Fast Ferries
&
Floating Production/Storage/Offloading (FPSO) Vessels

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Fast Ferries: Outline

- Technical Overview
- Background and History
- Present Market Conditions
- Likely Developments
- Financial and Risk Management Considerations

Fast Ferries: State of the Art

- large catamaran (Incat): 100 m, 500 dwt, 900 passengers/240 vehicles, 50 knots; $44m
- small catamaran: 30 m, 325 passengers, 40 knots; $15m
- Italian monohull: 150 m, 1800 passengers/460 cars, 40 knots

Fast Ferries: Earlier Approaches

- hydrofoil
- hovercraft
- SWATH

Fast Ferries: World Fleet

- 903 in 1990; 1218 in 1997; 12% growth
- over 1000 are passenger-only
- catamarans and monohulls growing fastest
- major regions: Greece (10%), China, Indonesia, Scandinavia, Western Europe, Turkey, Singapore, Australia, South America

Fast Ferries: Leading Builders

- Incat, Austal: Australian catamarans
- Kvaerner Fjellstrand, FBM: Eurasian catamarans
- Fincantieri, Rodriquez Cantieri Navali: Italian monohulls

Fast Ferries: Supply

- Italian and N. European yards: largest ferries
- Australian yards: 40% of fast pass/vehicle market
- licensing of designs from Australia

Fast Ferries: Current Demand

- passenger-only craft dominate
- greatest current demand still from Europe and the Asian Pacific Rim

Fast Ferries: Nearterm Growth

- United States: metropolitan transport systems
- Greece: replacement of aging hydrofoils

Fast Ferries: Longterm Growth

- Caribbean
- Indonesia
- Philippines
- South America

Fast Ferries: Developments

- size and speed
- propulsion
- reduced environmental impacts
- rough sea operations

Fast Ferries: Size and Speed

- gas turbines and composites: high speed more economical; long open water routes
- 95 m/1000 t/65 knots freight catamaran on offer
- 120-130 m/2000 t/50+ knots freight catamaran being designed
- flexible, modular designs

Fast Ferries: (Gas) Turbines

- more kW/kg, but higher purchase price
- fuel cost, maintenance cost coming down
- inefficient at low power
- four diesels is max. installation for catamaran hull (30,000 kW)

Fast Ferries: Environment

- wake wash
- emissions
- ship strikes on marine mammals

Fast Ferries: Rough Sea Ops

- motion control systems (refinements)
- SLICE: modified SWATH concept, focus on Hawaiian islands

Fast Ferries: Risk Management

- environmental and regulatory restrictions
- inexperienced operators
- secondary market

FPSOS and Fast Ferries: Conclusions

- growth in both markets areas
- opportunities exist
- cash flows, not asset values
- examine deployment specifics
- consider redeployment opportunities and limitations

Floating Production, Storage, and Offloading (FPSO) Vessels

Outline

- Technical Overview
- Background and History
- FPSO Market Development
- Market Forecasts
- Prospects for Conversions
- Conclusions

Technical Overview

- jackups
- semisubmersibles
- monohull FPSOs

Context

- offshore production about 20% of world production
- mobile production about 10% of offshore production
- both fractions are increasing

Mobile Production Installations

FPSO newbuildings	22
FPSO conversions	46
semisubmersible newbuildings	4
semisubmersible conversions	31
jack-ups	19
total	**122**

History

- first installation in Mediterranean
- first substantial development in benign waters of Far East, Australia
- move to North Sea, South America, West Africa
- likely soon in U.S. Gulf of Mexico

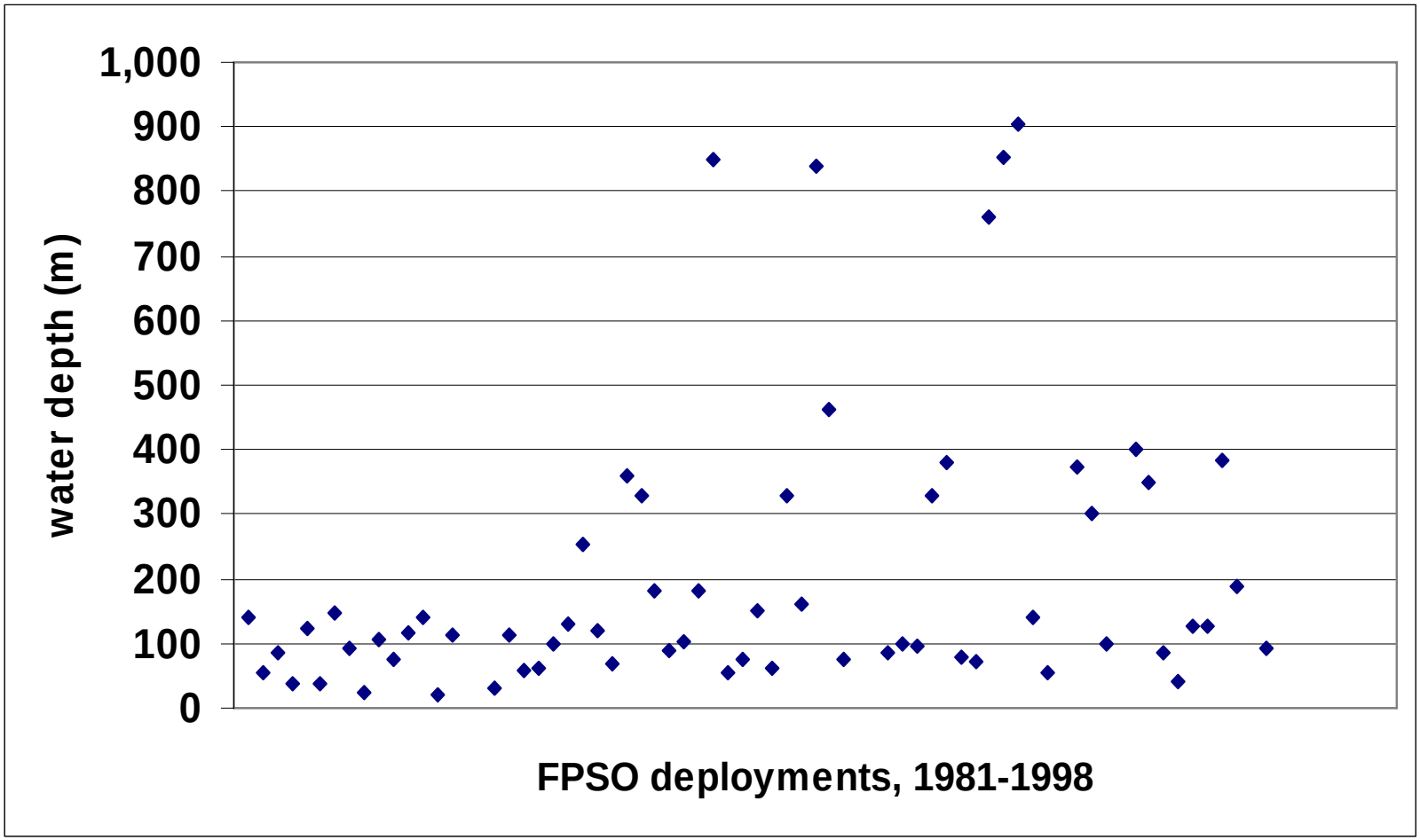
Technology Development

- flexible mooring to riser buoy
- rigid mooring to riser buoy (detachable)
- mooring turret in bow
- mooring turret within length of vessel
- dynamic positioning

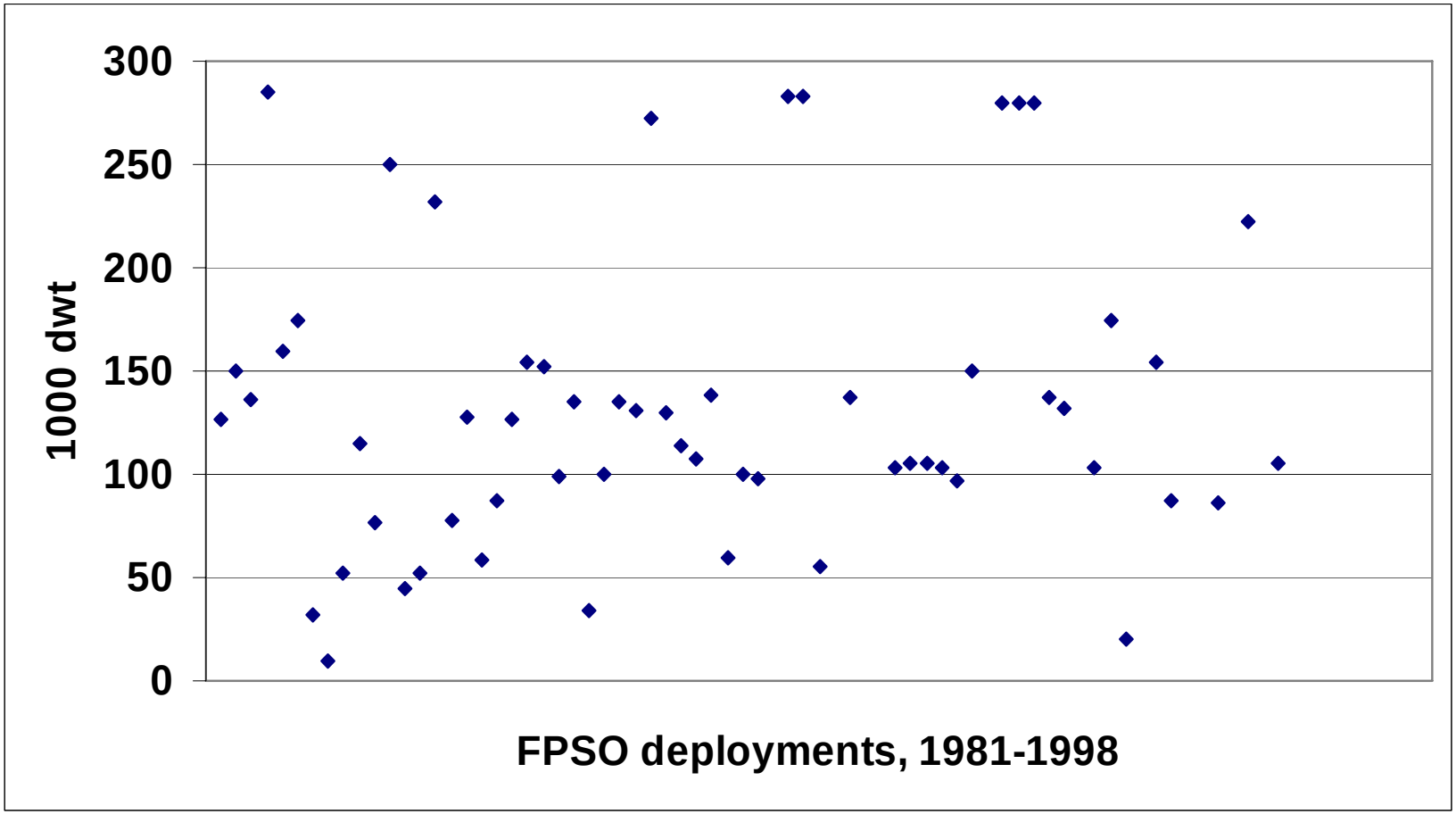
Technology Development

- water depth: 120 m (1977) to about 2500 m today
- production (flow) rates: 15,000 b/d (1977) to 200,000 b/d

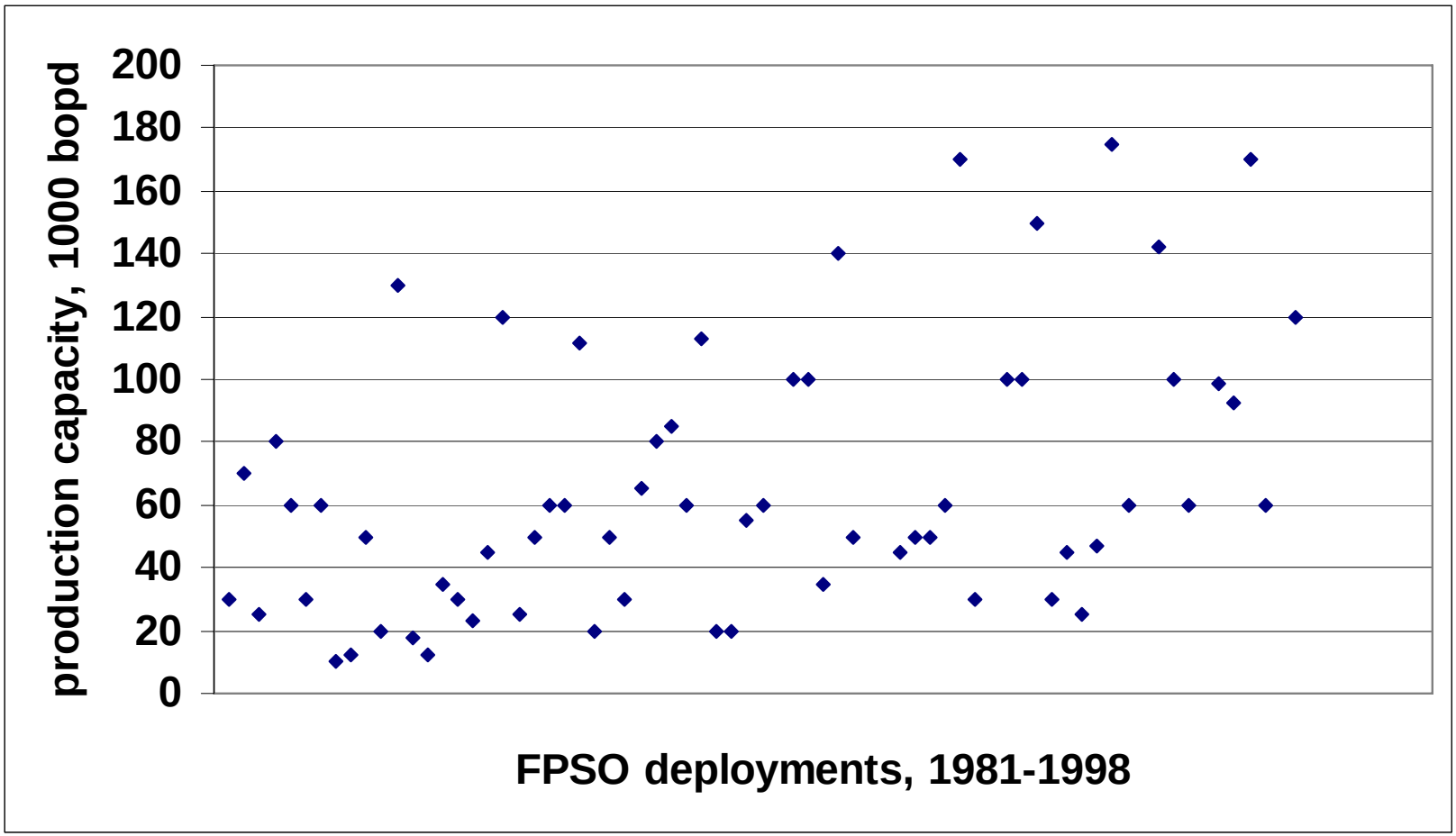
Water Depth Trend



FPSO Vessel Size Trend



Production Capability Trend



Geographic Regions

	FPS installations as of 1998	*FPS installations 2003 (est.)*
Europe	24	37
Africa	12	27
Middle East	1	1
Asia	13	15
Australia	4	7
North America	9	23
South America	12	25
Total	**75**	**135**

U.S. Gulf of Mexico

- USCG, MMS share management responsibility
- FPSOs are tank vessels (OPA 90 etc. apply)
- stored oil is cargo
- offloading is lightering
- possibility of ISIS
- EIS underway
- gas flaring is illegal

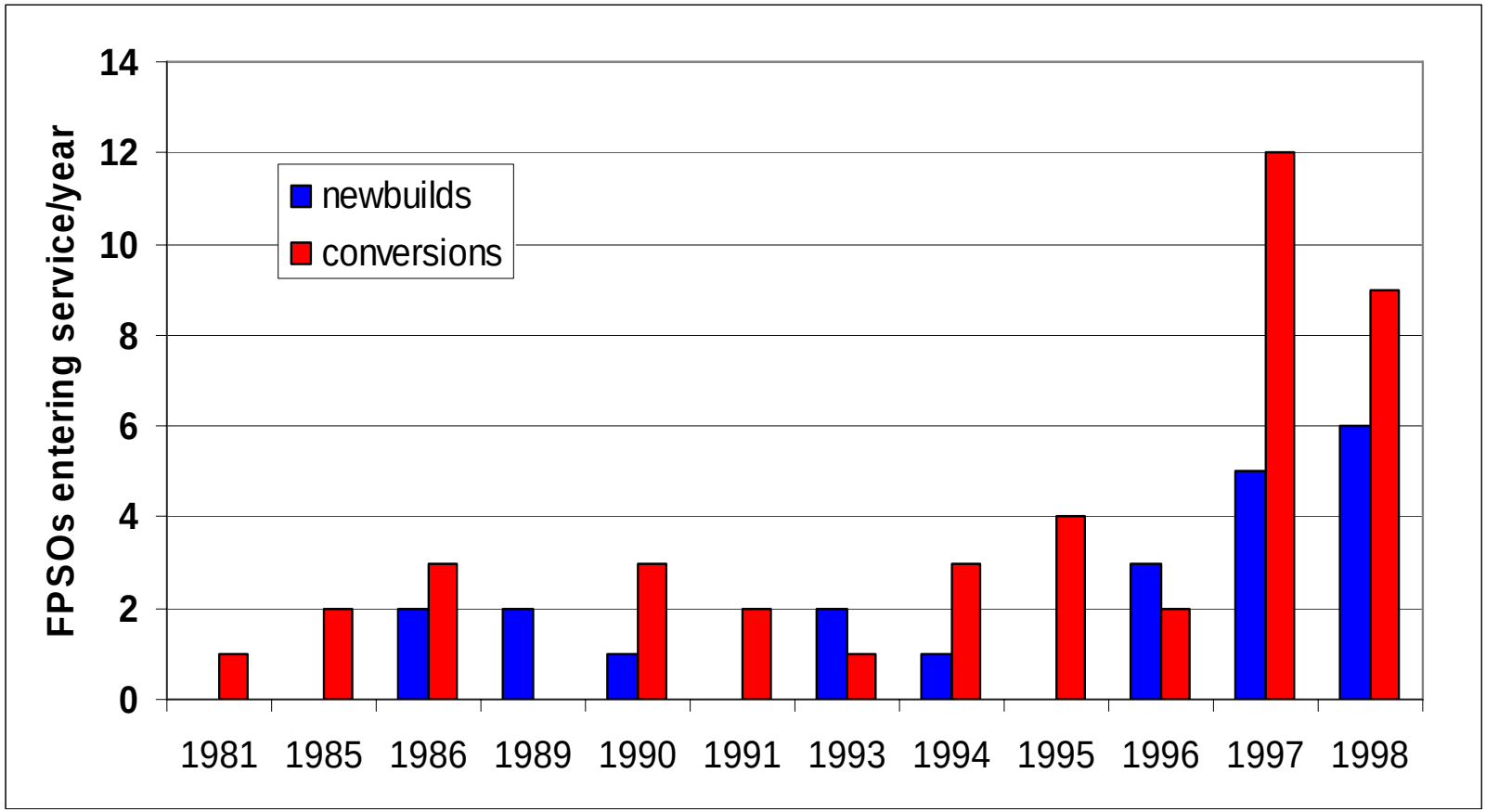
Economics

- structure cost insensitive to water depth
- operating cost compares favorably to fixed platforms
- rapid deployment, redeployment
- easy abandonment
- (subsea tiebacks)
- (semisubmersibles)

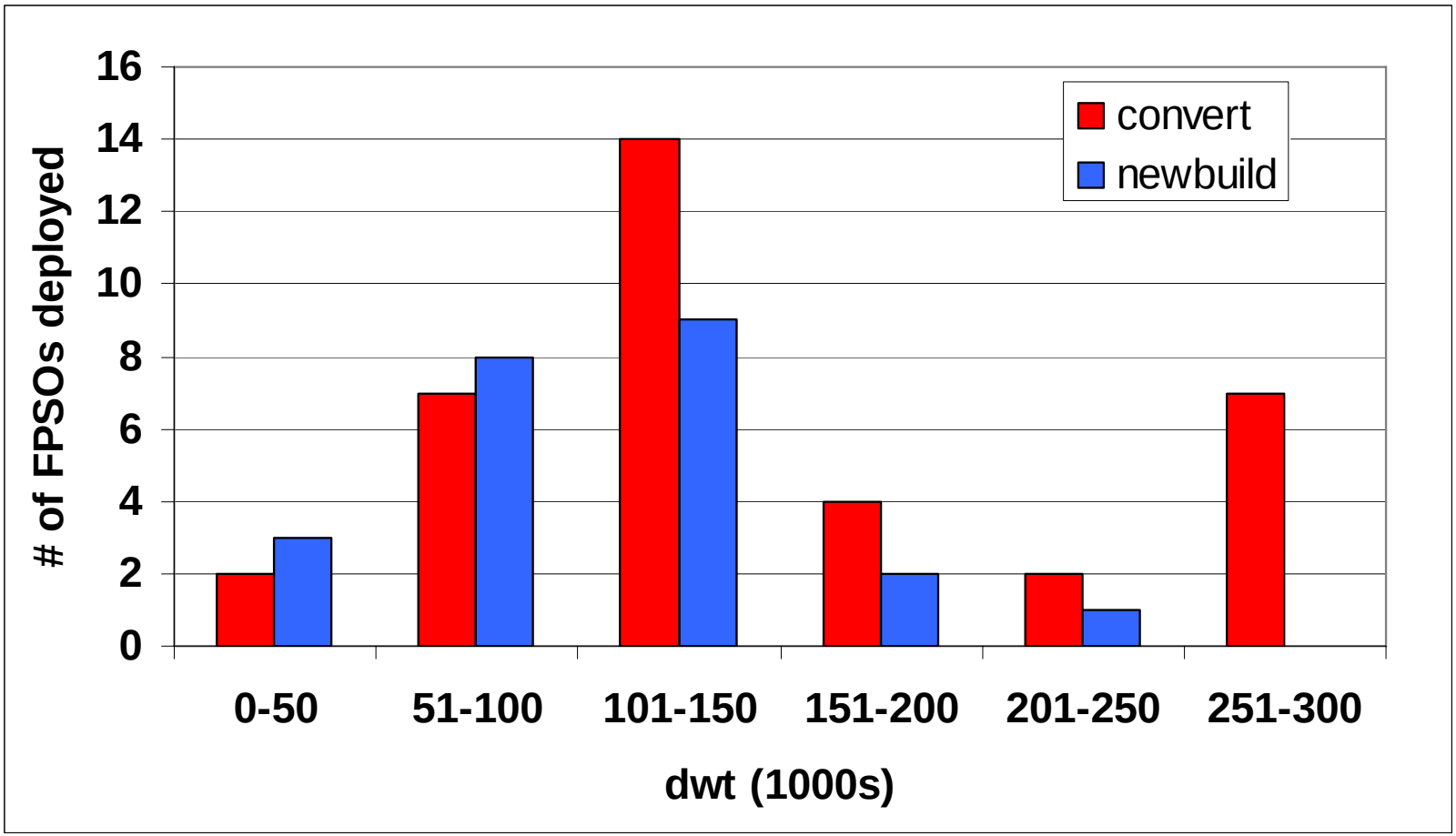
Conversion vs. Newbuild

- 2/3 to date are conversions
- cost: factor of 10 (conversion costs $15-30 million)
- availability of suitable tankers: 1970s and 1980s, 100 - 160,000 dwt

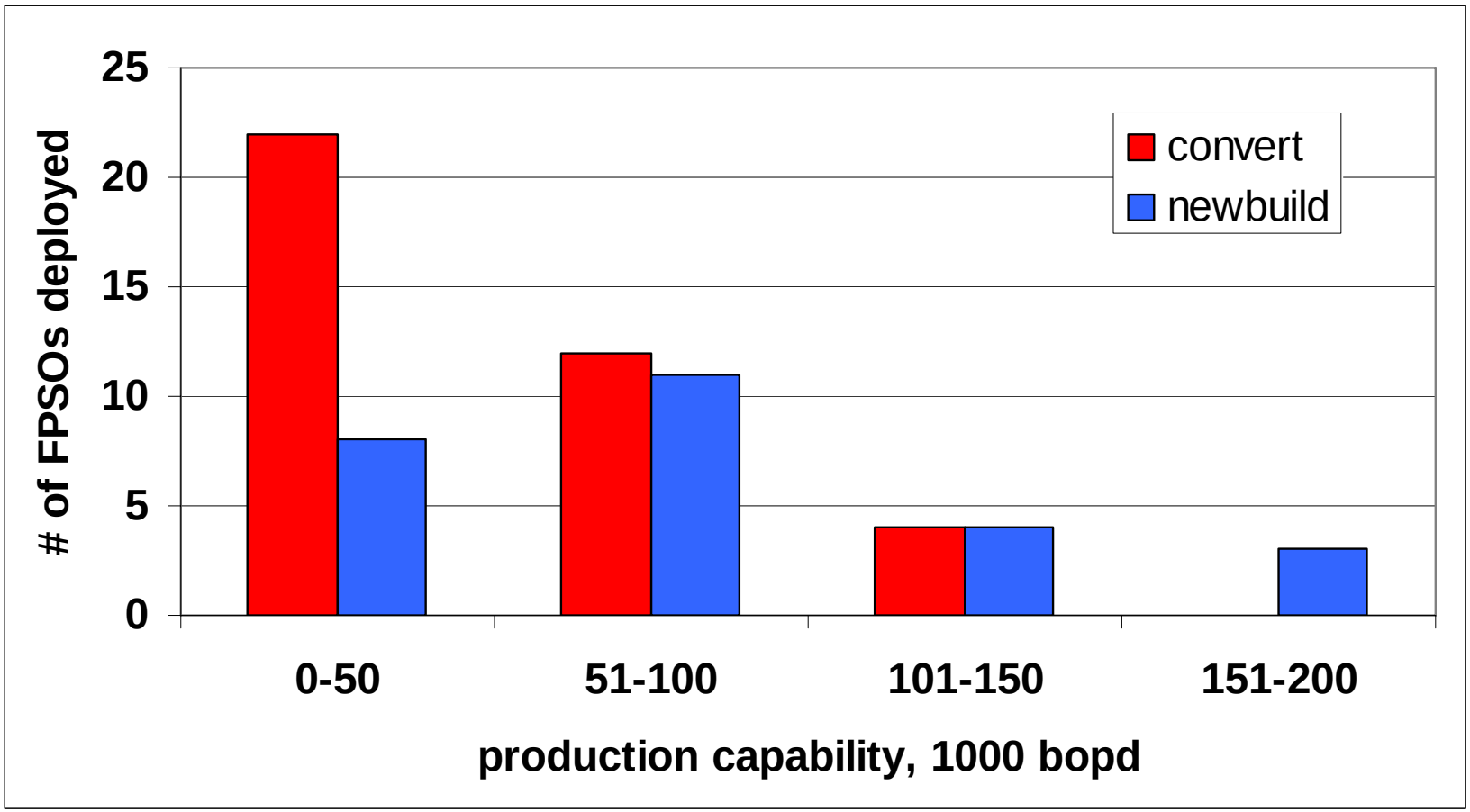
FPSO Deployment History



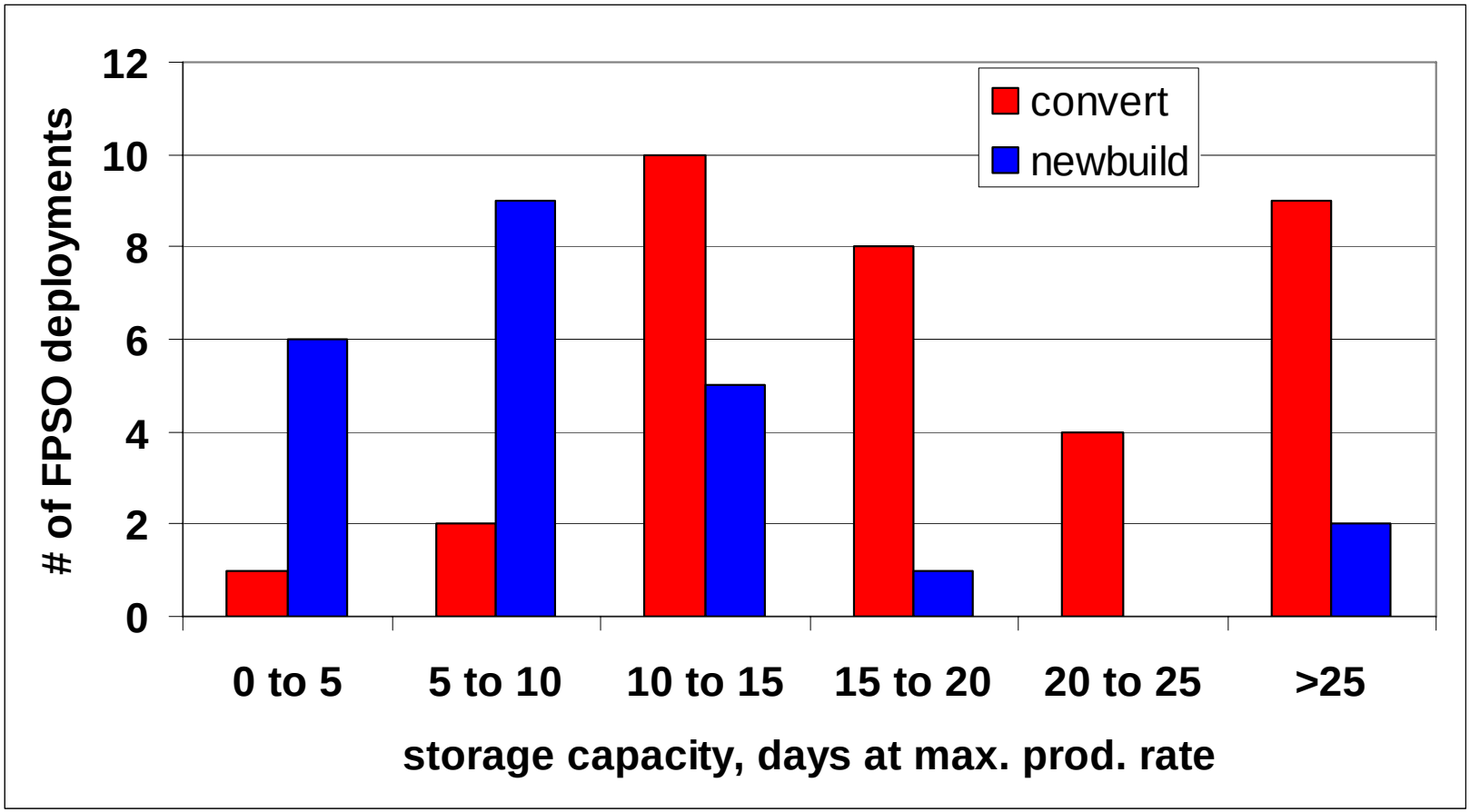
New vs. Convert: Vessel Size



New vs. Convert: Production Cap



New vs. Convert: Storage Cap.



Indications for Newbuild

- harsh environment (seas always head-on)
- long field life or deployment prospects

Indications for Conversion

- benign environment
- short term deployment

Tank Vessels for Conversion

- steel condition is paramount
- turbo generator a plus
- segregated ballast tanks (post-1980) a plus
- condition of piping does not matter

Demand Forecast

- 20+ deepwater fields/year being developed
- half of these to involve one or more FPSO: 10+ FPSOs/year

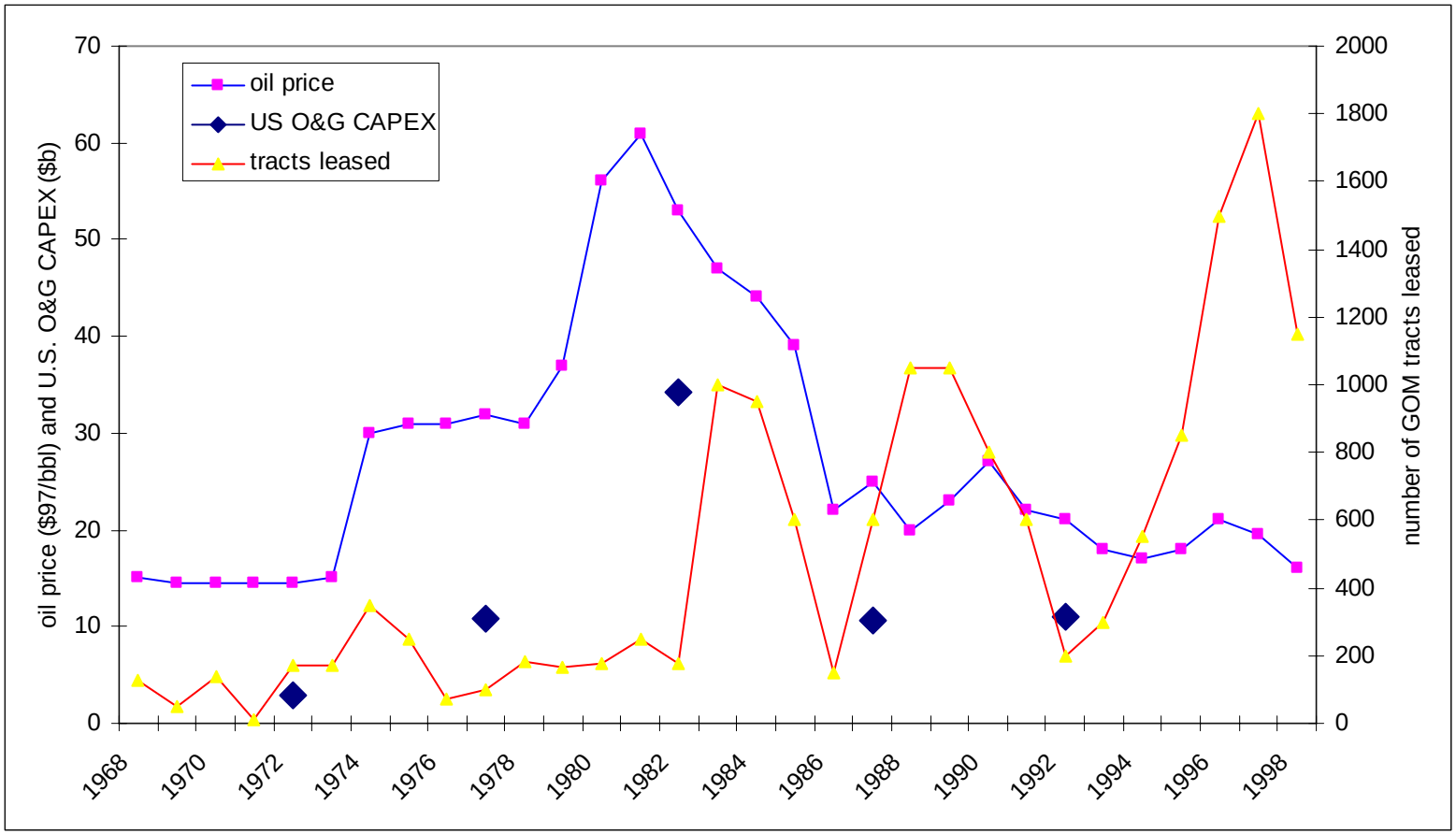
OOG Drivers

- deepwater fields: 44% of reserves deeper than 300 m
- average field size decreasing
- large new fields (West Africa, Brazil) are in deep water
- $44b in OOG development expenditures forecast for next 5 years; 250 to 400 subsea completions per year

Effect of Oil Price

- average deepwater finding/developing cost is just above $4/barrel (range: $2.11 to $9.42)
- deepwater development is relatively insensitive to oil price above $10/barrel

Oil Price and U.S. OOG Activity



Likely Developments

- Standardization -- not yet
- connection technologies
- gas production/disposal

Standardization

- has not yet happened: too many one-off conversions
- shift to contractor ownership will help drive standardization
- production system components

Connection Technologies

- subsurface buoys
- riser connections
- S-shaped risers
- composite risers
- synthetic rope moorings

Gas Production

- conversion to methanol
- liquefaction – now proven
- pipeline
- reinjection
- flaring

Conclusions

- growth projection healthy
- conversions now slowing
- investment opportunities in newbuildings