IOPF 2011-2002 Lovie

Tankers Vs Pipelines in Ultra Deep GoM

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19 October 2011

"The General Theory of Shuttle Tankers for US GoM"

From five 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

Today's story draws on a standing room only presentation at DOT in New Orleans in February 2009 and the "Shoot Out at the LT Corral" reception afterwards, both confronting the competition between tankers and pipelines.

Economics & risks remain generally similar today

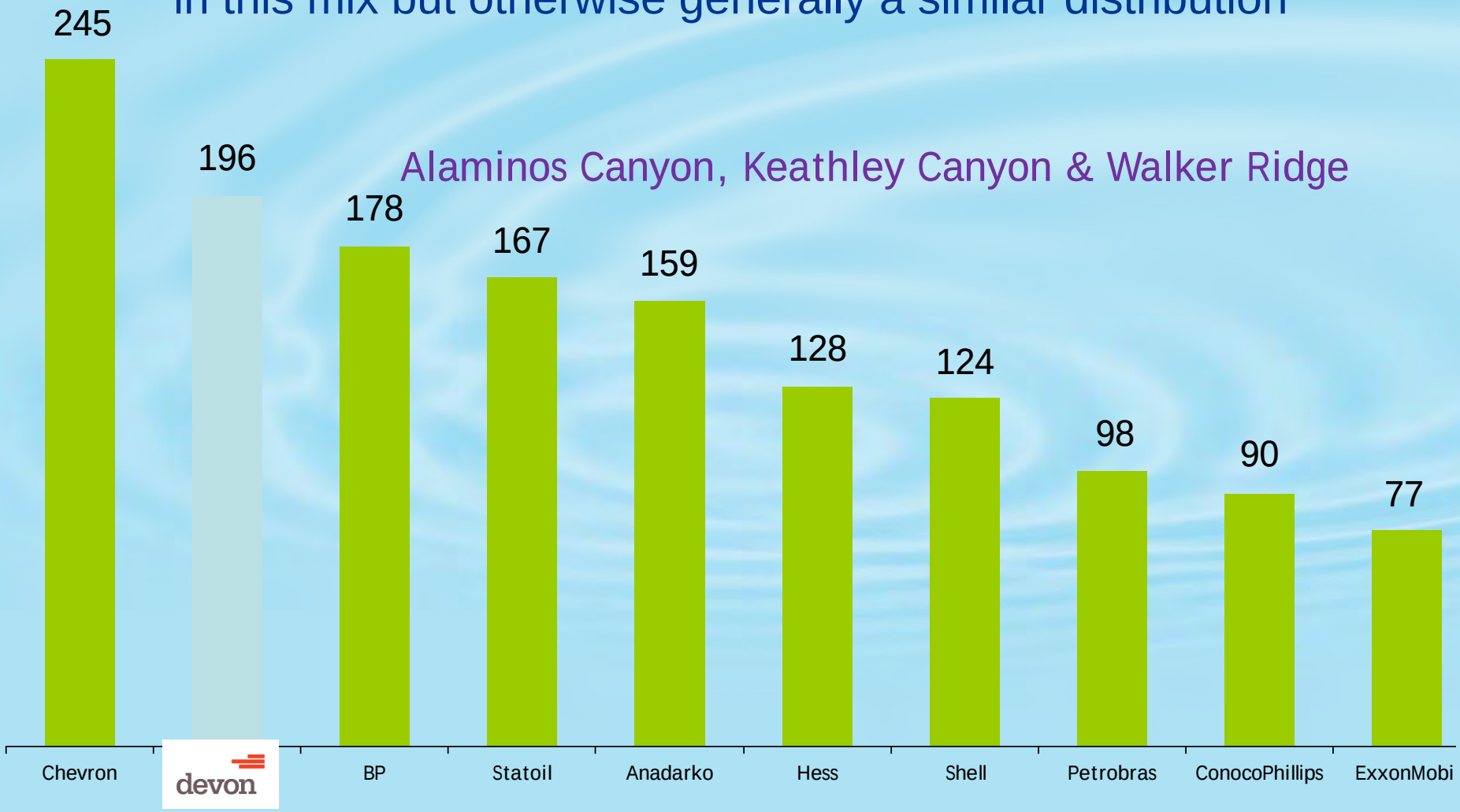
The Lower Tertiary Trend and the Oil Export Economic Prize

Peter Lovie

Lower Tertiary Block Ownership

Source of a potential oil export economic prize

Not a traditional line up for a frontier: today Devon is not in this mix but otherwise generally a similar distribution



Source: , Lexco Data Systems, Inc. – August 2008

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The 2009 “Shoot out at the LT Corral”: The gunslingers (panelists) left to right:

Rex Mars Project Consulting, independent pipeline construction viewpoint
Jim Healey Williams, major pipeline owner and operator
Tom Burgess OSG, shipowner, shuttle tanker contractor for *Cascade/Chinook*
Kim Diedrichsen Remora, developer of HiLoad
Peter Lovie Devon, operator, end user
Gene Kliewer Offshore magazine, moderator

Peter Lovie fires the first shots: recapping on his paper earlier in the day

After the “Shootout at the LT Corral” . . .

All the gunslingers are still standing

Note pipeliner and tankerman shaking hands!

The Two Linked & Ongoing Debates:
Facility and Transportation

1. Facility – two main options

(a) Semisubmersible or Spar
<u>without</u> storage

May allow well access (DVA)

(b) FPSO
<u>with</u> storage
+ Disconnectable

DVA not usually possible

Lower Tertiary Discoveries in WR & KC

Pipelines reaching out: come close to some discoveries

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General Conclusions so Far

a. Extensive pipeline network in deep and shallow waters in US GoM means competition for both oil and gas export tariffs;

b. Pipeline extensions and new lines over the years mean pipeline export usually economically feasible and fairly quick to arrange;

c. Hubs have been reasonably doable in deep waters in recent years: lining up “anchor tenants” to enable investing in transportation pipelines;

d. But it changes in the Ultra Deep Water (UDW), costs of extensions is greater in $MM/mile, distances longer, more demanding over mountainous sea floors;

e. Uncertain producibility of rservoirs in UDW can make economics and risks for pipeline hubs difficult, opening opportunity for tanker export;

f. Complicating the facility choice is the potential need to have direct vertical access (DVA) to the wells during production life.

The Pipeliners' Friend in Washington

Senator Wesley Livsey Jones (1863-1932), Republican from the state of Washington, author of the Jones Act passed in 1920, intended to protect his state's trade with Alaska, a measure acceptable in the protectionist times of the 1920s.

The Jones Act applies to ships engaged in coastwise trade in US waters: requires US built vessels, 75+% US owned, US crew.

A production platform is considered a US port, so delivery of production from a production facility to shore is "coastwise trade".

Tankers

Commercial basis

- Time charter (day rate for a contract term, like a drilling rig);
- Bare boat charter;
- Trip charter, spot market;
- Contract of Affreighment: common with shuttle tankers in North Sea.

Features

- Conventional tankers – typically for service anywhere in world, often weeks for each trip;
- Common sizes: Handymax, Panamax, Aframax, SuezMax, VLCC;
- Conventional tankers designed for safe efficient transportation;
- Shuttle tankers mean just that - shuttling back and forth between a production facility and a shore base terminal and/or refinery, frequent loading, often in rough conditions, short trips (say 1-5 days).

Shuttle Tankers in US GoM

Jones Act compliant;
OPA 90 compliant;
Double hull.

About 320,000 bbl capacity to allow backup use as product carriers;
OR About 550,000 bbl: maximum for GoM port drafts

Bow Loading System (BLS);

Sometimes use hawser mooring & hold off tug;

Added maneuverability for maximum safety: CPP, thrusters, DP2;

VERY expensive to build in the US!

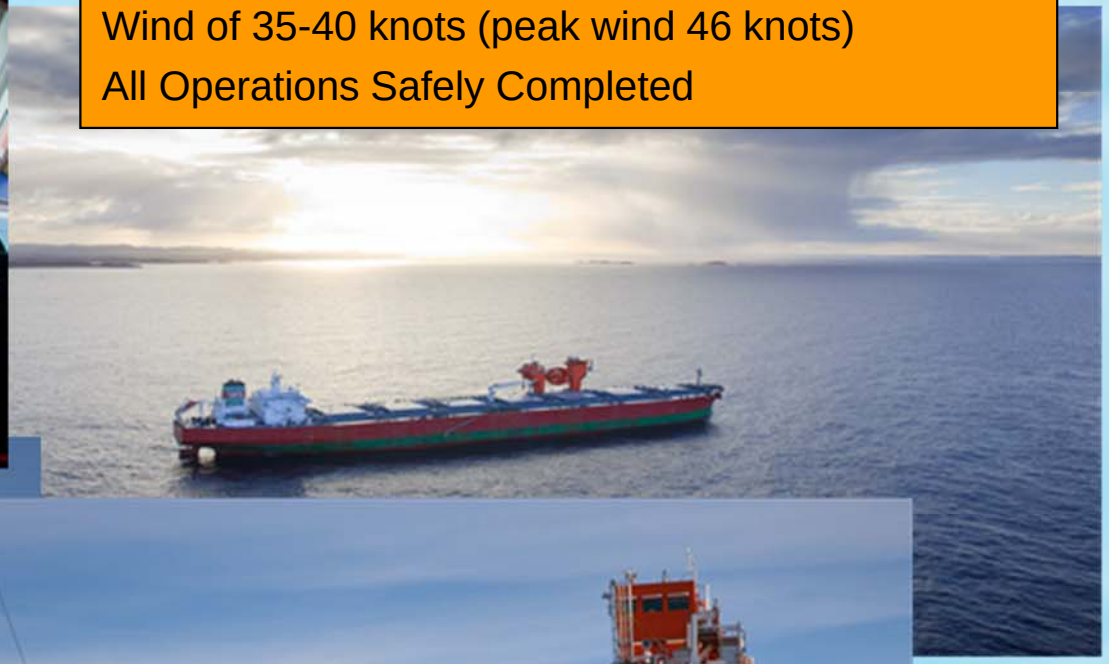
HiLoad: New Enabler for Tanker Export

Images from the 2011 series of trials

Docking and DP Station Keeping Operation in High Waves - Hs 3.5 m (max 6-7 m)

Wind of 35-40 knots (peak wind 46 knots)

All Operations Safely Completed



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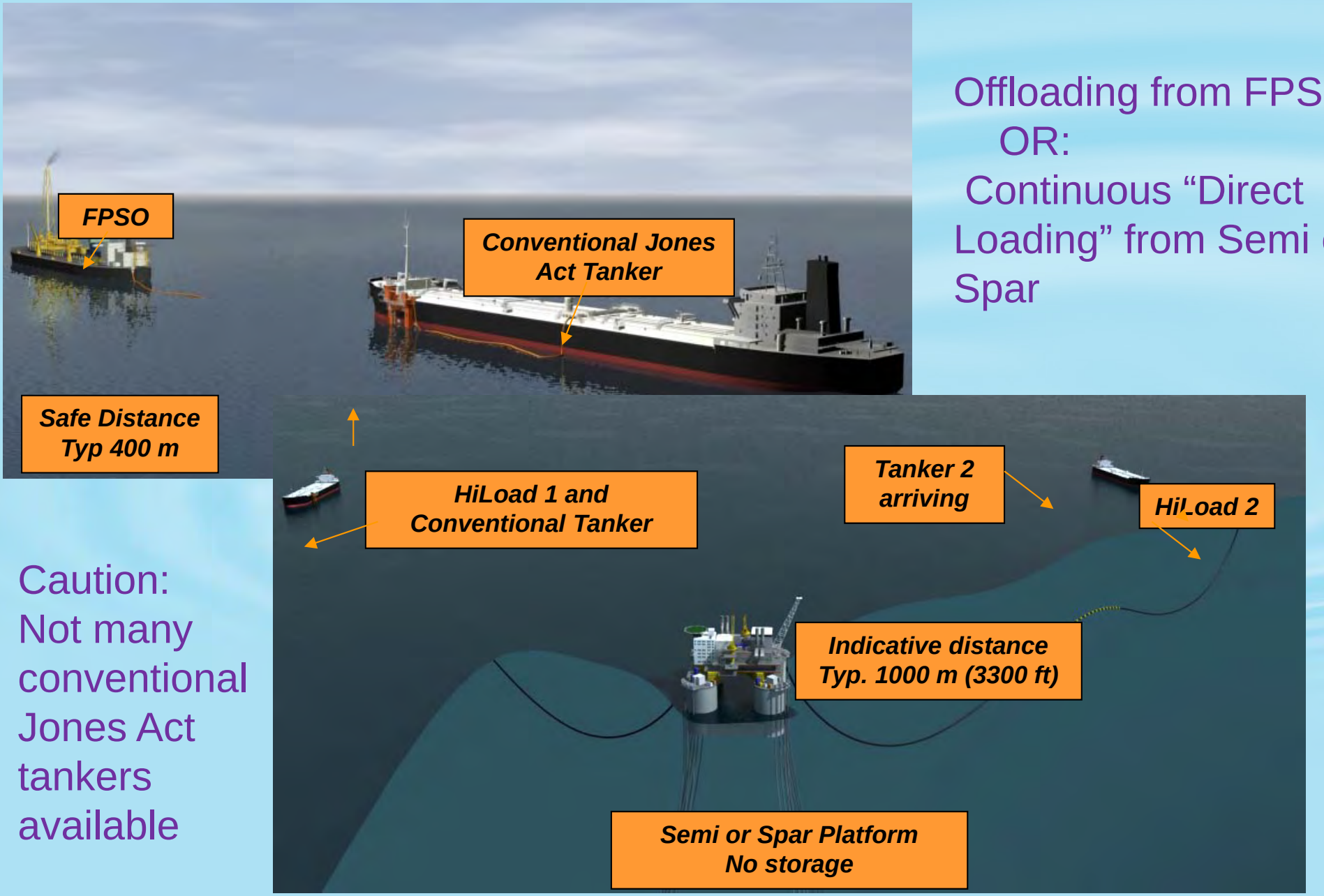
HiLoad + Conventional Tankers:

Tanker Loading from FPSO, Semi or Spar



Offloading from FPSO
OR:
Continuous "Direct Loading" from Semi or Spar

Caution:
Not many conventional Jones Act tankers available

Transportation – Five Main Options

Traditional choices:

1. **Pipeline**: Long history of success in GoM;

2. **Shuttle tankers + FPSO**: First use at *Cascade/Chinook* in 2011, common in North Sea;

3. **Shuttle tankers + FSO**: Common elsewhere in world, studied for GoM;

New options:

4. Conventional tankers + HiLoad for FPSO: only new part is HiLoad prototype;

5. Conventional tankers + 2 HiLoads for Semi/Spar.

Comparisons Tend to be Very Site Specific

a. Difficult to generalize on economics of tankers versus pipelines;

b. Tankers can be redeployed, have a larger operating component;

c. Pipelines also have large front end CAPEX commitment, low operating component, but cannot be rolled up and redeployed elsewhere!

d. Many regions employing tanker “export” are truly exporting, whereas GoM always imports all production;

e. Comparison calculations for DOT 2009 that follow are hypotheticals, based on realistic GoM fields and economics, believed to be first public exposure of this kind of discussion;

f. Please excuse the small print in the tables: email me for a copy of source DOT paper with explanations of assumptions.

Key Issues in Economics

Factors below are cited in tables that follow

FIRM	a	New construction tariffs. Tanker figures include time charter as applicable, fuel & port costs;
	b	Tariff on existing deepwater pipelines, booster platforms, pipelines to beach (total system);
	c	Equivalent of export system CAPEX in facility;
FUZZY	d	Quality bank in existing pipelines (controvetsial);
	e	Optionality, no. of destinations;
	f	Upside on marketing to wider range of destinations;
	g	Guaranteed future access throughout field life;
	h	Premium for prompt payment on delivery.

Economics

Now for the fine print and the devils in all the details

Source: Tables 6, 8 and 9 in this presentation are from the manuscript for DOT 2009 paper 138, 23 pages

Table 6: Comparison of $/bbl Economics for Different Export Options for "Large Reservoir"

703.7 mmbbl recovery in first 16 years Maximum rate of 166,948 bopd

Cost Component / Export Option:		Facility without storage			Facility with Storage		Notes
		1 Pipeline	2 FSO+ST	3 HiLoad+DLCT	4 ST	5 HiLoad+CT	
a	New construction tariffs. Tanker figures include time charter as applicable, fuel & port costs:	2.58	3.70	3.55	2.47	2.37	(i)
b	Tariff on existing deepwater pipelines, booster platforms, pipelines to beach:	1.00	0.00	0.00	0.00	0.00	(ii)
c	Equivalent of export system CAPEX in facility:	0.40	0.13	0.13	0.13	0.13	(iii)
d	Quality bank in existing pipelines:	0.80	0.00	0.00	0.00	0.00	(iv)
e	Optionality, no. of destinations:	2 ?	10	10	10	10	(v)
f	Upside on marketing to wider range of destinations	0.00	-0.50	-0.50	-0.50	-0.50	(vi)
g	Guaranteed future access throughout field life	TBD	yes	yes	yes	yes	(vii)
h	Premium for prompt payment on delivery	0.00	-0.30	-0.30	-0.30	-0.30	(viii)
	TOTALS, $/bbl:	4.78	3.03	2.88	1.80	1.70	
	RATIOS:	1.00	0.63	0.60	0.38	0.36	
	SIZE OF THE PRIZE, $BILLION:	0.00	1.23	1.34	2.10	2.17	(ix)
	Discounted at 10%, 16 years, $BILLION:	*0.00*	*0.60*	*0.65*	*1.01*	*1.05*	

Effects of the The Firm and the Fuzzy

Table 8: Summary: Effect of Reservoir Size on Overall Export Economics, $/bbl
With Both "Firm" and the "Fuzzy" Cost Components, i.e. all of a-h in Table 6 or 7.

Export Option:	Facility without storage			Facility with Storage	
	1 Pipeline	2 FSO+ST	3 HiLoad+DLCT	4 ST	5 HiLoad+CT
Medium Reservoir: 268.0 mmbbl recoverable over 16 years, maximum 76,411 bopd	6.74	5.84	6.02	2.61	2.93
Large Reservoir: 703.7 mmbbl recoverable over 16 years, maximum 166,948 bopd	4.78	3.03	2.88	1.80	1.70

Table 9: Summary: Effect of Reservoir Size on Overall Export Economics, $/bbl,
Only the "Firm" Cost Components, i.e. only a-c in Tables 6 and 7

Export Option:	Facility without storage			Facility with Storage	
	1 Pipeline	2 FSO+ST	3 HiLoad+DLCT	4 ST	5 HiLoad+CT
Medium Reservoir: 268.0 mmbbl recoverable over 16 years, maximum 76,411 bopd	5.94	6.64	6.82	3.41	3.73
Large Reservoir: 703.7 mmbbl recoverable over 16 years, maximum 166,948 bopd	3.98	3.83	3.68	2.60	2.50

Conclusions

a. Combination of visions needed in assessing export choices: facilities engineering + broad commercial + risks;

b. Facilities without storage – no compelling winner (3 export choices);

c. Same for facilities with storage (2 export choices);

d. Facility choice may be driven by well production characteristics, overriding export considerations;

e. But BIG difference between export economics for: with storage and without storage: as much as 0.5:1.0 favoring tankers;

f. More information on logic and assumptions in the manuscript.

Thank you

Questions?

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