



Bureau of Safety and Environmental Enforcement

History of Multiphase Flow Meters in Federal Waters of the Gulf of Mexico

Fred M. Jacobs
February 24, 2016

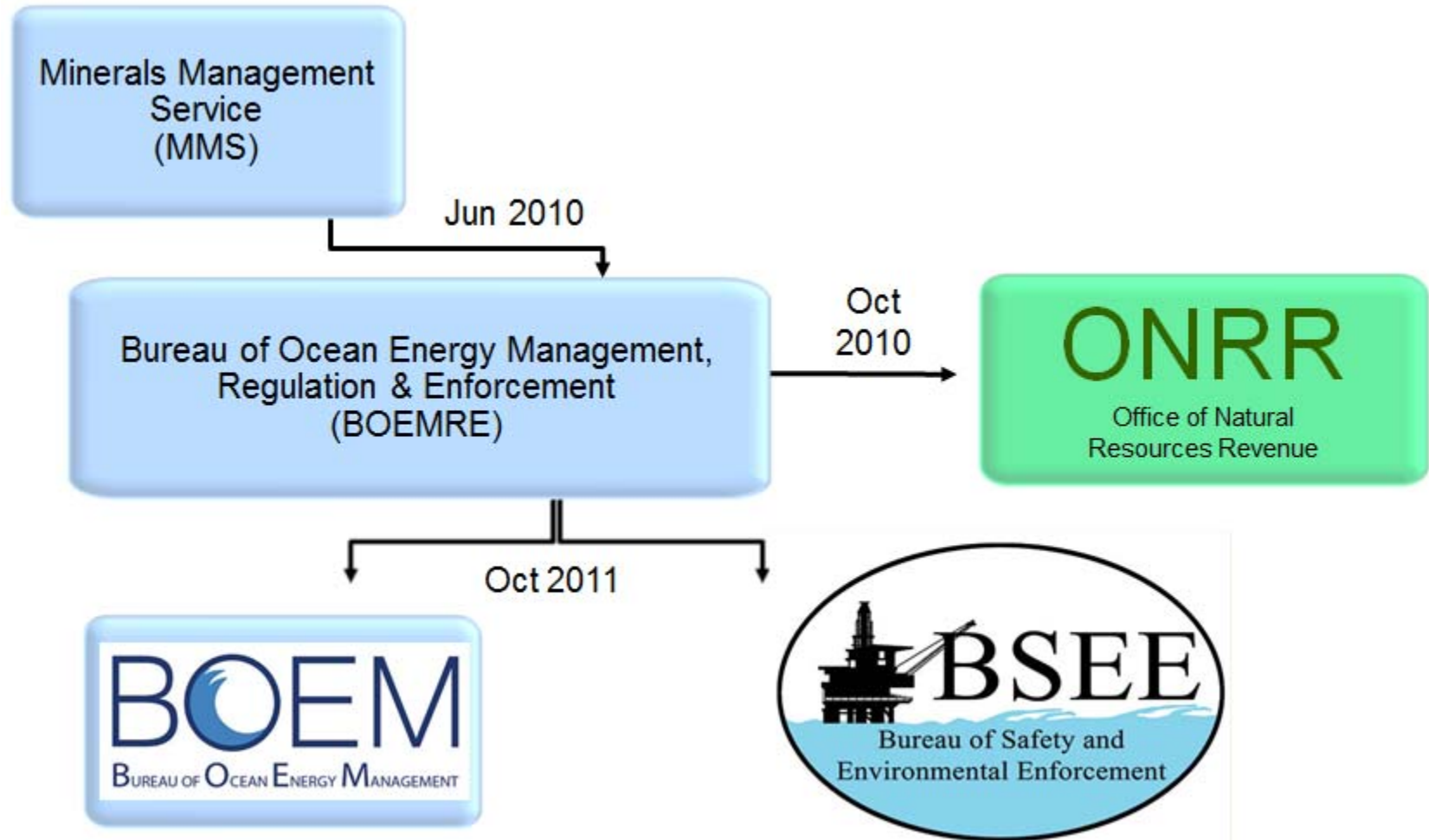
UPM FORUM
UPSTREAM PRODUCTION MEASUREMENT

“To promote safety, protect the environment and conserve resources offshore through vigorous regulatory oversight and enforcement.”

Topics

- Background Information
- Measurement Approval & Enforcement Section
- Commingling and Measurement Policy
- MPFM/WGM Statistics
- Trends

Organizational History



Measurement Approval & Enforcement

Primary Functions

- Evaluate commingling/measurement applications for compliance with Federal OCS regulations and Regional Policy
- Establish Facility Measurement Point (FMP) numbers for all royalty and allocation measurement points
- Collect, review, and input source measurement documents for all Federal OCS royalty points - independently verify volumes
- Perform onsite oil and gas measurement and site security inspections in Gulf of Mexico OCS Region

Commingling and Measurement Policy

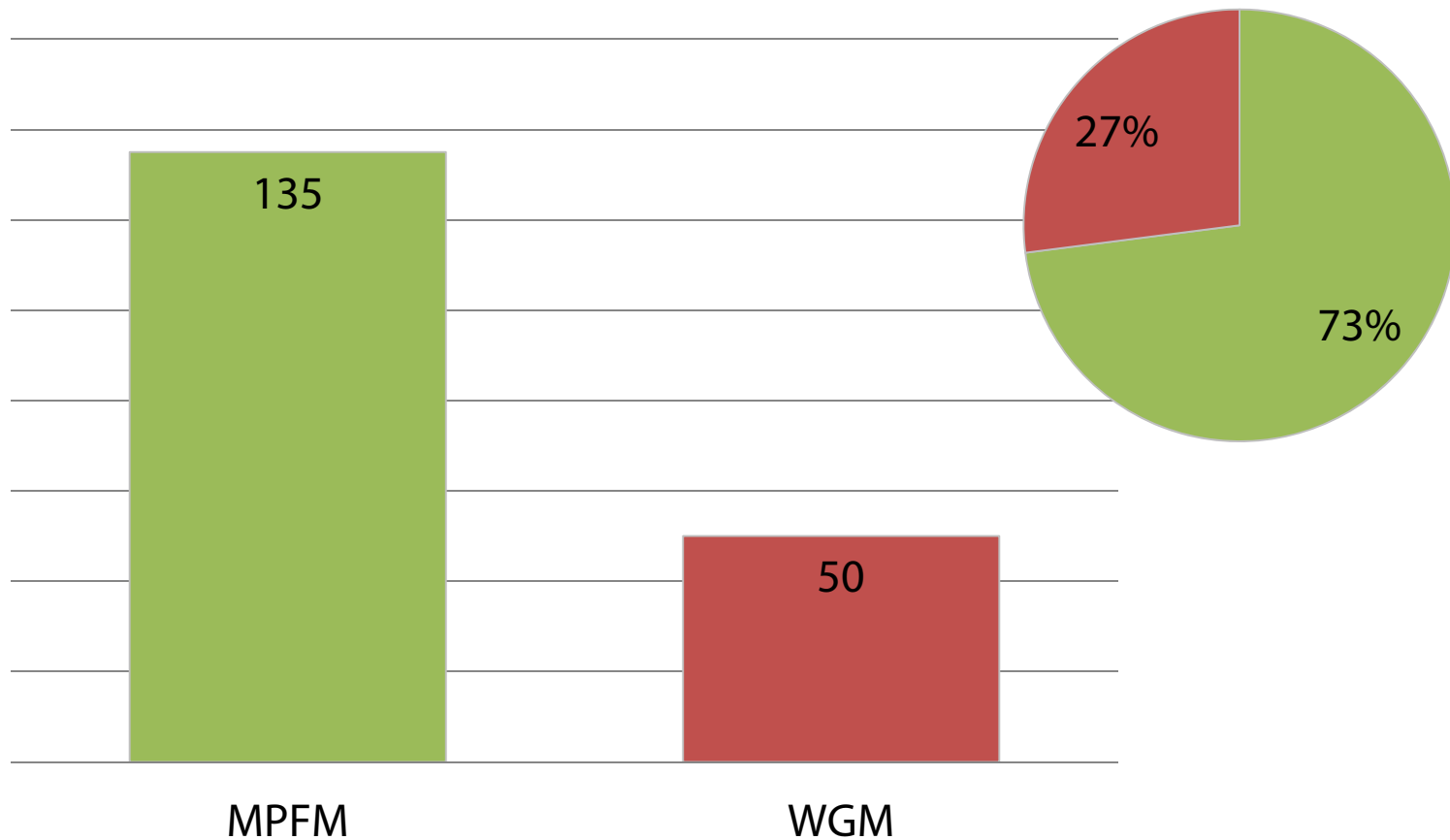
- There is always risk associated with commingling since it introduces uncertainty at each allocation point
- In situations where production from two or more leases/units with different royalty rates are to be commingled, separate and continuous measurement of the gas and liquid hydrocarbons belonging to each royalty rate group is expected
- If using MPFM/WGMs, follow guidelines contained within API MPMS 20.3 (Measurement of Multiphase Flow) and RP 17S (Recommended Practice for the Design, Testing and Operation of Subsea Multiphase Flow Meters)

Canyon Express

First Approved MPFM/WGM Installation in OCS

- Commingling/Measurement Approval dated Feb 6, 2002;
Production began in 4Q of 2002
- Water Depth = 7200 ft.
- Three Operators, Three Fields
 - TotalFinaElf - Aconcagua (MC 305)
 - BP - King's Peak (DC 133 and 177 and MC 217)
 - Marathon - Camden Hills (MC 348)
- Different royalty rate groups
- Two 12-inch pipelines to host
- Nine wells each equipped with a subsea WGM

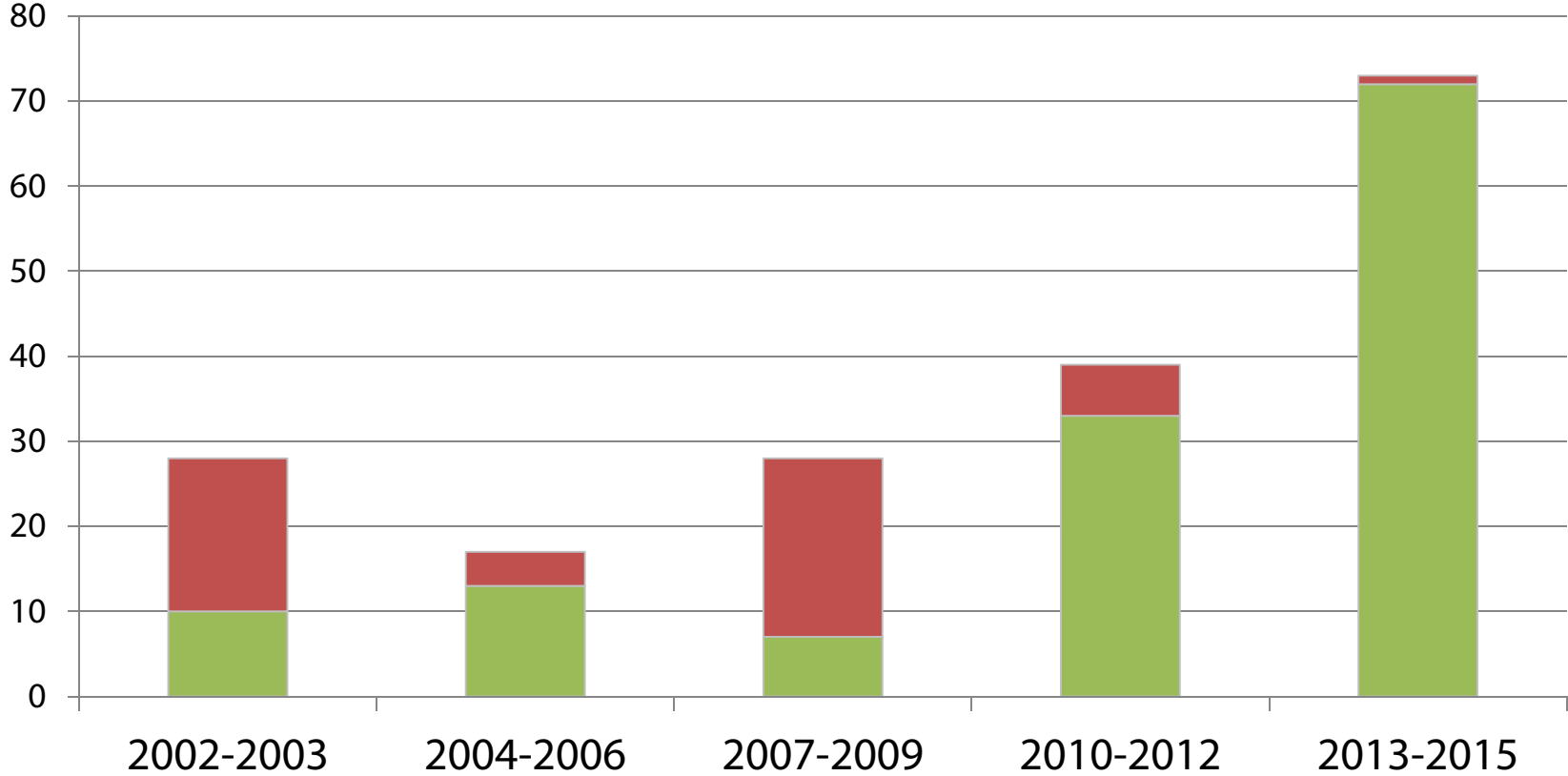
MPFM & WGM Approvals 2002-2015



A total of 185 Multiphase Flow Meters (MPFM) & Wet Gas Meters (WGM) were approved through 2015 in the Gulf of Mexico OCS

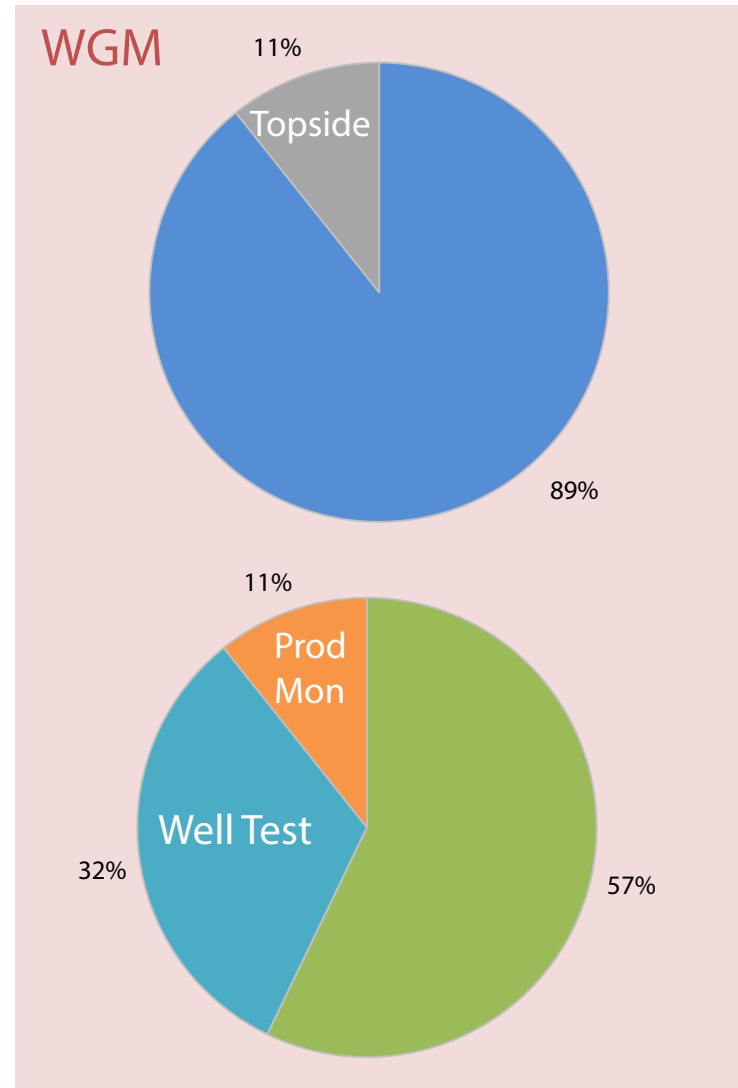
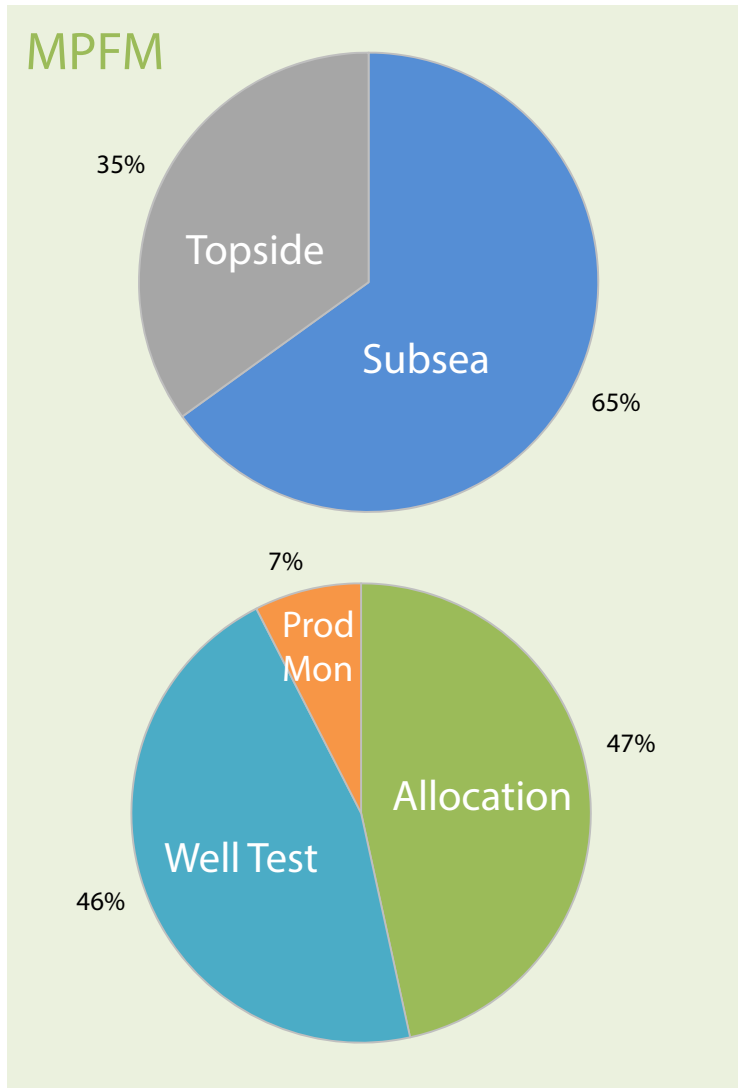
MPFM & WGM Approvals by Year

■ MPFM ■ WGM



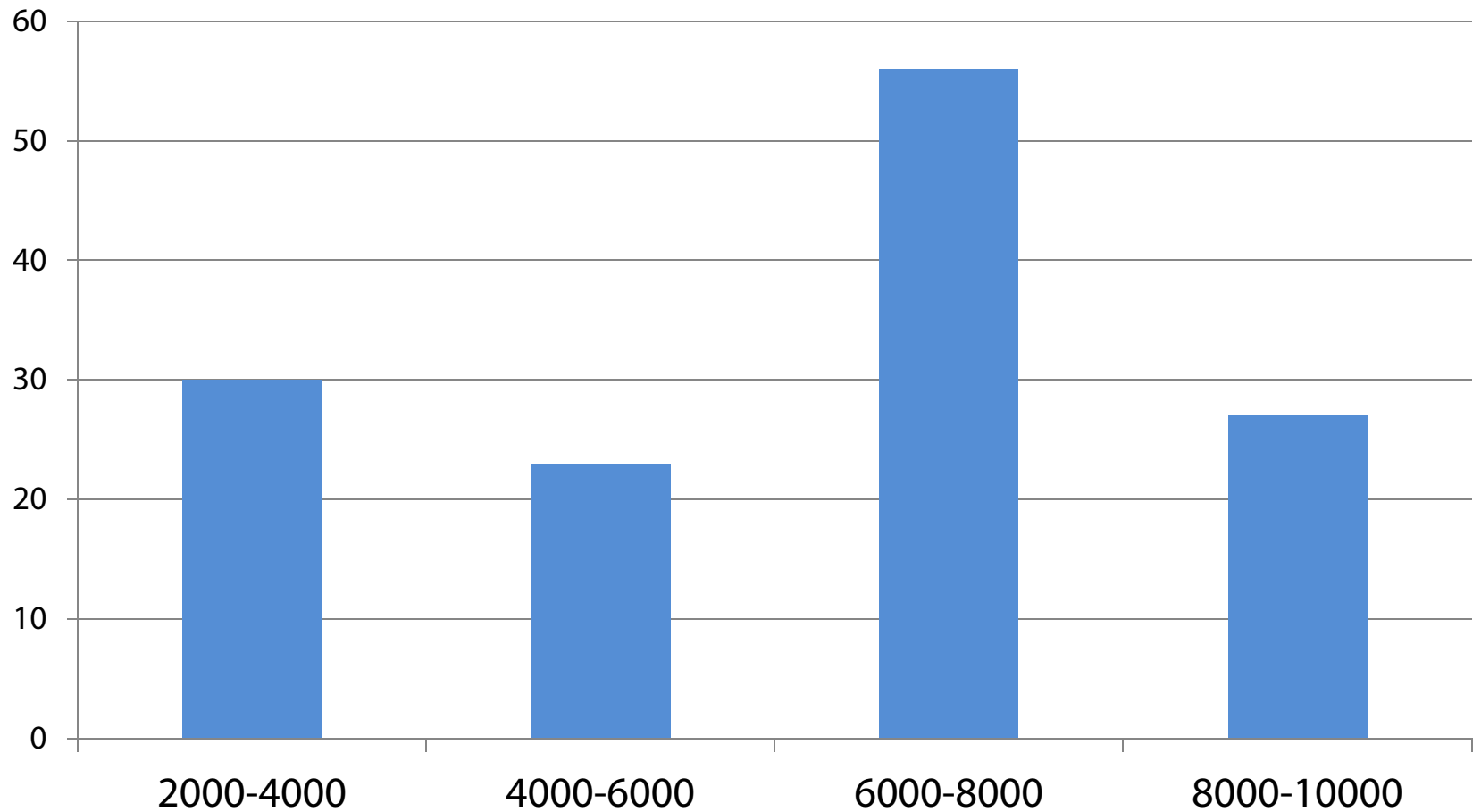
Approvals have risen steadily since 2004

Service & Application



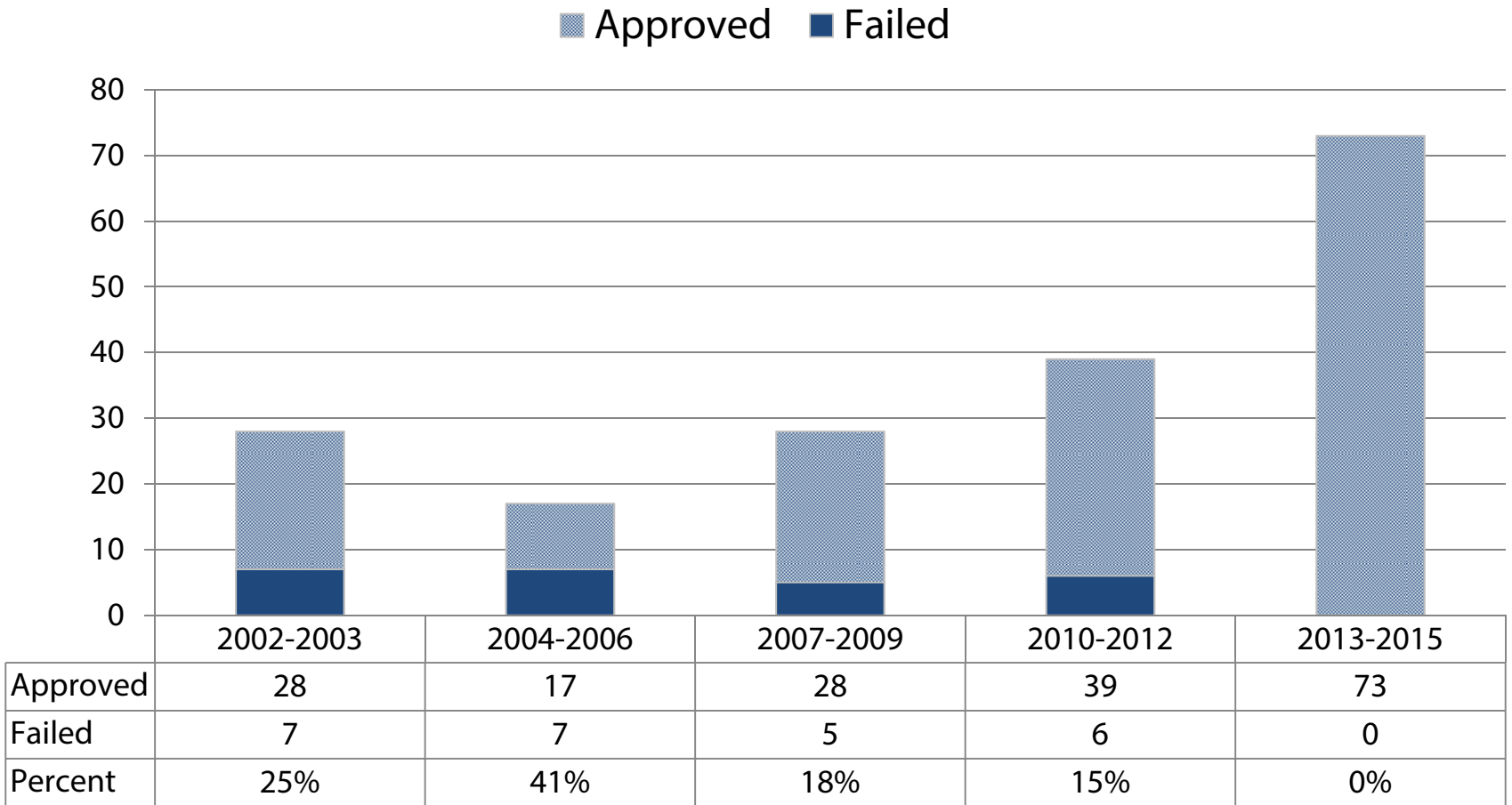
Charts include 17 additional MPFM/WGMs used for production monitoring

Water Depth (ft) for Subsea MPFM/WGMs



Deepest Water Depth for MPFM/WGM – 9627 ft at AC 859

MPFM & WGM Failures by Year

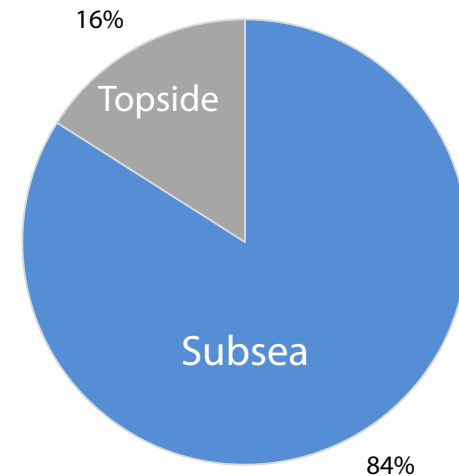


Total of 25 Known Failures of Approved MPFM/WGMs
 Several MPFM/WGMs (topside and subsea) from 2003 still in service

Reasons for Meter Failures

As Reported by the Operator

- Meter Failures
 - Pressure Reading Error: 6
 - Gamma Densitometer Failure: 5
 - Communication Issue: 4
 - Calibration Issue: 1
- Flow Rate Changes
 - Diminished Flowrate: 1
 - Water Cut Too High: 1
- Other
 - Damaged by Hurricane: 1
 - Unknown: 6



Trends

- Increase in the number of multiphase flow meters used for allocation and well test purposes
- Use of multiphase flow meters for allocation purposes even when other options are available
- More meters capable for use in both multiphase and wet gas flow conditions

Accessing FMP/Meters Listing

BSEE Website: Offshore Stats & Facts; GOM Data Center;
Production; FMP/Meters/Tanks Listing

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Offshore Stats and Facts

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Our regional offices also provide information specific to the operations:
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Pacific Region
Gulf of Mexico Region

| Headquarters | Alaska | Pacific | Gulf of Mexico |
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Thank You

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