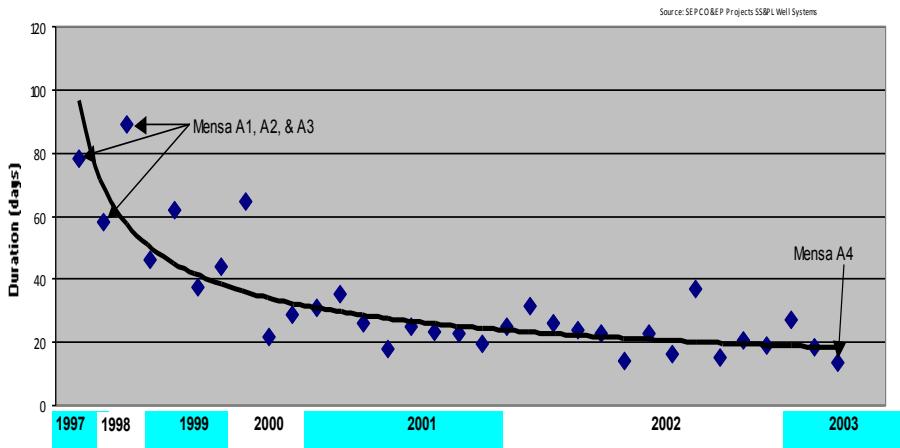
Figure 5 - Subsea Equipment Cost Improvements



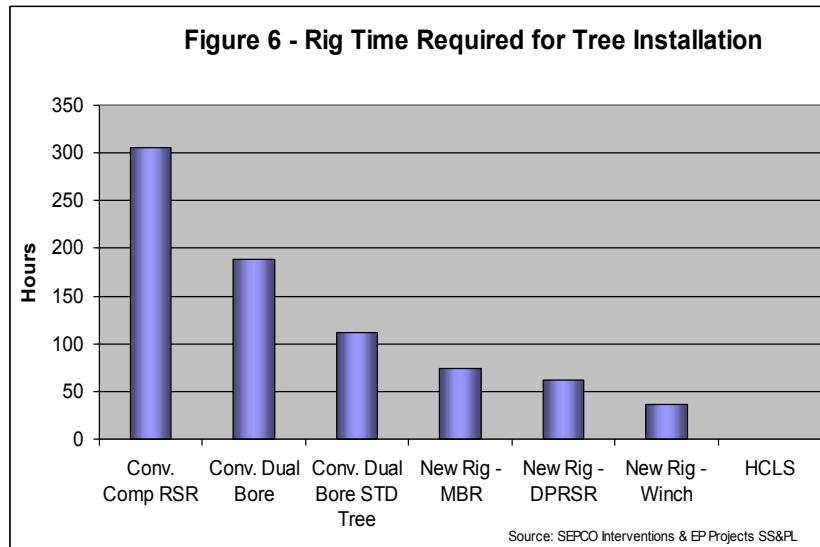
Significant Reduction in Cost of Subsea Equipment

Significant Reduction in the Completion Time for Subsea Wells

Figure 3 - Subsea Completion Duration Improvements



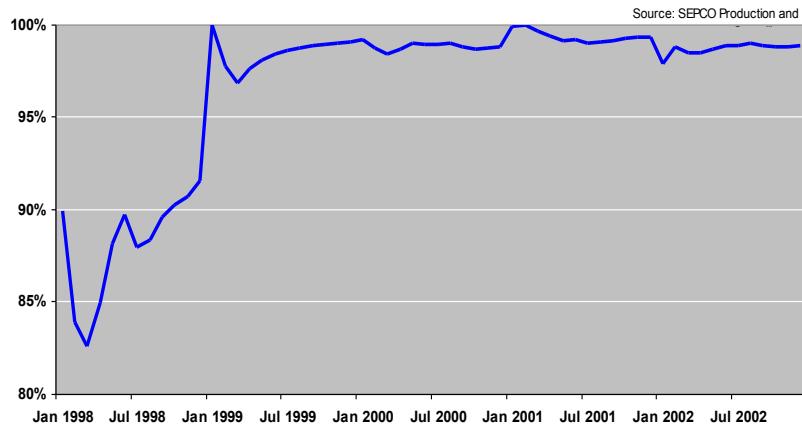
Continuous Performance Improvement



Overall Subsea System Availability is 99.3% in Q1' 2003

Use of Innovative Technology to Reduce Rig Time for Tree Installation

Figure 8 - Subsea Systems Availability



Shell's Deep Water Standardization Chronology

<u>Phases</u>	<u>Representative Projects</u>
Pre-Standardization (1992 ~ 1997)	Tahoe Popeye Mensa
	
Standardization Phase 1 (1997 ~ 2000)	Macaroni Angus Europa
	
Standardization Phase 2 (2000 ~ present)	Na Kika Bonga Princess
	
Global Application (2006 ~)	GoM - Perdido Brazil – BC10 Malaysia Nigeria

Standardization Highlights

- GoM activities (1998 to present)
 - 55 trees + 5 in 2007
 - 15 projects + 4 new phases
 - Perdido – 20+ trees, new standard
- Applications beyond GoM
 - Bonga (2002 to present)
 - 27+ trees
 - vertical, slimboore, ROV tree cap, similar architecture to GoM
 - Open water installations
 - New project awards 2006/2007
 - > 50 trees
 - Applied new Global Standards
- Proved innovation and standardization can coexist
 - ROV tree cap
 - Slimboore designs
 - HCLS and winch installations
 - Smart wells



Why Standardize?

- Business drivers
 - Portfolio management
 - Interchangeability and Flexibility
 - Repetition and applied learnings
 - Economics
 - Cost and cycle time reduction
 - High system availability
- Resource constraints
 - Reduce design effort for multiple concurrent projects
 - Focus on execution and quality



Summary

“Learning Based” Subsea Strategy Implemented

- **Development of Technology**
- **Standardization of Hardware and Processes**
- **Expanded Contractor Relationships**
- **Early Involvement of Operations Staff**

**Each Generation of Subsea System in place faster
and more cost effectively than the previous**

Overall Project Cycle-Time greatly reduced

World-Class Uptime / Availability Performance