



Galveston, 21-22 September 2011

Why so Long for an FPISO in US GoM?

Peter Lovie

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Houston

"The General Theory of Offshore Pioneering"

From six centuries ago

There is nothing more difficult to take in hand,
More perilous to conduct,
Or more uncertain in its success,
Than to take the lead in the introduction of a new order of things.



*Machiavelli, "The Prince",
Chapter 6, 1513*

History

Year	Field Development	Location	Operator	Contractor	Comments
1977	Castellon	Spain	Shell	SBM	World's First true FPSO
1981	Hondo	California	Exxon	Various	First FPSO in US waters
1996	Fuji	GoM	Texaco	None	Study that prompted DeepStar led industry wide support of EIS
1999	Na Kika	GoM	Shell	None	Exhaustive study of deepwater development options included FPSO
2001 December	Regulatory approval of FPSOs: US Department of Interior signs Record of Decision, approving FPSOs in GoM on basis of EIS				
2005	Mayhem: hurricanes Katrina and Rita damaged platforms, pipelines, MODUs adrift, caused rethink of design codes				
2007 August	<i>Cascade /Chinook</i>	GoM	Petrobras America	BW Offshore	Charters signed for FPSO + 2 shuttle tankers
2010 April	<i>BW Pioneer</i> arrives in GoM, 2 weeks before <i>Macondo</i> , delays, FPSO & shuttle tanker assist in spill				
2011 TODAY	<i>Cascade /Chinook</i>	GoM	Petrobras America	BW Offshore	Satisfy latest regulatory requirements, installation difficulties overcome

Shell

1977: The First FPSO: offshore Spain in 141 m. of water

Swivel: Swivel development for low pressure single point moorings and testing was an ongoing activity at the SBM premises in Kinderdijk, Holland.

Flexible riser: For a number of years Shell (SIPM) had been involved in a joint venture with IFP (Institute Francaise du Petrole) and Coflexip.

Tandem loading: Testing was conducted by the Wageningen Laboratory.

Key pioneers included:

Leon M J Vincken	SIPM	Originator of the idea involved in all aspects and overall in charge
Wim van Heijst	SBM	Head engineering team
Frank Eijkhout	SIPM	Head development and installation team SIPM
Joop Langevelt	SIPM	Development of Single Point Mooring
Alan Beare	SIPM	Development and testing of Coflexip riser

Source: Cobie Loper, SBM

Exxon

1981: First FPSO in US waters

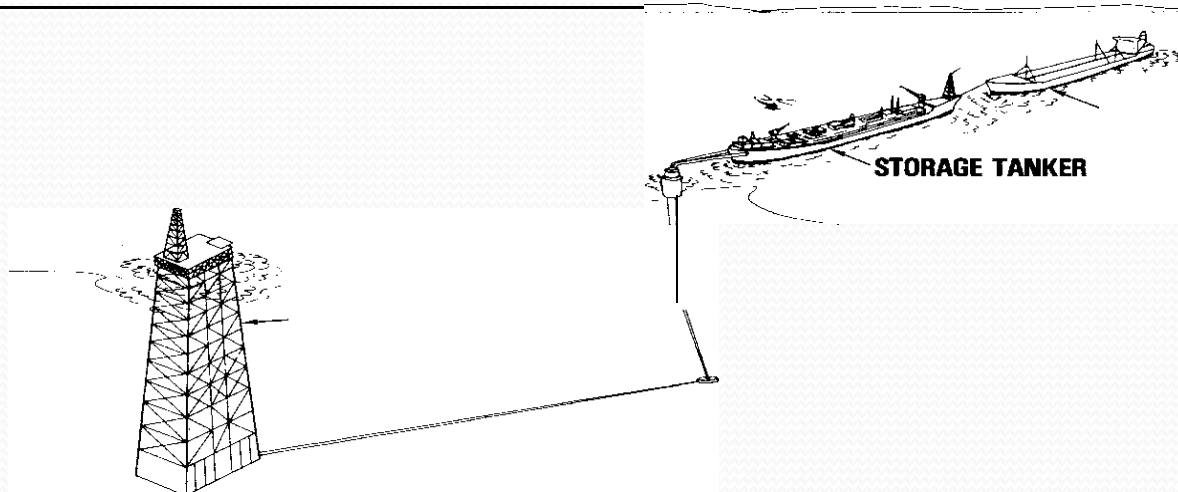
"OS&T" tanker at the *Hondo* development offshore California



Exxon's OS&T moored at Hondo development offshore Santa Barbara;

50,000 dwt tanker for production plus shuttle tanker;

OS&T (aka FPSO) is SALM Moored in 490 ft. of water, 1-1/2 miles from the *Hondo* platform in 850 ft. of water;



Pioneers on this project included:

N.A. Deacon, J.E. Hofferber,

T.E. Law, D.E. Masnada,

D.R. Olsen, R.E. Olson,

J.D. Rullmann, F.G. Vasser,

W.R. Wolfram, all of Exxon

US GoM

1997-2001: doing something about FPSOs in GoM has its roots in DeepStar



Allen Verret is a 30-year veteran of Texaco's Offshore Gulf of Mexico Operations and is presently the Executive Director of the Industry's Offshore Operators Committee and Technical Advisor to the Deepstar Regulatory Sub Committee.

Texaco had a prospect named *Fuji* in the then ultra deep of around 3,500 ft, remote from pipelines, looked like a field development candidate made for an FPSO;

Regulators would require an Environmental Impact Statement (EIS) before allowing such a revolutionary system into GoM! Would take 2+ years and \$millions of effort'

Absence of EIS would delay *Fuji* and other developments and make it difficult for any other operator to use the FPSO "tool in the toolbox";

About this time DeepStar was tackling the joint development of technologies by multiple operators, such as concepts for deep water in GoM and elsewhere;

Hence DeepStar took on the task of securing regulatory acceptance of FPSOs in GoM and preparing the EIS. The cat herding leader for this complex multi year initiative was Allen Verret, who deserves great credit for this accomplishment.

Shell

1998-1999: Early and thorough consideration of FPSO in US GoM



George Rodenbusch

led a number of early studies at Shell on FPSOs for GoM in 1998-1999, involving a large multidiscipline team from Shell and partner BP in assessing the feasibility of FPSO and other field development solutions for the *Na Kika* deepwater development in US GoM.

The semisubmersible at *Na Kika* that we know today was decided on after consideration of all kinds of options, including multiple variations on the FPSO theme;

Back then some people speculated on an operator prejudice in GoM against FPSOs;

No evidence of this in the deliberations for *Na Kika* - quite the opposite, it was a skillful rational decision, based on all reservoir, production and facilities choices and open internal debate;

More on this and other FPSO history in two part series "*The First FPSO in the US Gulf of Mexico – The 14 Year Journey*" in SPE's Journal of Petroleum Technology, April & May 2010.

Environmental Impact Statement on FPSOs

2001: Key US regulatory policy documents on FPSOs

OCS EIS/EA
MMS 2000-090

Proposed Use of Floating Production, Storage, and Offloading Systems On the Gulf of Mexico Outer Continental Shelf

Western and Central Planning Areas

Final Environmental Impact Statement

Author

Minerals Management Service
Gulf of Mexico OCS Region

Prepared under MMS Contract
1435-01-99-CT-30962

Cover

*Turret-moored FPSO in a tandem offloading
configuration with shuttle tanker
(illustration courtesy of Advanced
Production and Loading AS, 1999).*

Published by

MMS U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

New Orleans
January 2001

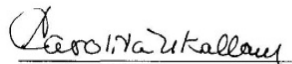
_____ **Alternative B-4** (Approve the general concept of using FPSO's with a requirement for an attendant vessel.)

_____ **Alternative C** (No action at this time (insufficient information to make a decision)).

_____ **Other** _____

This decision, authorized by the signature below, and this Recommendation and Decision Document together establish the Agency's Record of Decision on the Environmental Impact Statement prepared on the Proposed Use of Floating Production, Storage, and Offloading Systems on the Gulf of Mexico Outer Continental Shelf, Western and Central Planning Areas. This programmatic decision is effective immediately. This decision does not constitute approval of any specific FPSO project. Submission, review, and approval of all required OCS plans, permit applications, and other submittals must be completed for every proposed FPSO system.

Dated: 13 December 2001


Carolita U. Kallaur
Associate Director for
Offshore Minerals Management

The signed Record of Decision:
US Government says FPSOs OK
in principle in GoM

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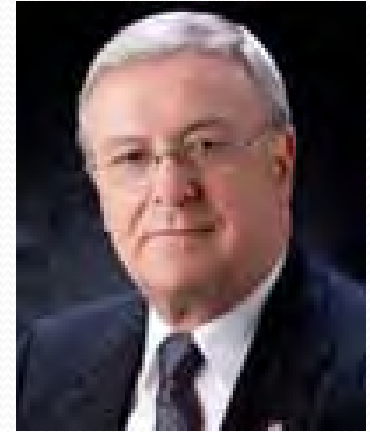
Devon

2003-2009: An independent - truly independent in US GoM



W.D. (Dave) Bozeman was Vice President at Devon Energy Corporation in Houston, responsible for the Project Support Office, set up to plan and manager major projects, before Devon's sell down of deepwater assets and ultimately exiting offshore altogether.

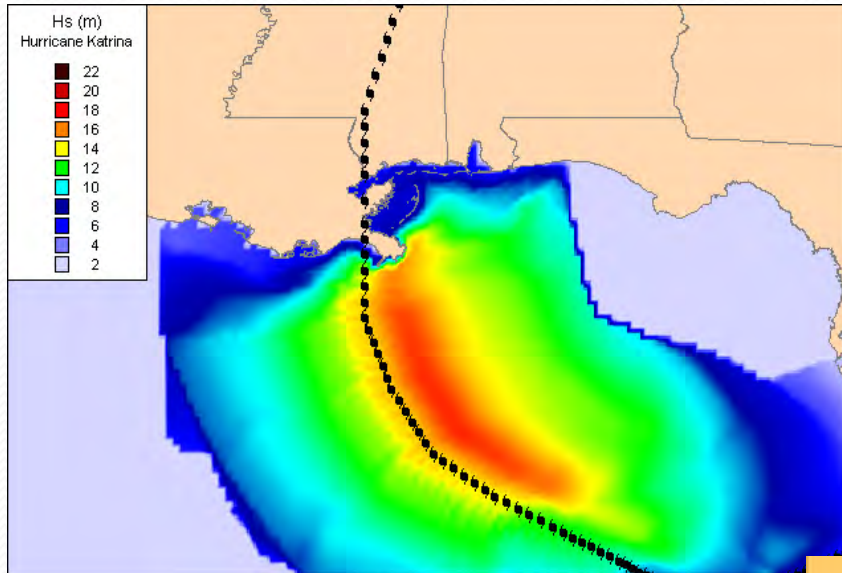
- a. No ownership in pipelines or refineries: the export of oil and gas to shore driven by open consideration of all options: FPSOs plus shuttle tankers openly competed in field development studies with Spars;
- b. Searching for nimble solutions to reach first oil early, e.g. try EWT or EPS if overall it gets us there faster;
- c. Large acreage position in remote ultra deep waters of Lower Tertiary: second after Chevron, big potential impact on company;
- d. 50:50 with Petrobras at *Cascade*;
- e. Then Devon chose to completely exit offshore in 2H 2009!



Peter Lovie, Senior Advisor Floating Systems. Seriously in the loop on contracting for FPSOs and shuttle tankers at *Cascade / Chinook*, then later deliberations on other GoM field developments for Devon

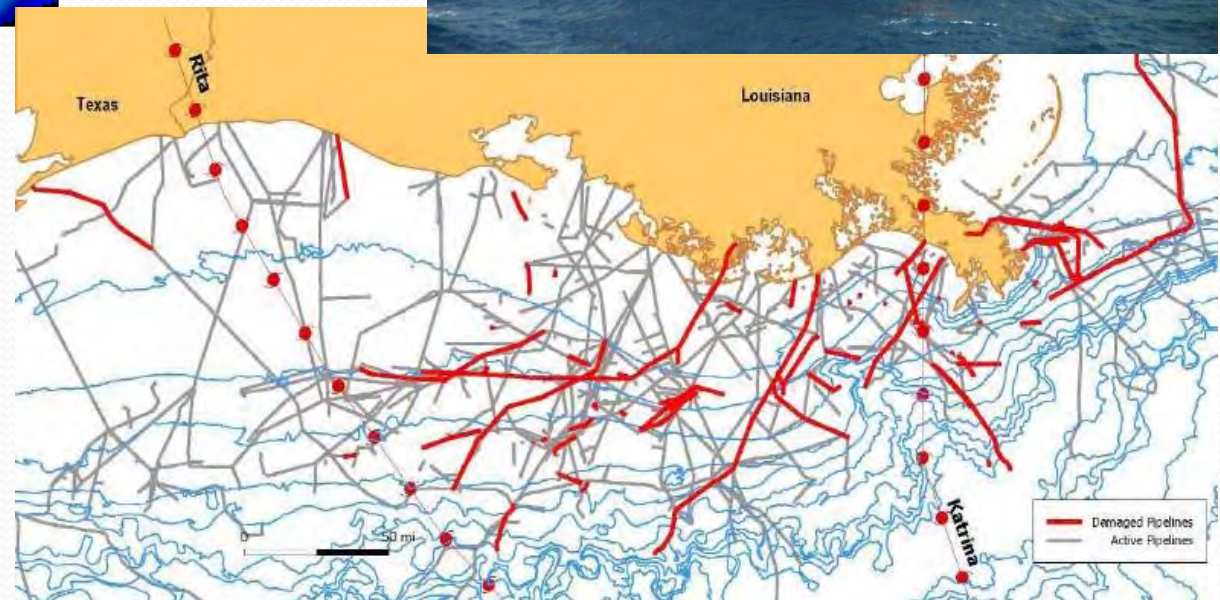
Stormy Weather aka Mayhem

2005: Offshore industry forced to rethink design codes



Map of Hs for Hurricane *Katrina*, with Water Depth Effects Included

Example of
Topsides
Damage Due
to Wind



Hurricane Damage to GoM Pipeline Network
(Source: MMS)



Engineers get busy on diagnoses and design code revisions, to be presented at OTC 2007

Less Mayhem – for a While

2006-2010: Serious progress

- 2006 Petrobras takes over operatorship of *Cascade/Chinook*;
Major find: BP's *Kaskida* in Keathley Canyon;
Petrobras and partners announce plans for first FPSO at *Cascade /Chinook*;
- 2007 March Bids were solicited for the third FPSO in GoM - and first on US side – for a minimum lease of five years.
May OTC: GoM design practices extensively revised, tightened;
August Stiff competition on contract for FPSO, signed with BW Offshore;
First shuttle tankers in GoM contracted – signed 2 from OSG;
- 2008 Hurricane *Ike* reminds industry – and Houston – that Mother Nature can still be a mean mother!
Another big find: BP's *Tiber* in Keathley Canyon. FPSOs are considered seriously in GoM but only for a few prospects;
- 2010 April First FPSO for GoM: *BW Pioneer* arrives from Singapore;
then disaster at *Macondo* disrupts everything, more mayhem!

Petrobras Pioneers (again)

2006 to date: Operator on first FPSO in US GoM!



Cesar Palagi is the Walker Ridge Production Asset Manager with Petrobras America Inc., responsible for the design and implementation of development projects of ultra-deep waters in Lower Tertiary fields in GoM. Provided technical and managerial E&P services to Petrobras for 30 years.

Contracted in 3Q07:
Aframax size FPSO for 8,200 ft. w.d., plus two Handymax size shuttle tankers;

First disconnectable turret for GoM, first Jones Act shuttle tankers.



The patron saint of US GoM shuttle tankers (and pipeliners' friend in Washington)

Senator Wesley Livsey Jones (1863-1932), Republican from the state of Washington, author of the Jones Act, intended to protect his state's trade with Alaska. The Jones Act applies to ships engaged in coastwise trade: US law requires shuttle tankers to be Jones Act compliant: US built, 75+% US owned, US crewed, and OPA 90 compliant (double hull). In contrast a production platform is considered a US port, not subject to the Jones Act.



Pioneering for US GoM

FPSO conversion in Singapore, shuttle tankers built in Philadelphia

The *BW Pioneer* in GoM waters



US construction of shuttle tankers



Conversion at KeppelFels



Source: Petrobras



Shuttle tankers owned by US company, crewed by US citizens

BW Offshore's *BW Pioneer* in GoM

Now ready for first oil



Source: Petrobras

What's Ahead for FPSOs in GoM?

Disconnectable

Run before storms like in Far East. Also benefit of easier to modify, expand or maintain;

Long field life

Lower Tertiary fields may produce for as long as 30-50 years, i.e. about double past field lives. Important effect on facility design and on exposure to extreme storm events;

New more remote areas

Lower Tertiary turning out to be very prospective (potential for high rates). Examples: BP's discoveries at *Kaskida* in 2006 and *Tiber* in 2009;

Long way out, over mountainous seabeds

Pipeline routes much longer, more circuitous and more expensive than hitherto (export economics may favor FPSOs);

Pressure to cut the cycle time

Intent to improve economics is countered by risks of reservoirs performing differently from expectations (timing on a firm FPSO contract less clear than before.

The EWT Dream

- a. Reservoir compartmentation, producibility questions lead to interest in an Extended Well Test (EWT) for say 6-12 months on a remote ultra deepwater Lower Tertiary prospects;
- b. “No flaring” gives operators serious gas pains. What to do about small amounts of associated gas? Not just producing but practical solutions for transporting gas to shore?
- c. No easy answer, e.g. GTL, LNG, CNG, etc. etc.
- d. Hazards of committee design v. engineers’ desires v. commerciality;
- e. Success of *Seillean* in deepwater Brazil thus not workable in GoM;
- f. A few operators talk but so far no one willing to pay the freight:
 - Difficult to string together enough 6-12 month requirements,
 - Arranging a sequence of prospects,
 - Securing partner agreements for multiple prospects;
- g. So far, no one yet willing to offer a charter for 4-7 years for economic operation.



Conclusions

In my humble opinion

- a. There are links in US GoM between reservoir conditions, well established extensive pipeline infrastructure and the choice of development solutions other than FPSOs;
- b. Fields that are particularly remote, with uncertain reservoir conditions, might favor another EPS such as *BW Pioneer*;
- c. Operator risk and field development philosophy IS a factor, e.g. compare Chevron and Petrobras: *Jack St. Malo* and *Cascade/Chinook*;
- d. Some field development solutions in US GoM have got accepted more quickly than FPSOs, e.g. Spars and TLPs. Curiously these two have been slow to catch on elsewhere in the world;
- e. FPSOs are now considered more than ever for GoM, but another FPSO after *BW Pioneer* is not a sure thing, far less an FPSO for full field development.

Thank you

Questions?

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