

An underwater photograph of an oil rig structure. The scene is dominated by deep blue water. In the foreground, a large, yellow, rectangular module is visible, illuminated from within. Several thick, black cables or pipes run across the water, connecting different parts of the rig. In the background, more yellow modules and the complex structure of the rig are visible, though slightly out of focus. The overall atmosphere is one of industrial activity in a deep-sea environment.

# Innovation Now

## Claudi Santiago

President & CEO  
GE Oil & Gas

# EHS excellence ...it's the way we work.

- Strong '08 performance ...I&I 85% below industry average
- Delivering value ...90 industry & customer awards/recognitions
- Environmental stewardship ...Double-digit GHG & energy-use reductions
- Social responsibility ...GE EHS values transferred to supply-base

## Awards & Recognition



EHS... A Core Value

# GE Oil & Gas ...is a global energy infrastructure company serving the oil & gas industry

Drilling &  
Production



LNG &  
Pipeline



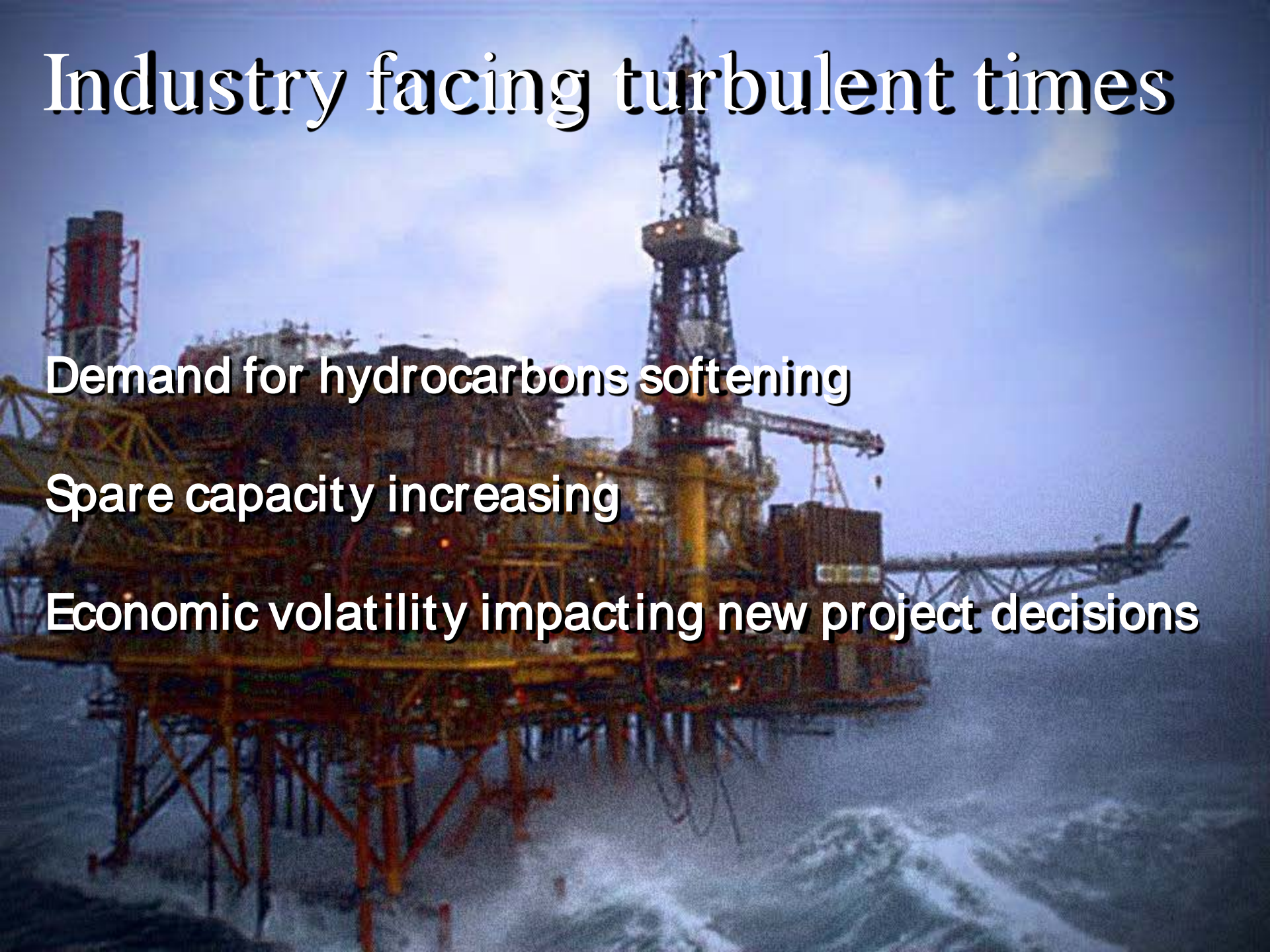
Refinery &  
Petrochemical



Global  
Services



# Industry facing turbulent times

A large offshore oil rig is shown in the middle of a stormy sea. The rig's complex structure of steel beams and platforms is silhouetted against a dark, overcast sky. The water is turbulent, with white-capped waves crashing against the base of the rig. The overall atmosphere is one of industrial scale and environmental challenge.

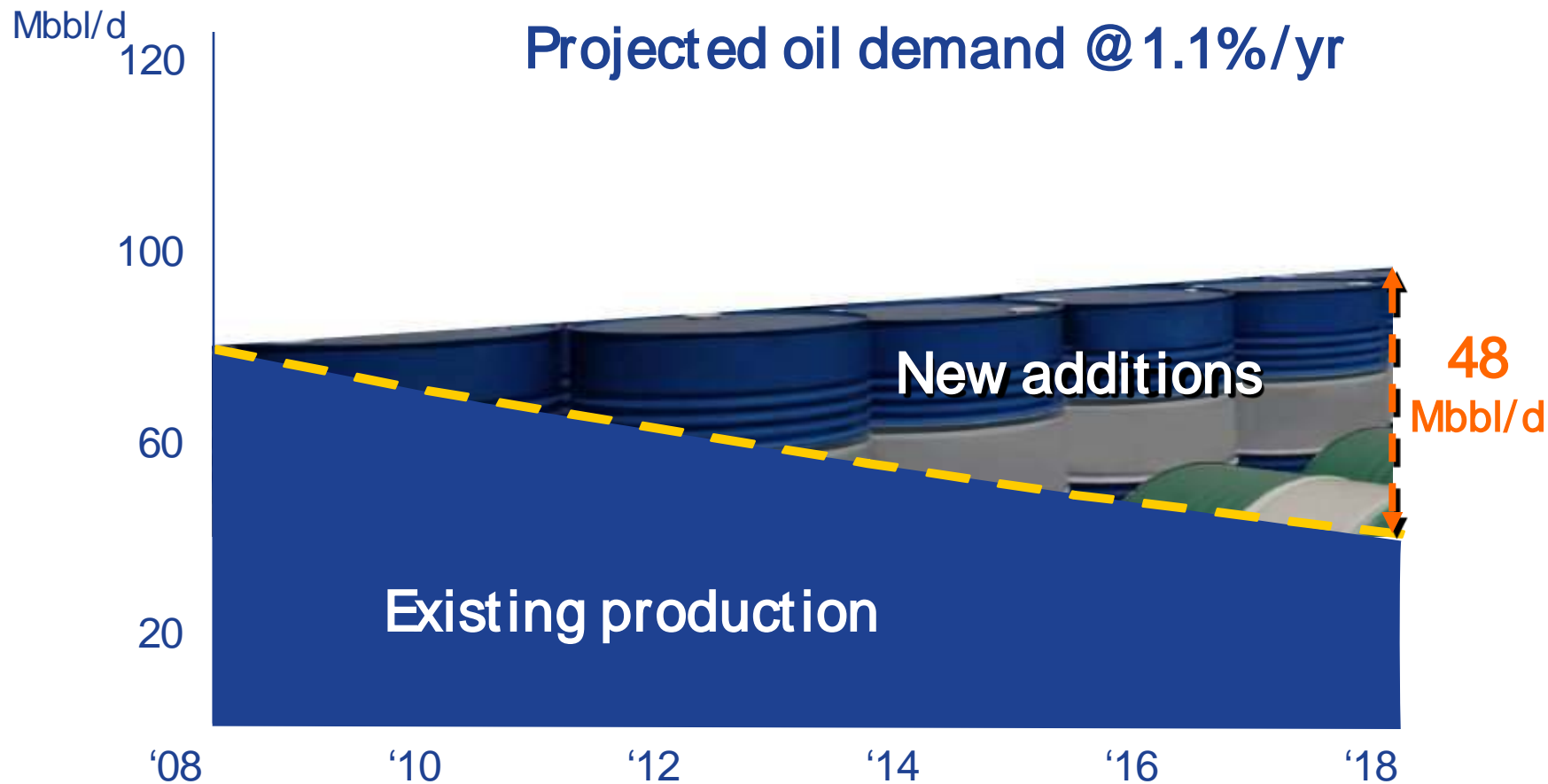
**Demand for hydrocarbons softening**

**Spare capacity increasing**

**Economic volatility impacting new project decisions**

# However ... There's a future for oil

Transportation driving oil demand



**4.5x Saudi Arabia to meet projected demand**

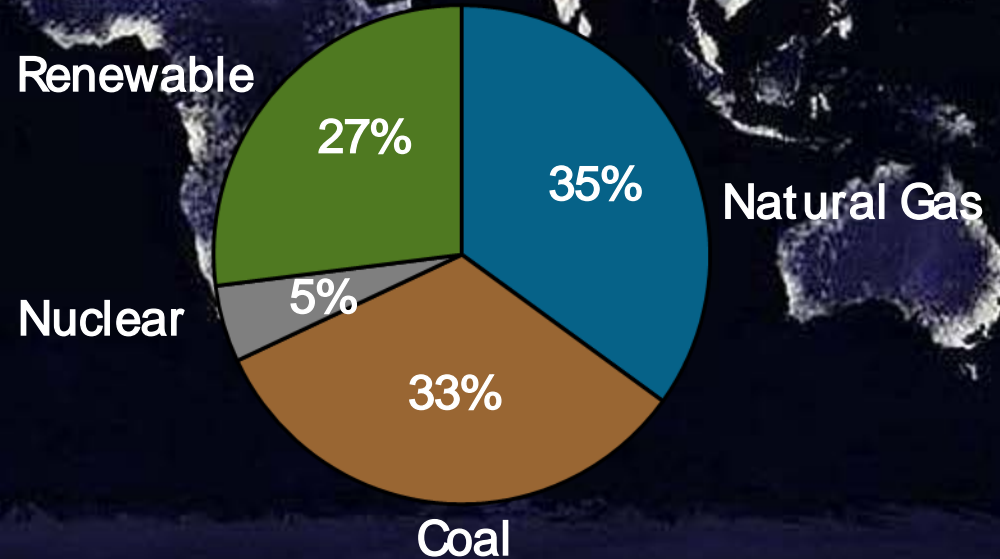
Source: New additions - IEA's World Energy Outlook  
Depletion rate - CERA - IEA

# There's also a future for gas

Electricity driving gas demand

2018

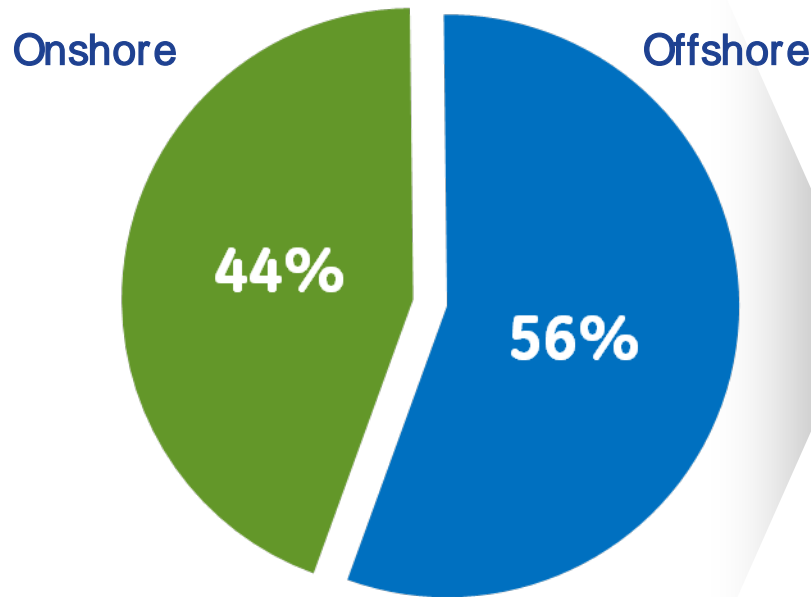
230 GW/Y Power Gen  
additions '08-'18



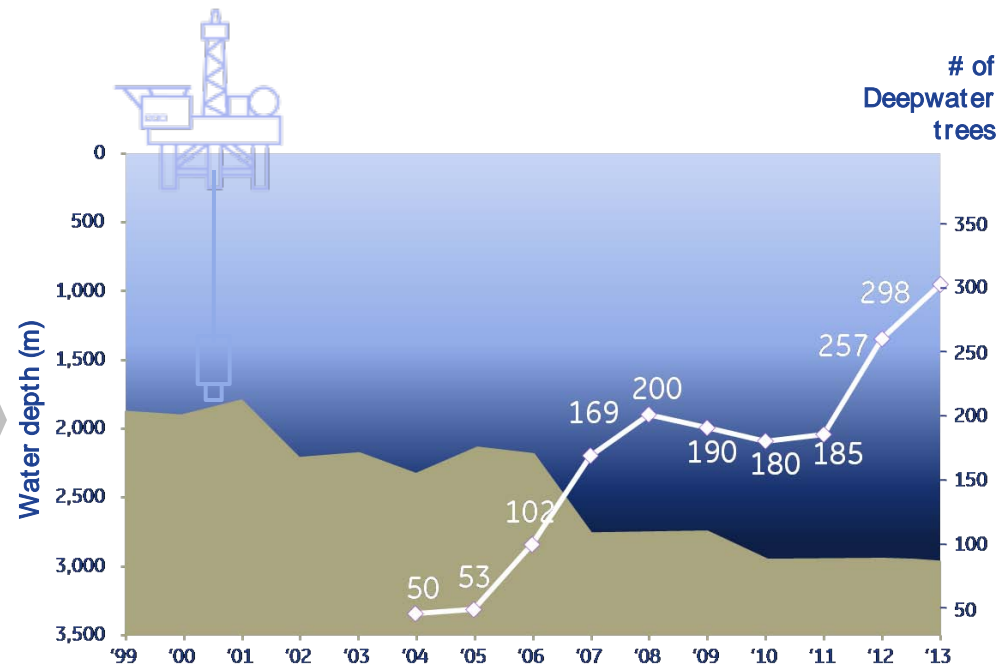
Time for Gas ... Big Role to Play

# A significant contribution from deeper waters

## Total world oil additions ('08-'11)



## Moving to Ultra-deepwater



**Deepwater vital to energy supply ...  
mission critical capabilities needed**

Source: CERA, Infield

# What are the challenges?

## ➤ Deeper water

- Must solve the paradox of higher external pressures with lighter risers to go beyond 12,500'

## ➤ Eliminate surface facilities

- Longer step out from host to producing wells
- Seabed processing for EOR/IOR

## ➤ High temperature higher pressure reservoirs

- Drilling and production equipment for HPHT service ... Pressures to 20 Ksi & temperatures over 350° F

**Cannot be solved without industry cooperation**

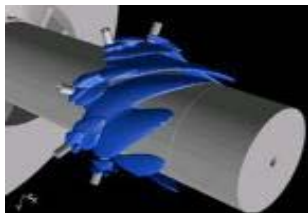
# GE Oil & Gas Technology Capabilities

## Sciences

- Combustion
- Composite Materials
- Advanced Sensors
- Computational Fluid Dynamics
- Power Density

**190 People**  
(Senior+Principal+Chief)  
Legacy & PII

**69 People**  
(Senior+Principal+Chief)  
Vet coGray



## Products

- Rotating Machinery
- Subsea X-mas Trees
- Drilling Systems

**64 People**  
(Principal+Chief)  
Legacy & PII

**56 People**  
(Principal+Chief)  
Vet coGray

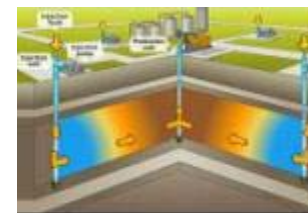


## Systems

- LNG, Refineries
- Pipeline
- Drilling Rig Operations
- Flow Assurance
- Reservoir Recovery

**25 People**  
(Principal+Chief)  
Legacy & PII

**20 People**  
(Principal+Chief)  
Vet coGray



# Leveraging Technology from GE “stores”

## Aviation



*Composites*

### Composite wrapped steel riser

- higher pressure, lightweight drilling and production riser

## Lightweight risers



## Wind



*Field proven technology*

### SemStar5 subsea control module

- Internet enabled ...RM&D-ready

## Open architecture controls



## Transportation



*High pressure seal technology*

### High delta P subsea Pumps

- enabling EOR and long step out capability

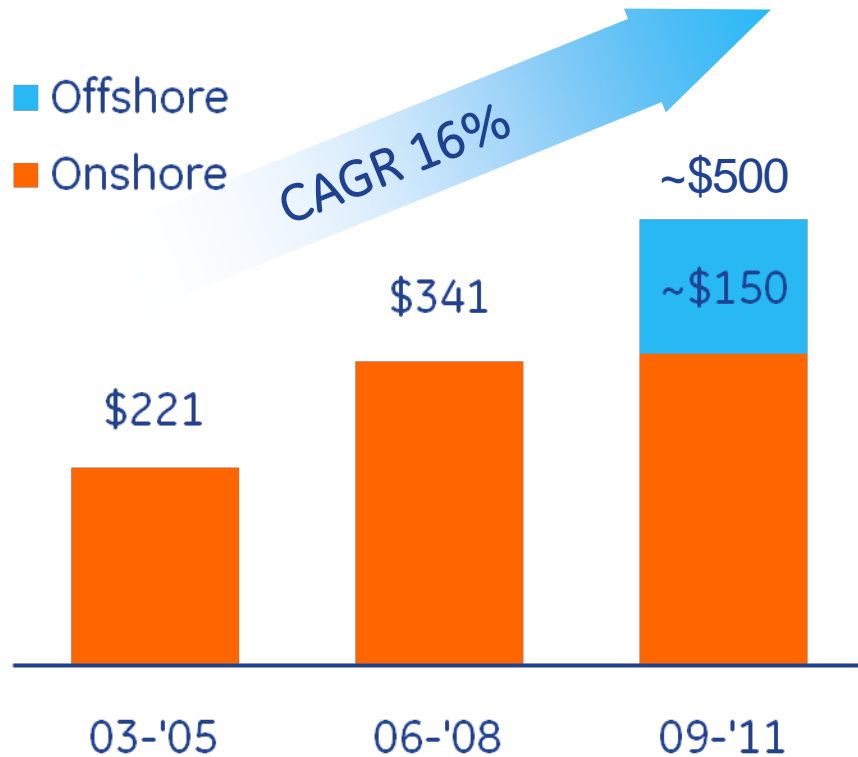
## High pressure multiphase pumps



# GE Oil & Gas Investments in Technology

(\$ in millions)

## R&D Spending



## Offshore focus



### Deeper water

Materials science ...  
coatings and composites



### Eliminate surface facilities

Power & communications,  
pumping & compression



### HPHT reservoirs

Metal-to-metal seals +  
reliable well-heads

Plus ...Leveraging \$50B GE investment over this decade

# Leveraging GE's Global Research Centers



*Data mining*

## Remote Monitoring & Diagnostic

### SmartCenter

- Process & condition monitoring and diagnostics ...flow assurance



*Electrification*

## Subsea Transmission & Distribution

### Switchgear and connectors

- Pushing long step-out boundaries for provision of power



*Material Science*

## Subsea Compression

### Blue-C™ compressor

- Magnetic bearing oil-free motor



# Benefits of industry R&D cooperation

- Sharing common vision of industry needs
- Bringing the best capabilities to solve big challenges
- Lowering the risk of new technology introduction
- System approach better than design component in isolation
- Becoming your industry partner



**Inventing the future ...together**

# Innovation Now!



# Back-up

# EHS ... it's our shared responsibility

Option 2



## Our Challenge ...

keeping personnel safe while undertaking high risk operations, often with varied programs & expectations

## Our Expectation ...

zero injuries, authority for all employees to STOP unsafe work, the ability to freely report safety concerns, proactively reward the right safety culture

## Our Commitment ...

to work with customers to develop a common approach to EHS, to jointly resolve safety concerns, to review EHS performance & deliver continual improvement

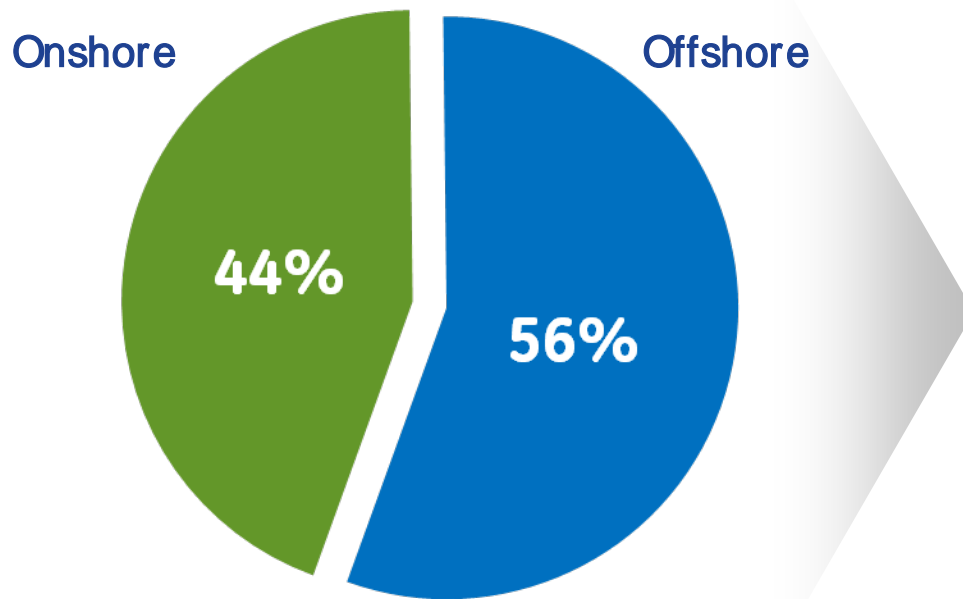
# ExxonMobil



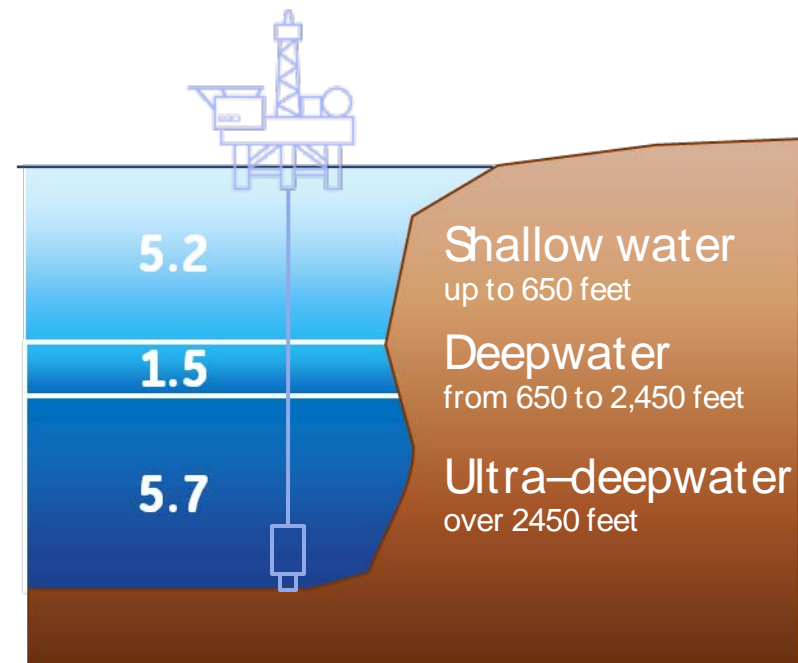
Teddy Sonnier, VG Service Engineer (pictured on the right), receiving his Good Catch Award for correcting an incorrectly slung tool from Dave Hill ExxonMobil

# A significant contribution from offshore & deepwater

Total world oil additions ('08-'11)



Offshore additions (Mbbbl/d)



**Offshore vital to energy supply ...  
mission critical capabilities needed**

Source: CERA

