

Petroleum Equipment & Services Association

Oil 101

Perspectives from a Research
Analyst

Energy Markets

James K. Wicklund
Managing Director, Research



Source: Atwood

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A Primer, an Overview and an Opinion

- Oil & Gas markets have changed dramatically in the last 10 years
- The US “gold rush” crashed and has risen like the Phoenix from the ashes but it is a different, and more efficient, world.
- The US is now the “swing producer” of oil in the world
- Oil has the role of suppressing US production growth rather than spurring new drilling, activity and production
- Major Oil Companies are returning to drilling in the US after decades
- Technology has lowered the long-term datum of oil & gas prices

The presentation will focus on the last two parts -

- Overview & Current Trends – *Will Spend Some Time*
- Industry & Company Segments - *Reference*



Overview and Current Trends

First, There are Two Different Places We Find Oil & Gas

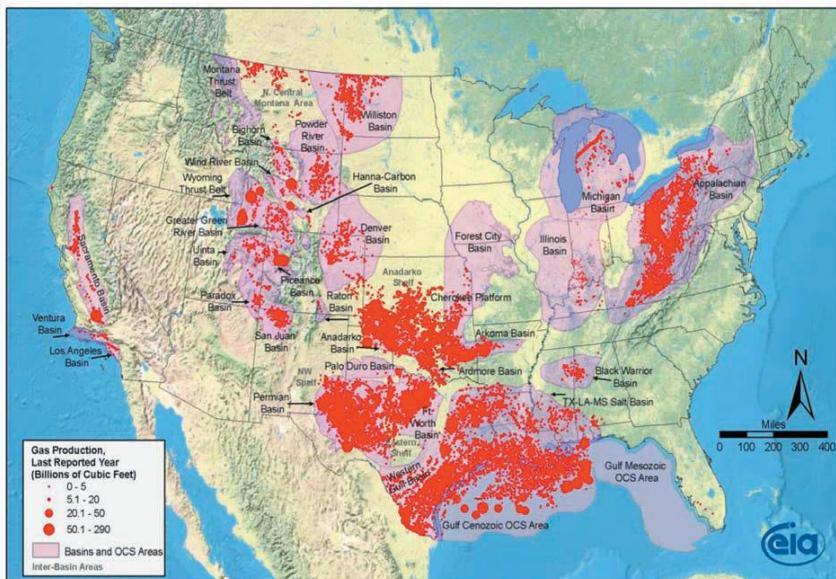
Primer

- Conventional Production – oil and gas from rocks that have pore space for it to reside, and the ability to flow between pore spaces and out of the rock. High Porosity and Permeability.
 - 96% of global oil production is from Conventional Reservoirs
 - Oil & Gas gets trapped by stratigraphy while migrating
 - Vertical wells, little technology
- Unconventional Production comes from rocks with little Porosity or Permeability. It is hard, tight rock and hard to get oil and gas out.
 - The US has 99% of global Unconventional Oil & Gas Production
 - It is the source rock, where the dinosaurs actually died
 - Horizontal wells, high technology

Same Places but the Source Rock

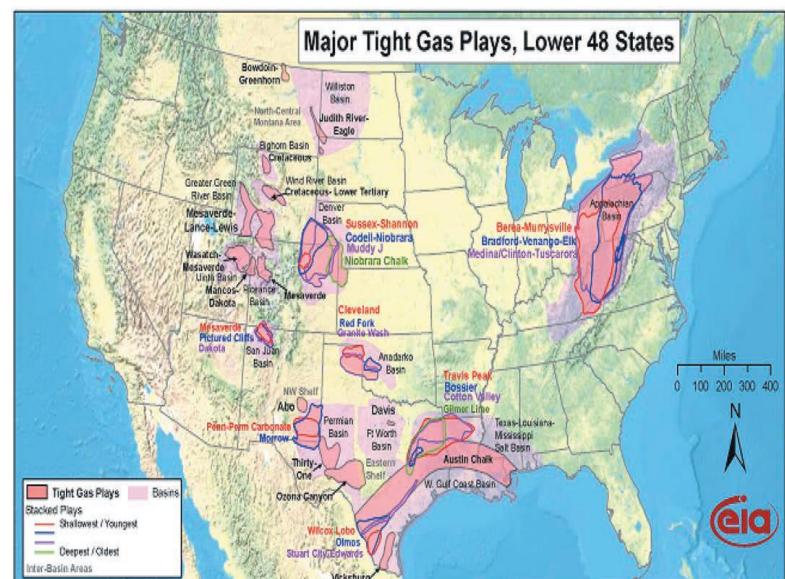
The left map shows “conventional US oil fields and on the right are “unconventional” We knew where they were but couldn’t produce them

Gas Production in Conventional Fields, Lower 48 States



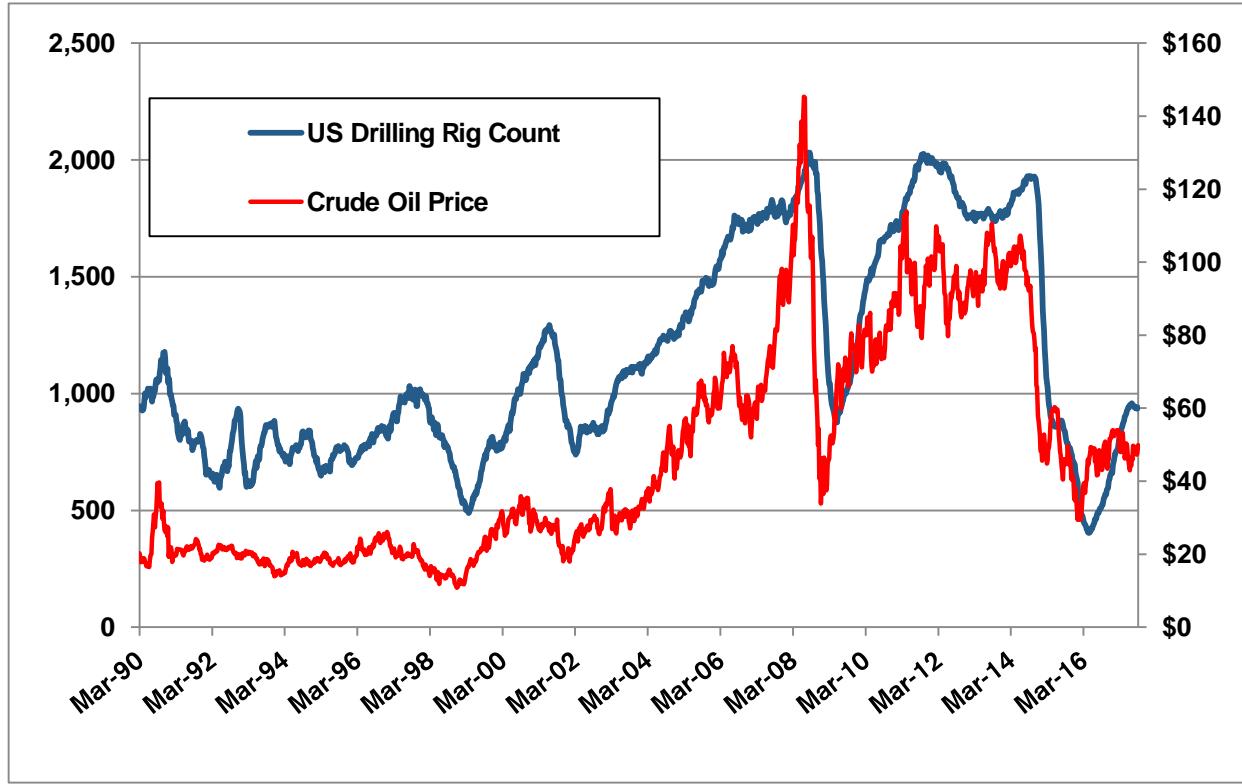
Source: Energy Information Administration based on data from HPDI, IN Geological Survey, USGS
Updated: April 8, 2009

Unconventional Basins



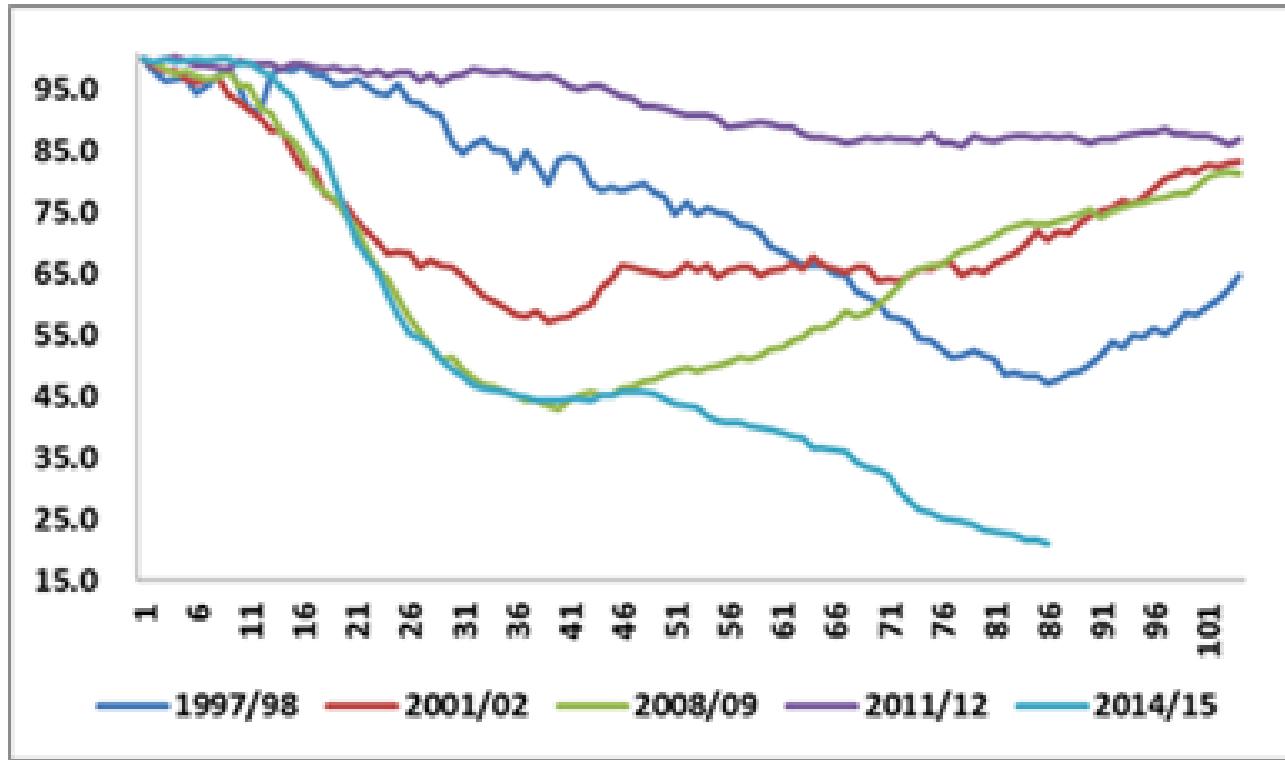
Source: Energy Information Administration based on data from various published studies Updated: June 6, 2010

It is a Cyclic Business

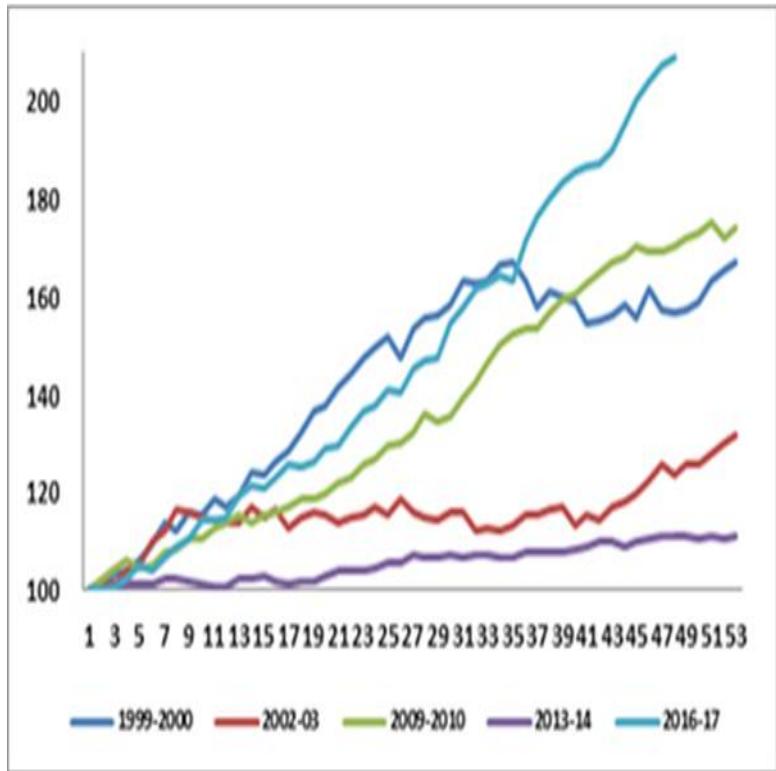


Oil Prices are Cyclical and Drive Drilling

The Worst Down-cycle in History

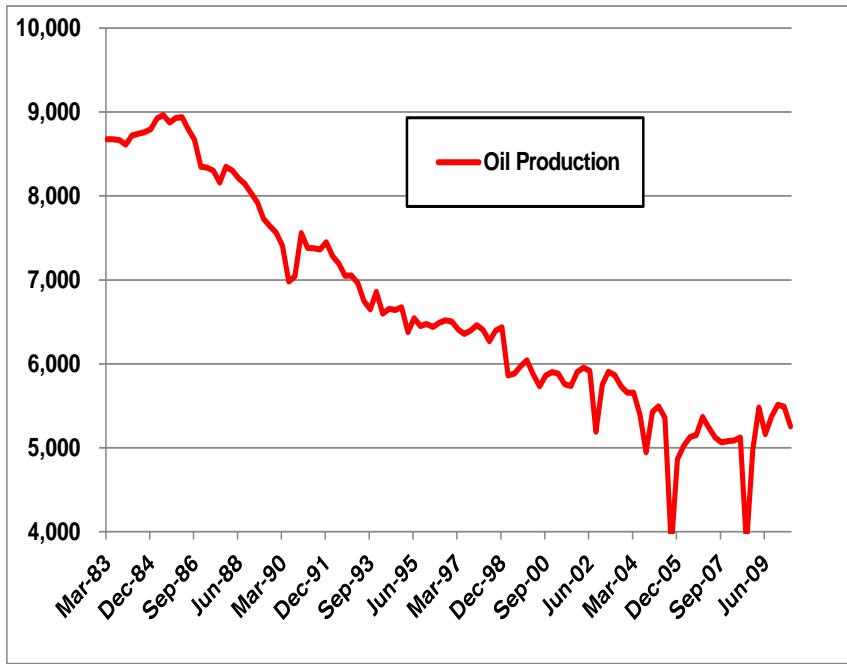


Be Careful What You Wish For



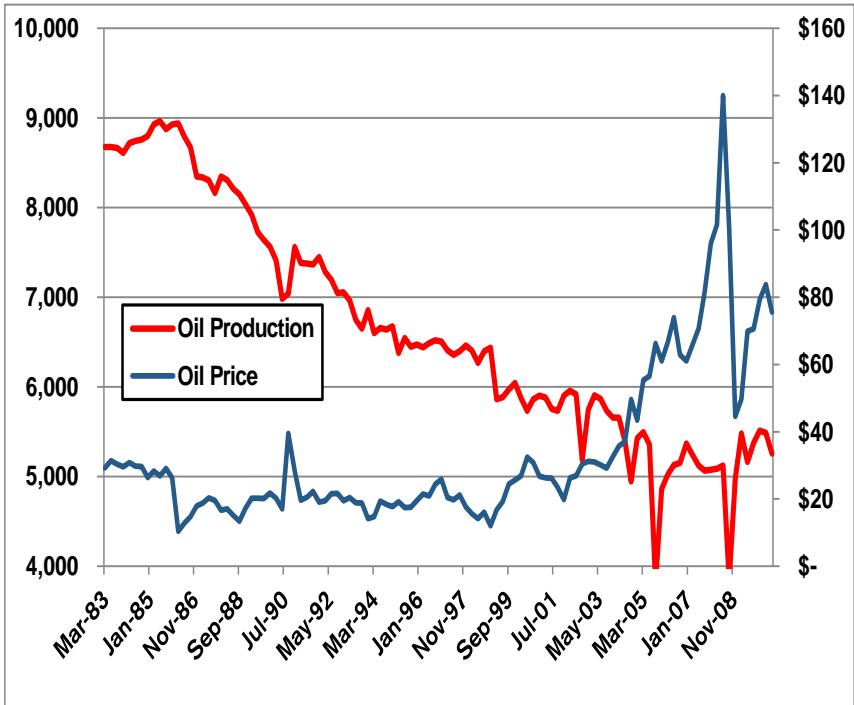
- This has been the sharpest recovery in history
- The rig count doubled in 10 months
- The Q4-Q1 rig count growth was the biggest ever at 29%
- The rig count doubled with \$50 oil
- All existing pressure pumping capacity is being reactivated and has gotten a 25% price increase so far this year
- Utilization of “super spec” rigs is almost 100%
- Sand prices doubled in three weeks in Q1

The US Oil Industry Was in Decline



- US oil dropped from 23% to 14% of global production
- For 25 years, production had been in very steady decline
- More and more imports were needed
- Balance of trade was skewed
- Oil is denominated everywhere in US\$'s so the transfer of wealth was significant
- Individual companies could try and grow production but the US was increasingly irrelevant

As Production Dropped, Prices Went Up

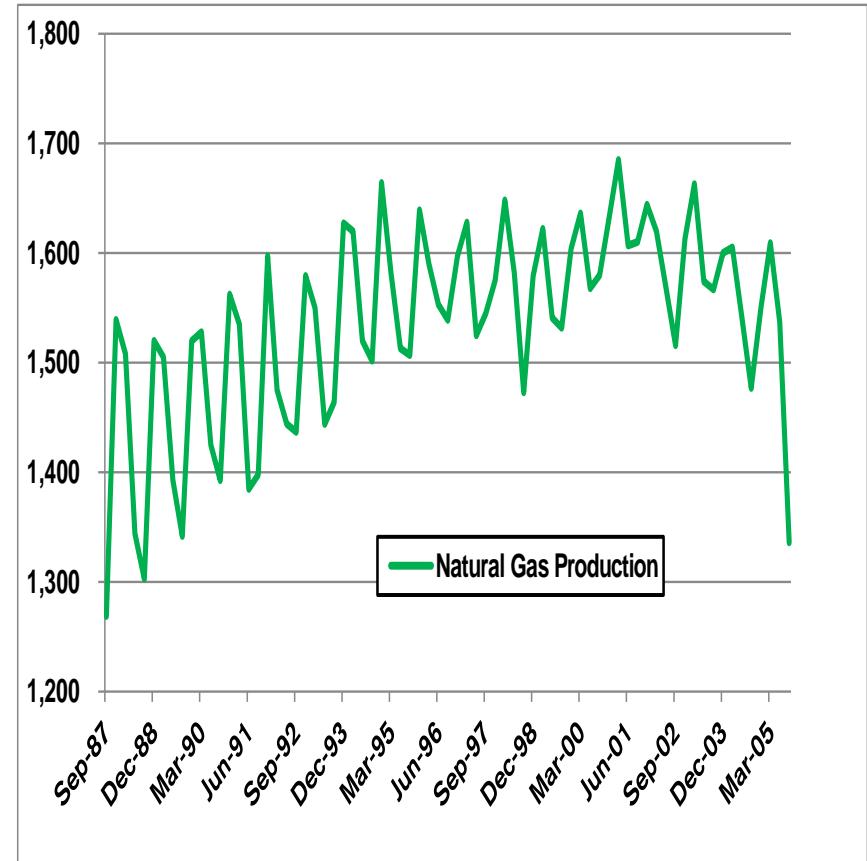


- In expected economic fashion, as US production declined, prices rose
- Global production was rising, even though it has higher operating costs
- US reserves were playing out
- The price spike to \$147 in 2008 did little but made the correction more painful
- The Oil Industry was in a quandry

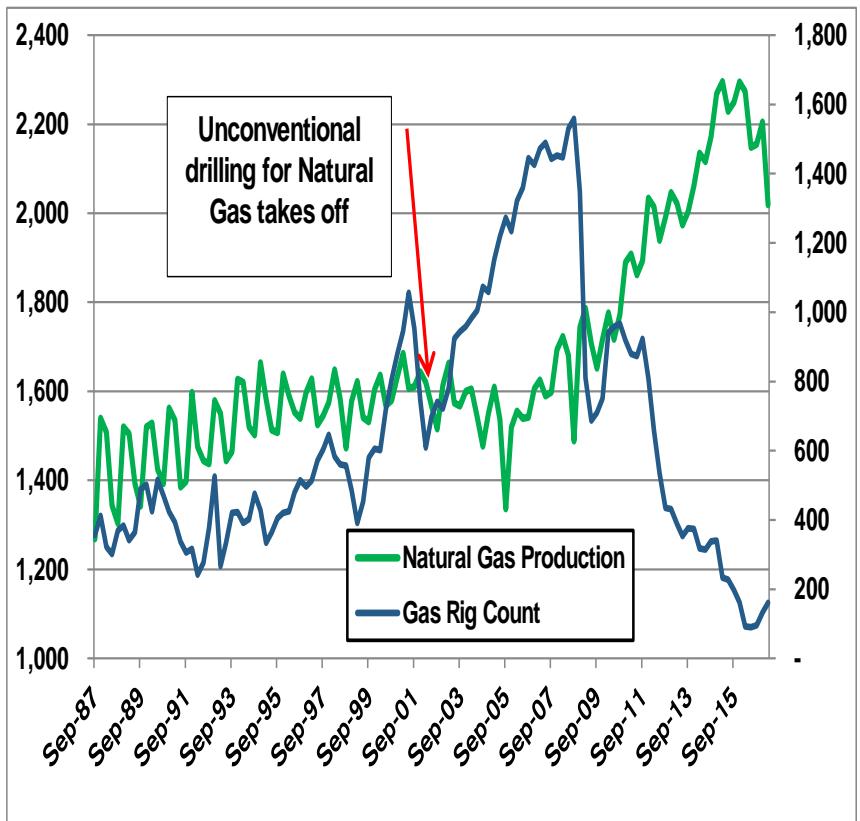
Natural Gas Production Had a Different History

- It was illegal to use natural gas to generate electricity until 1980's
- It is now 60% of all the energy we consume
- In 2005, drilling for Natural Gas was **93%** of all drilling activity
- Production was in sharp decline
- Natural Gas prices hit **\$14/mcf**

Even with the financial incentive of price and the almost exclusive effort to find gas, we couldn't stop the decline

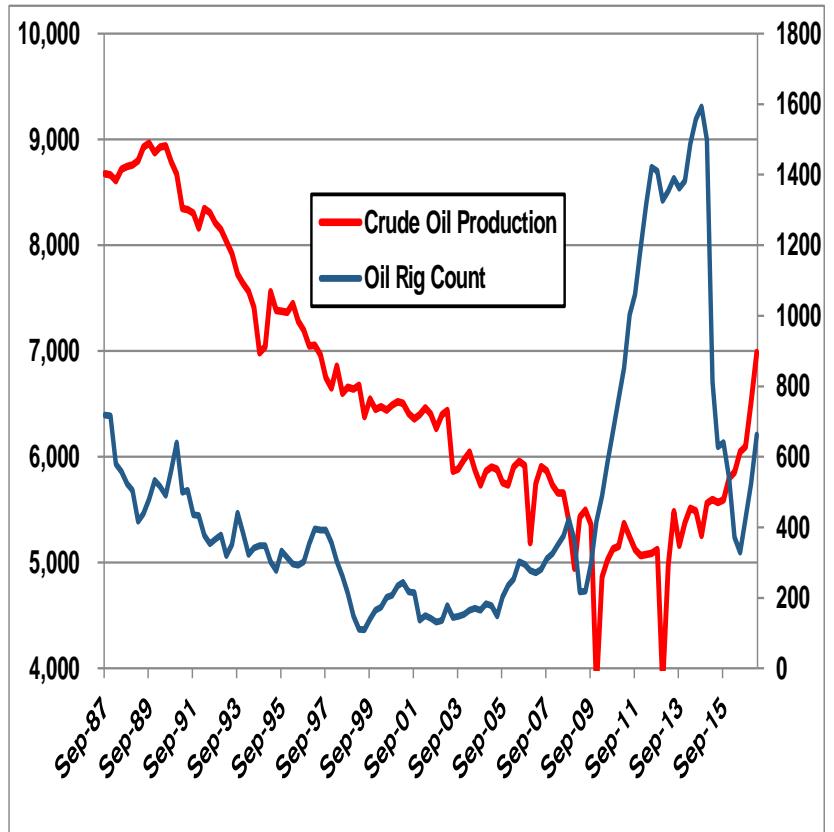


Natural Gas Starts the Trend



- Drilling explodes with \$14 gas and new technology
- The rig count hits 1,600 rigs before the 2008 crash
- Production is up 30% in 3 years with prices still above \$13
Wave 2 of Technology, More with Less
- The gas rig count hit 75 last year and is now at about 135
- Gas has averaged \$3.25 for the last six years, well below the \$14 peak
- High-grading of prospects
- Greatly reduced the footprint

Oil Is Now Following Suit

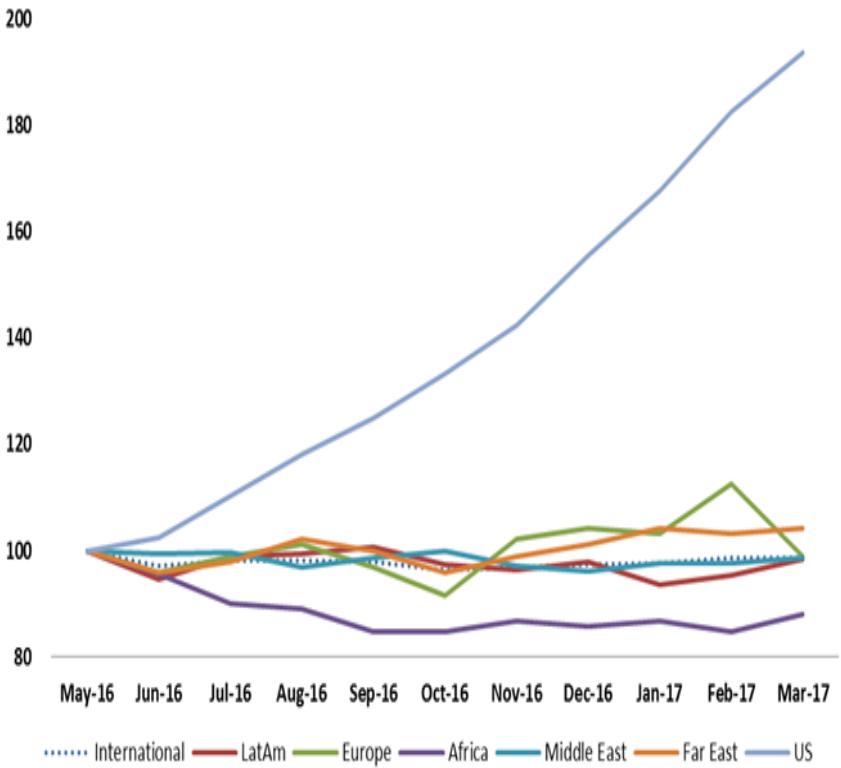
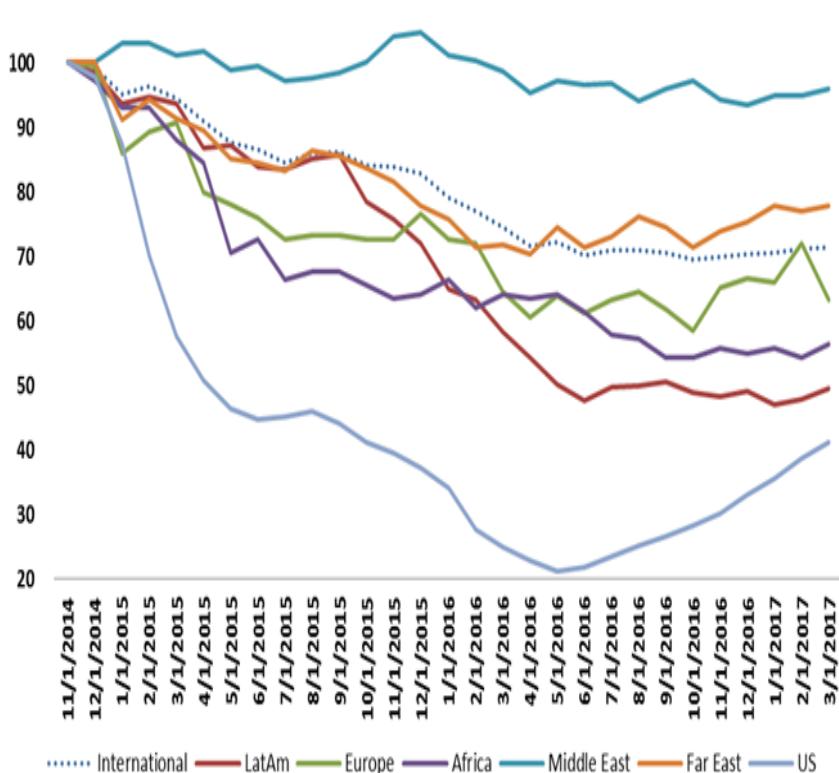


- Drilling for oil exploded as Natural Gas activity waned
 - The same impact is being seen – more production at lower prices and significantly lower levels of activity
 - Now 90%+ of drilling is for oil
 - 90% of wells are drilled horizontally
- Victims of our own Success**
- “900 is the new 2,000”
 - Futures don’t go above \$55 until 2023
 - US is the “swing producer”

The New Reality – It is a Changed World

- The US can add *more* production, *more quickly* than any country in the world, aided by mineral ownership that is very unique
- Hydraulic fracturing and horizontal drilling have changed the nature of the industry, dramatically reducing the “footprint” of drilling operations, increasing safety and efficiency and lowering costs
- Without hydraulic fracturing, everyone’s utility bills would *triple* and the cost of gasoline would more than *double*.
- OPEC matters but less and less each day
- Unconventional activity has barely begin in China, Argentina and other locations

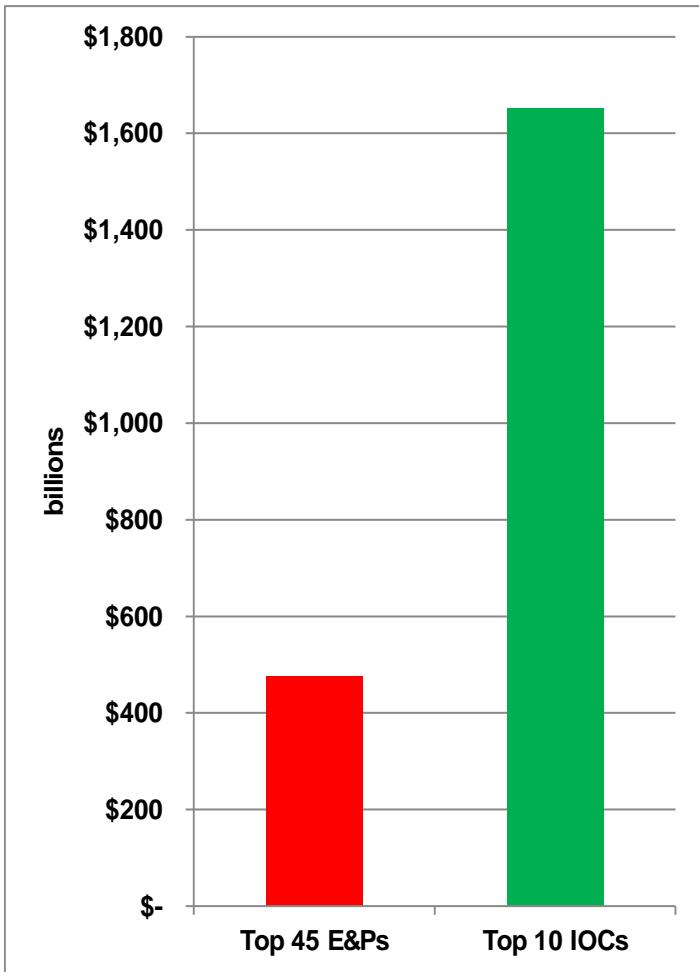
International Held Up Better But Hasn't Turned Yet



International & Offshore

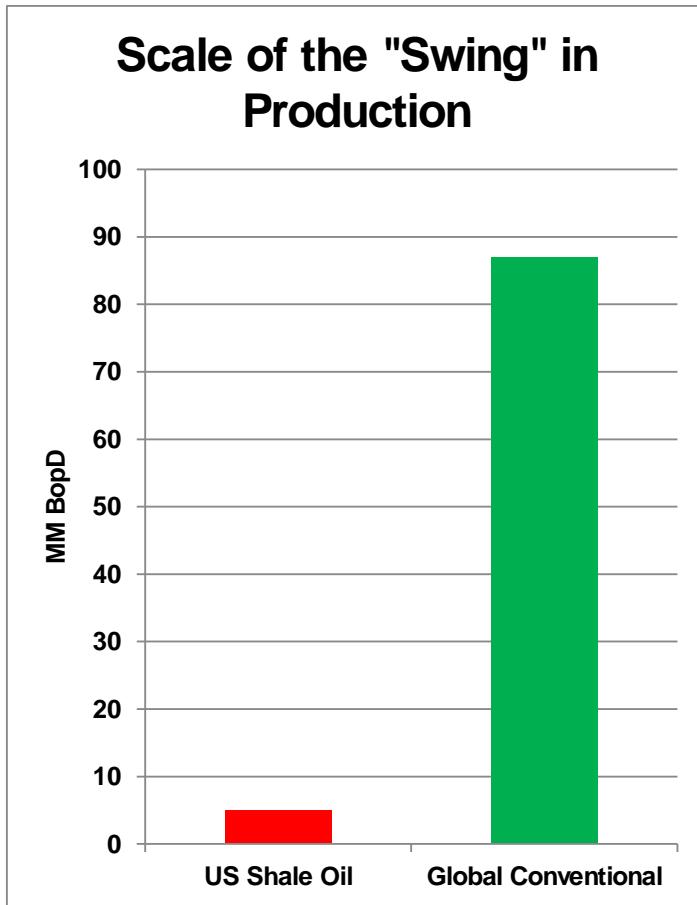
- Large onshore discoveries are harder to find
- Large offshore discoveries are not economic to develop
 - Competition for capital – the Permian wins
 - 70% of deepwater projects at \$100 oil lost money
 - 400+ discoveries, \$65 is a minimum for greenfield
- International onshore will recover later this year
 - Primarily independents and NOCs (National Oil Companies)
 - China is the biggest, Middle East is the best
- Deepwater recovery is not on the horizon yet
 - Down-cycle will have lasted at least five years
 - Rig rates from \$650k to \$90k in two years
 - \$600mm assets get mothballed before ever working

For All the Focus, the Big Guys Own the Market



- The top 10 Integrated Oil Companies are dramatically larger than the entire E&P universe
- The top 4 IOCs have 65% of the market capitalization
 - Exxon
 - Shell
 - Chevron
 - Petrochina
- Companies that have US onshore exposure are active – 50% of Exxon's total upstream capital will be spent on US shale
- IOCs make up about 12% of total US spending, focused on the Permian Basin

Perspective – On the Margin is a Strong Place



- US shale oil production accounts for only about 5.5% of global production
- 2014 – US grew oil production more in one year than any country, ever
- Whoever can respond fastest, and in size, rules the market, “managing” incremental supply
- The market is waiting for decline rates of global conventional production to move closer to 6% from the recent 4%, resulting from applied capital and technology
- You can forestall “aging” only so much before reality sets in.
- US shale as to peak out in growth before deepwater can really recover



Industry & Company Segments

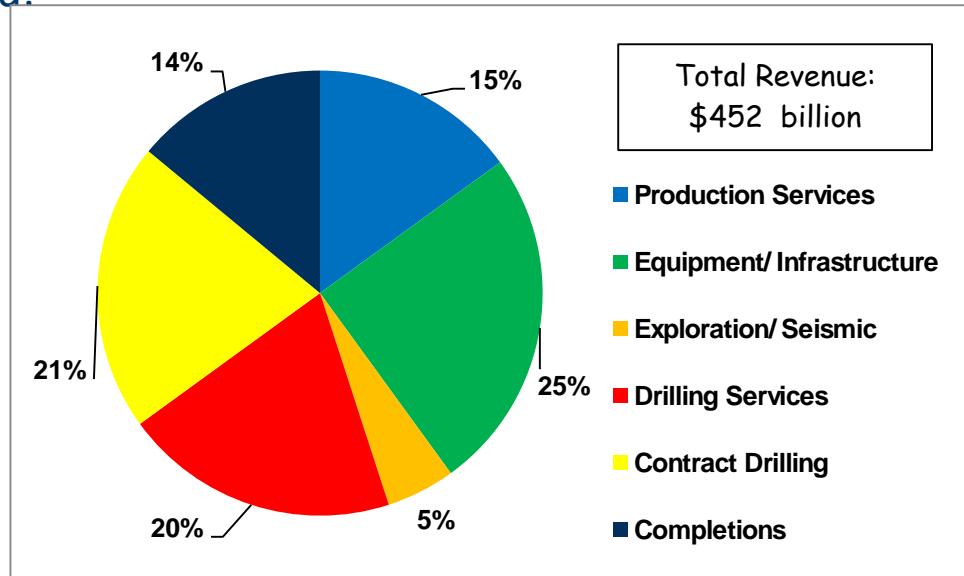
Oilfield Services: Industry Segments

Oil Service companies aid independent exploration and production companies (E&Ps), international oil companies (IOCs) and national oil companies (NOCs) in the exploration and production of oil and natural gas. Some of the largest Oil Service companies are SLB, HAL, BHI, and WFT.

The Industry is made up of several segments/life cycle categories. We list them by stage of a new oil & gas field:

- 1) Exploration/Seismic
- 2) Drilling
- 3) Completion
- 4) Production

2014 Western Service company total revenues: \$452bn



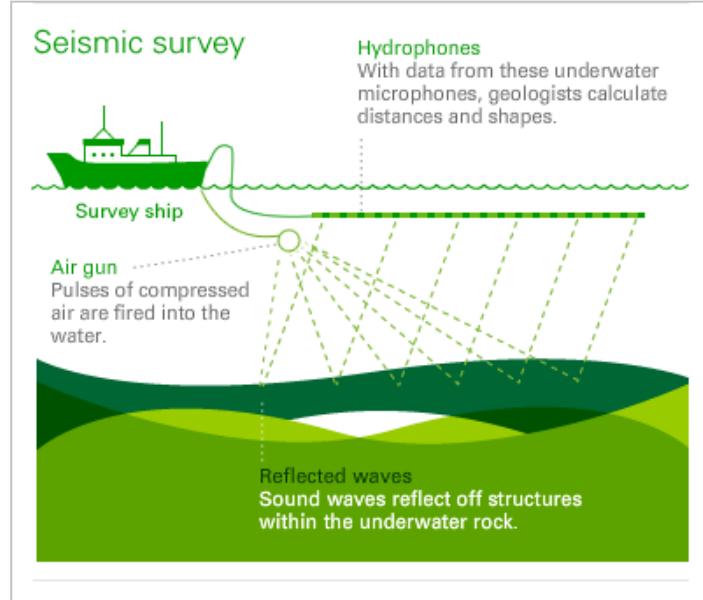
Source: Spears & Associates

OFS - Exploration: Seismic

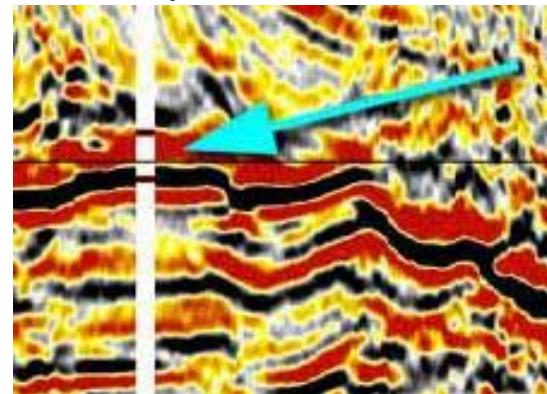
Seismic services and equipment include:

- *Data Acquisition* - collection of seismic data
- *Data Processing* - third party processing of seismic data prior to interpretation
- *Library Sales* - *multiclient* sales of non-exclusive seismic data
- *Software* - software products for seismic processing, interpretation, mapping, reservoir modeling and characterization, petrophysical evaluation, and engineering analysis that can run on workstations or PCs
- *Geophysical Equipment* - data recorders, telemetry systems, geophones/hydrophones, energy sources (vibratory vehicles, air guns, etc.) used in data acquisition.

Marine Seismic Survey



Seismic Output



Source: Spears & Associates, BP Energy, Baker Hughes

OFS – Exploration/Drilling: Wireline Logging/LWD

Wireline logging includes both open and cased hole services.

- *Open hole logging* occurs during the drilling process and measures characteristics of the rock and the fluids contained therein.
- *Cased hole logging* refers to measurements taken in a well after a casing or liner has been set in the well. It is often applied in old wells to help operators determine what to do next (e.g. where to drill a side track well).

Types of Log Measurements:

Electrical properties – resistivity and conductivity

Neutron density (porosity)

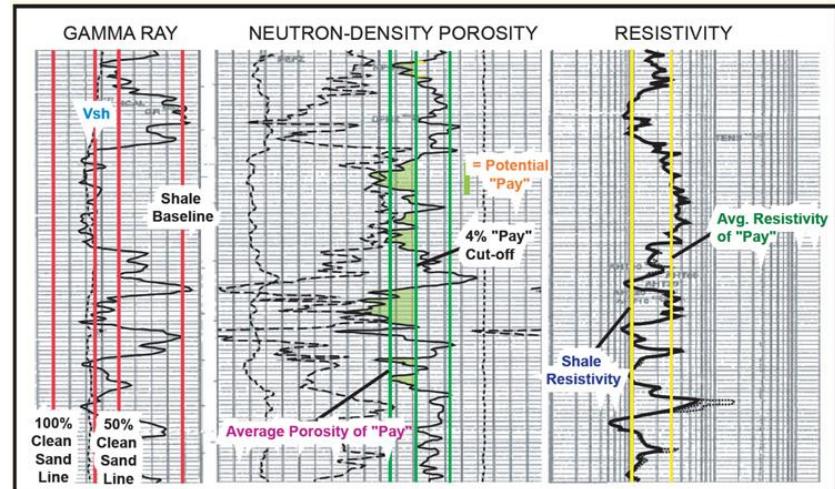
Pressure testing

Sonic properties

Dimensional measurements

Formation fluid sampling

Spectroscopy (lithography)

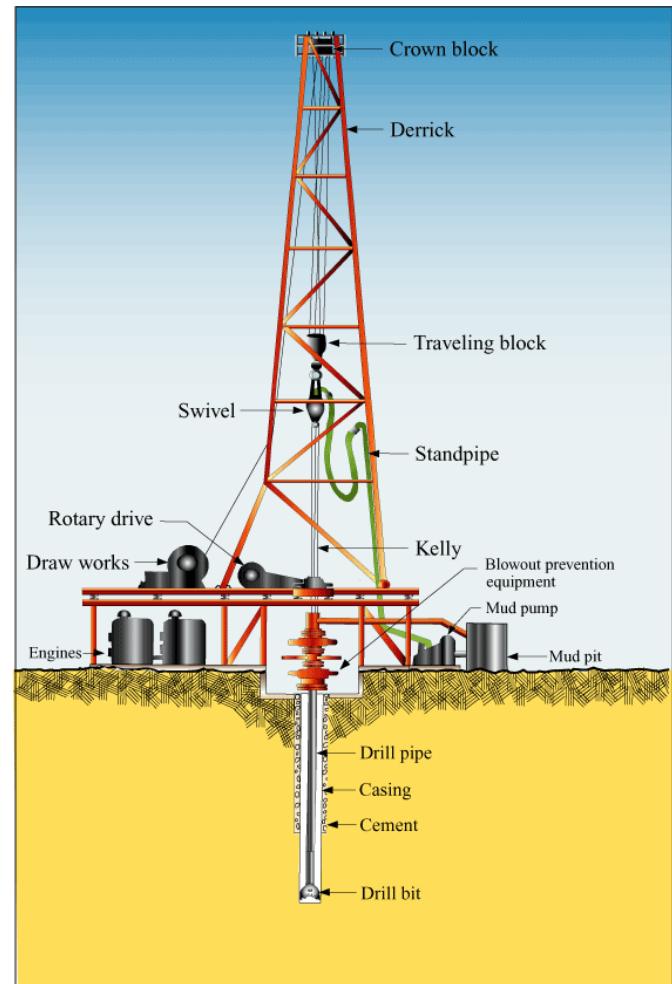


Source: Spears & Associates, Schlumberger, American Association of Petroleum Geologists

OFS – Contract Drilling: Land Rigs

Land Rigs can be mechanical or electric and vary in terms of drilling depth and horsepower. They are used for onshore oil and gas drilling. Key equipment includes:

- **Derrick** – A structure used for lifting and positioning the drilling string and piping above the well bore and containing machinery for turning the drill bit.
- **Top drive** – A device suspended in the derrick that rotates the *drill pipe* in order to drill the well.
- **Draw works** – A steel spool device that is used to reel out and reel in the drilling line.
- **Blow Out Preventer (BOP)** – A large valve used to seal off a well being drilled or worked over at the surface to prevent the escape of pressure.



Source: Schlumberger

OFS – Drilling: Bits

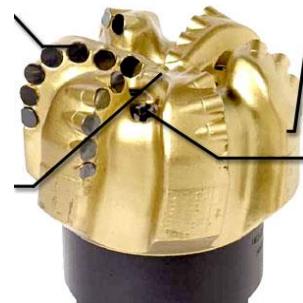
Drill bits come in two main categories: Roller-cone and fixed cutter (PDC). Technology advancement has led to steady share gains by PDC bits and is moving the market to buy on a \$/ft drilled basis (i.e. a “rental” model).

- *Roller cone bits* have teeth typically made of milled steel or tungsten-carbon inserts mounted on three roller cone assemblies. They are best used in hard and medium strength formations.
- *Fixed cutter bits* usually use Polycrystalline Compact Diamond (PDC) inserts mounted on the body of the bit. Fixed cutter bits are often custom engineered for specific formation characteristics. PDC bits have typically been used for soft formations, but advancing technology now puts them in hard, abrasive rock.

Roller or Tri-Cone



Fixed Cutter or Polycrystalline Compact Diamond (PDC)



Source: Spears & Associates

OFS – Drilling: Fluid System

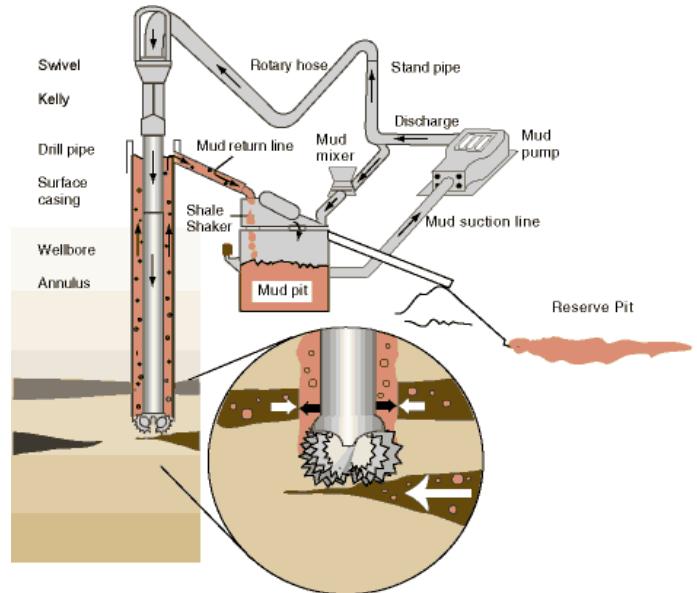
The *drilling fluid*, also known as *drilling mud*, is one of the major factors in the success or failure of the drilling operation. Drilling fluid serves three functions:

- Lifts cuttings to the surface
- Cools the drill bit
- Supports the integrity of the wellbore and prevents hydrocarbon “kicks” by providing weight/pressure that is generally greater than that of the reservoir (known as an “over-balanced” condition).

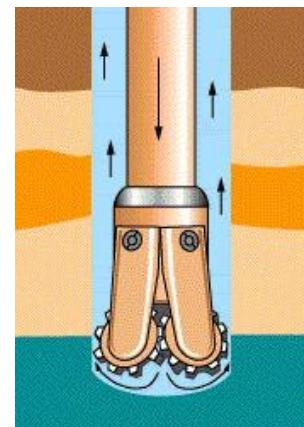
The *fluids handling system* re-circulates the drilling mud and includes:

- Mud pump
- Mud mixer
- Shale shaker - to remove cuttings from the subsurface
- Mud pit – to collect used mud for recirculation

Fluid Circulation System



Fluid Enters the well at the Bit



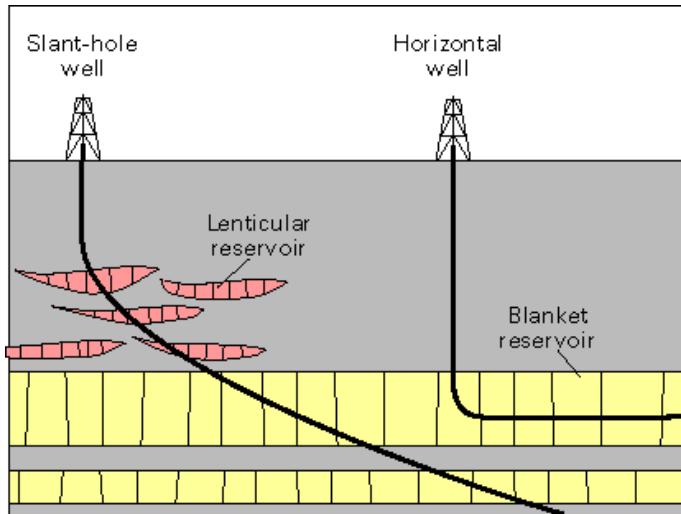
OFS – Directional Drilling

Directional drilling entails drilling in a direction other than vertical. There are two methods:

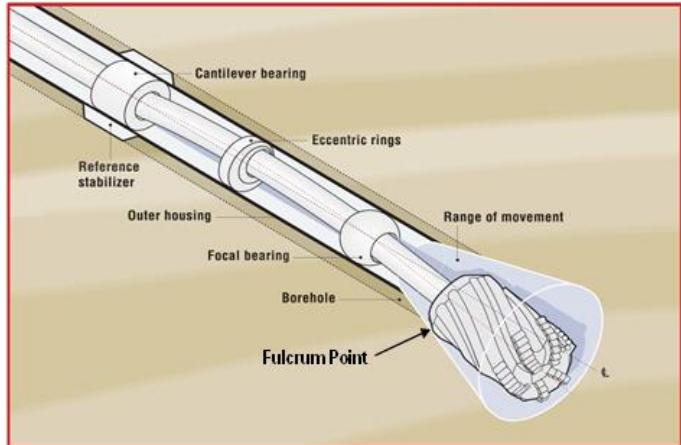
- *Conventional* uses a bend near the bit and a *steerable mud motor*. Drilling fluid is pumped through the mud motor, turning the bit and thereby allowing it to drill in the direction the bit points (unlike conventional [vertical] drilling, the drill string does not rotate).
- *Rotary Steerable Tools (RST)* allow the driller to “point” or “push” the bit without stopping drill pipe rotation, allowing for faster and smoother hole construction.

Drilling directionally entails use of steering systems (*Measurement While Drilling* or *MWD*) and *Logging While Drilling* or *FEWD* or *LWD*). LWD measurements are generally similar to those taken in wireline logging.

Directional and Horizontal Wells



Rotary Steerable Technology



Source: www.horizontaldrilling.org, Halliburton

OFS - Completions

Completing the well is the process of accessing the reservoir including:

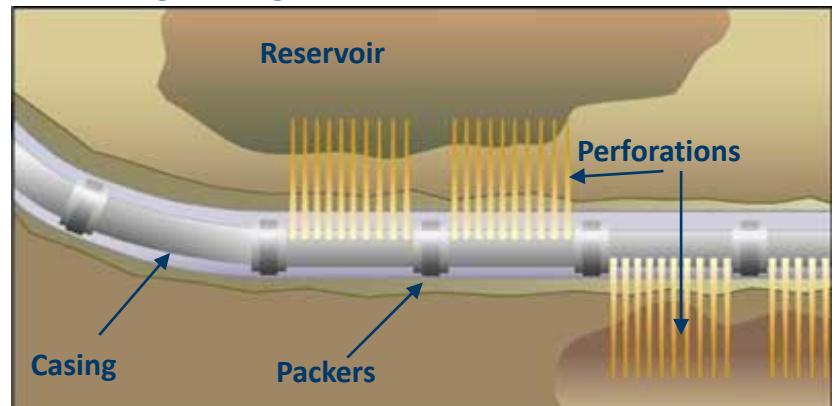
- Installation of casing and liner. **Casing** is large diameter steel pipe that is cemented into the well bore to ensure stability of the formation.
- Perforating the casing to access the reservoir. A series of “**chargers**” are deployed to where the well accesses the reservoir.
- **Stimulation** (see next page)

Other key products include:

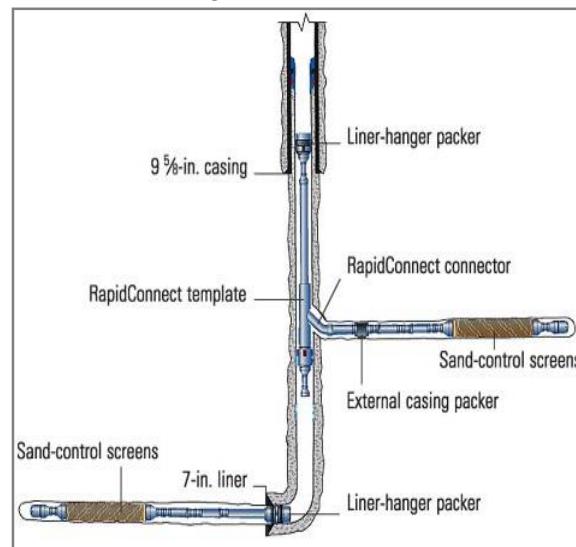
- **Packers and plugs** to isolate zones
- **Screens** to keep sands away from production
- **Isolation valves** to manage flows from multiple completion zones

Source: Schlumberger, Halliburton

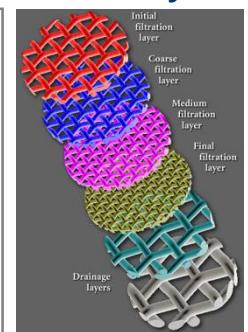
Perforating Casing/ Completion



Completion System



Screen Layers



OFS – Completion: Pressure Pumping

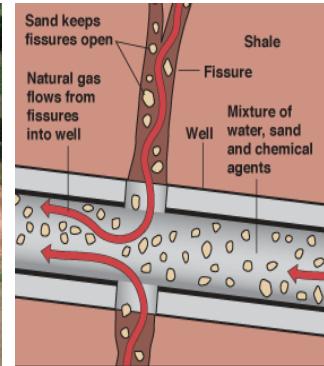
Pressure pumping consists primarily of cementing and various forms of production stimulation.

- *Cementing of Casing* (approx 20% of P.P revenue) - As described in the completions section, casing is cemented in place in the well bore. Cement is pumped thru the casing to the end of the section and forced back up the well in the annulus (between outer wall and well) where it sets and hardens.
- *Stimulation* (80%) – Services include *hydraulic fracturing* (dominant), *acidizing* and *nitrogen injection*.
 - In fracturing, fluid is pumped at high pressures into the well bore to create/widen fractures in the formation so oil/gas can flow into the well.
 - Proppants* are used to keep fractures open and can be sand, resin-coated sand, and/or ceramic.
 - In acidizing, acids can be used to etch away rock.

Frac job



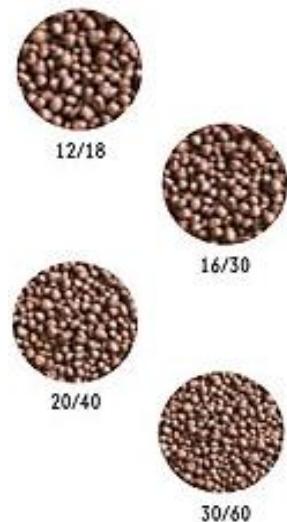
Proppants



Frac unit



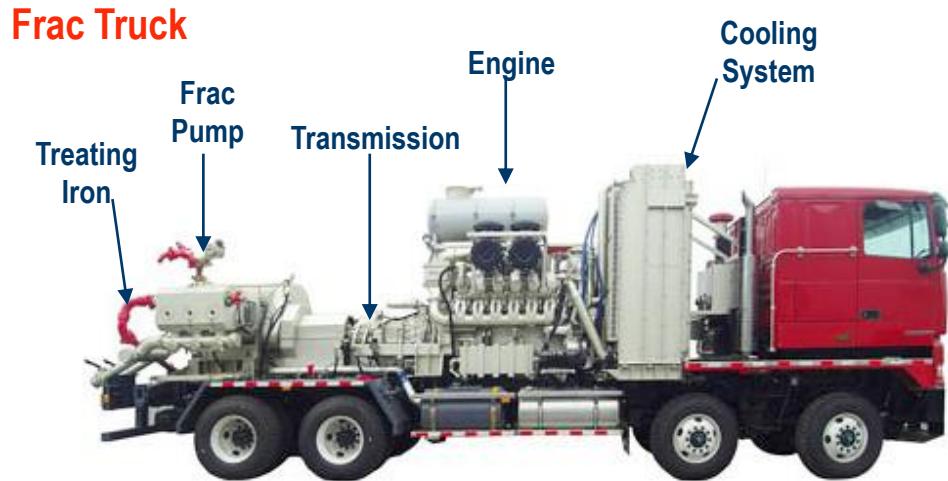
Cementing unit



Source: BJ Services, Carbo Ceramics, Independent Oil & Gas Service, Gulftex, ProPublica

OFS – Hydraulic Fracturing Equipment

Treating Iron: temporary surface piping, valves and manifolds required to bring fluid treatment down to wellbore from the pump FMC Technologies' (FTI) Weco™ and Chiksan™ and Forum Energy Technologies (FET).



Frac Pump: a high pressure, high volume pump used in hydraulic fracturing

- Manufacturers include independents such as National Oilwell Varco (NOV), Gardner Denver (private), Weir SPM (WEIR.LN), Kirby Corp. (KEX) and vertically integrated providers such as Halliburton (HAL) and FTS International (private)

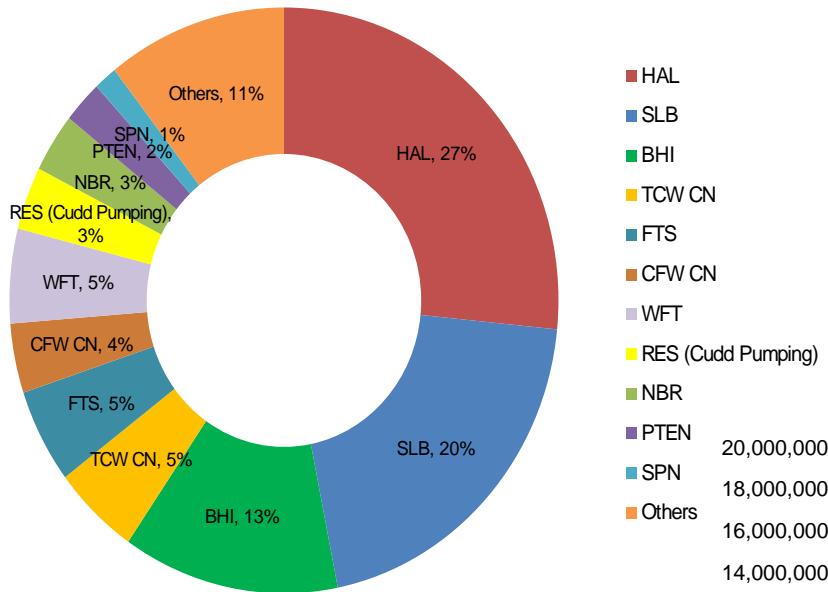
Frac Pump



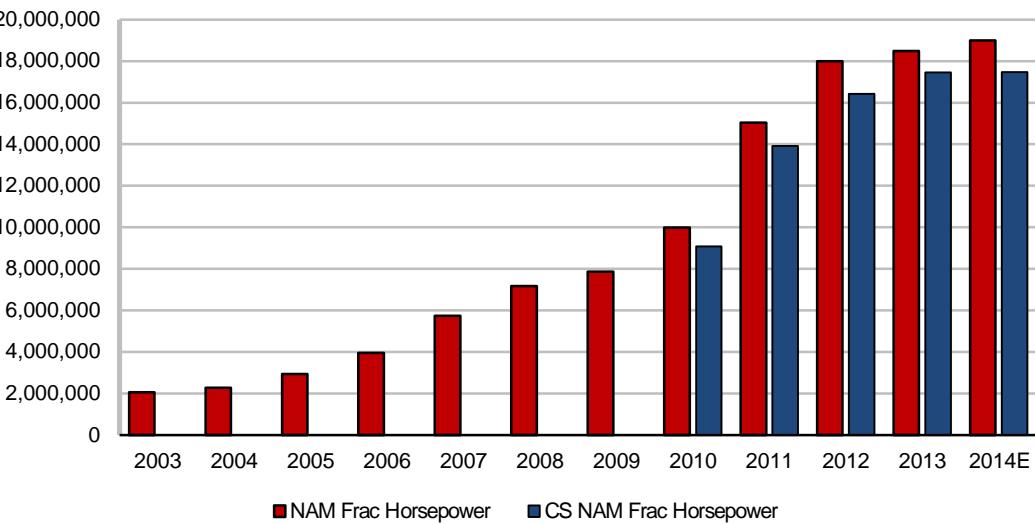
Source: Jereh-PE, Weir SPM, Schlumberger

OFS – Hydraulic Fracturing Market

2013 Pressure Pumping Market Share



The most over-supplied US product line. Without Hydraulic Fracturing, your utility bills would triple



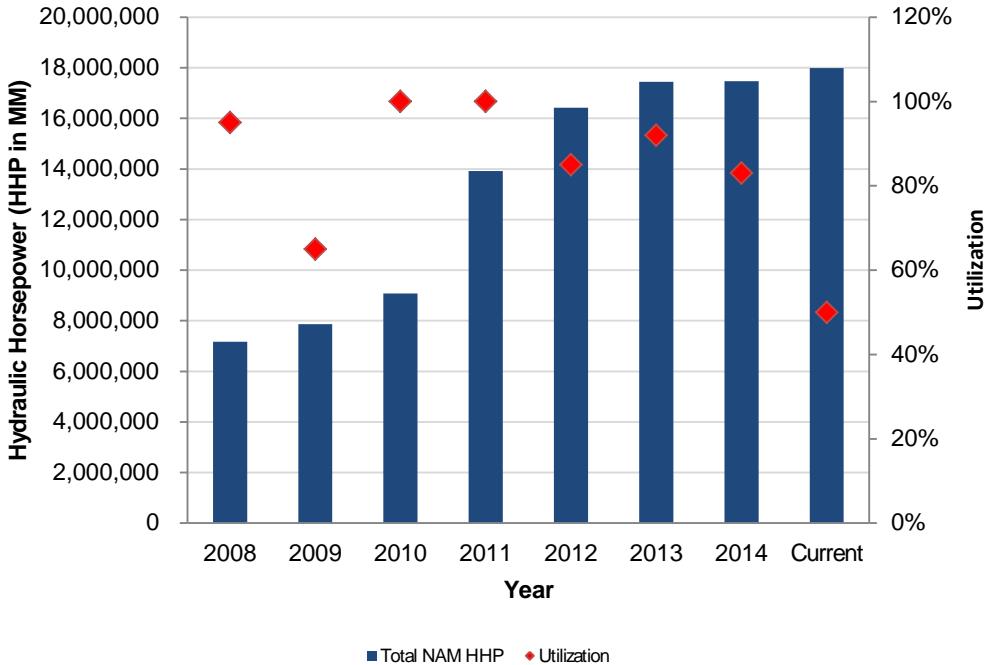
Source: Credit Suisse estimates, company data, and Spears & Associates

North America Hydraulic Horsepower Supply

Ticker/Company	2010 Capacity (HHP)	2011 Capacity Additions (HHP)	2011 Capacity (HHP)	2012 Capacity Additions (HHP)	2012 Capacity (HHP)	2013 Capacity Additions (HHP)	2013/Current Capacity (HHP)	2014 Capacity Additions (HHP)	2014/Current Capacity (HHP)
Baker Hughes (BJ Services)	1,300,000	300,000	1,600,000	200,000	1,800,000	100,000	1,900,000	-	1,900,000
Halliburton	1,900,000	700,000	2,600,000	400,000	3,000,000	100,000	3,100,000	-	3,100,000
Schlumberger	1,500,000	400,000	1,900,000	300,000	2,200,000	100,000	2,300,000	-	2,300,000
Weatherford	500,000	250,000	750,000	50,000	800,000	800,000	-	800,000	800,000
FTS International	65,000	1,328,500	1,393,500	191,000	1,584,500	56,250	1,640,750	-	1,640,750
Trican Well Service Co.	615,000	240,000	855,000	145,000	1,000,000	-	1,000,000	-	1,000,000
Nabors Industries	450,000	230,000	680,000	145,000	825,000	(25,000)	800,000	-	800,000
Calfrac	414,000	346,000	760,000	217,000	977,000	217,000	1,194,000	-	1,194,000
Patterson-UTI	365,000	105,000	470,000	130,000	600,000	163,050	763,050	-	763,050
Sanjel (USA) Inc.	250,000	130,000	380,000	20,000	400,000	50,000	450,000	-	450,000
C&J Energy Services	95,000	95,000	190,000	116,000	306,000	-	306,000	20,000	326,000
Superior Energy Services	325,000	75,000	400,000	200,000	600,000	60,000	660,000	-	660,000
Basic Energy	180,000	90,000	270,000	21,000	291,000	6,000	297,000	-	297,000
Canyon Technical Services	100,000	37,000	137,000	78,000	215,000	10,000	225,000	-	225,000
RPC, Inc. (Cudd)	350,000	250,000	600,000	83,000	683,000	27,000	710,000	-	710,000
Gasfrac Energy Services	75,000	25,000	100,000	35,000	135,000	-	135,000	-	135,000
Archer	98,800	9,000	107,800	42,200	150,000	58,000	208,000	-	208,000
Seventy Seven Energy Inc.	250,000	75,000	325,000	35,000	360,000	-	360,000	-	360,000
Others	250,000	150,000	400,000	100,000	500,000	100,000	600,000	-	600,000
Total	9,082,800		13,918,300		16,426,500		17,448,800		17,468,800

Source: Credit Suisse estimates, company data, and Spears & Associates

North America Hydraulic Horsepower Demand



Almost 20mm HHP in North America

Effective Capacity was 85% a year ago and 50% now

Pumping market may not see any pricing improvement until later NEXT year

Spot market pricing increases seen in the Permian just as the market crashed

The expectation is that this downturn will be “bathtub” shaped

Going from “most in demand” to “most oversupplied” in one year

Source: Credit Suisse estimates, company data, and Spears & Associates

OFS – Production: Subsea

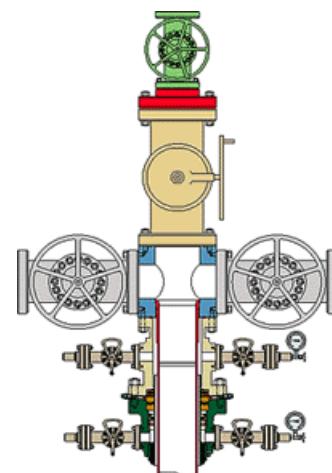
A *Christmas tree* is a set of valves that sit on top of the wellhead and control the flow of pressure of a producing well.

- *Surface trees* are installed on land and on offshore platforms.
- *Subsea trees* are installed on the sea bed.

Manifolds house equipment and pipes that control, direct and measure the flow of fluids to/from the subsea well.

Umbilicals are used for the control of subsea production systems. Umbilicals are made of either steel or thermoplastic tubes that contain fluid conduits for hydraulic power and chemical injection.

Surface Tree



Subsea Tree

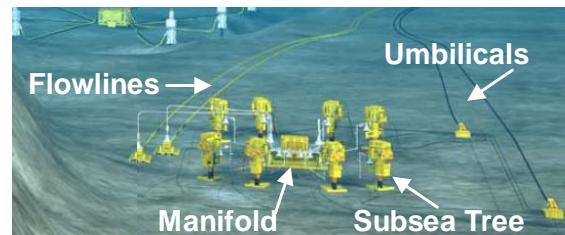


Geothermal Wellhead and Christmas Tree Assembly

Umbilical

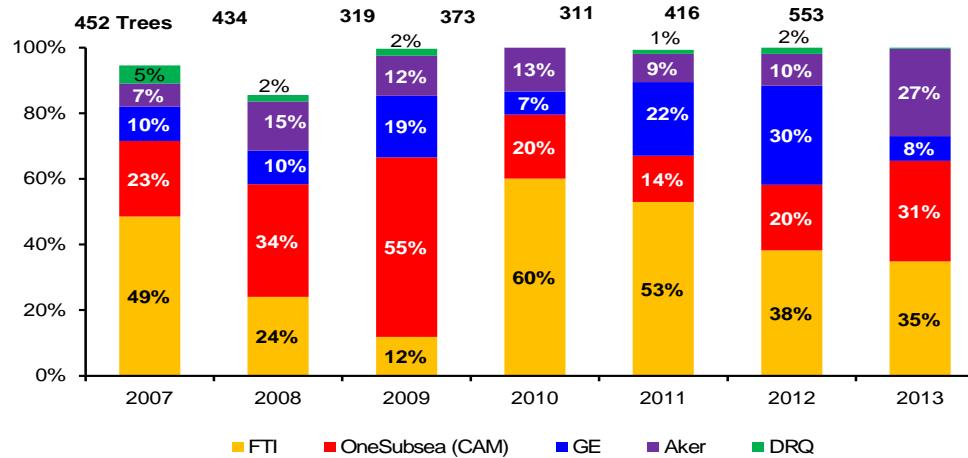
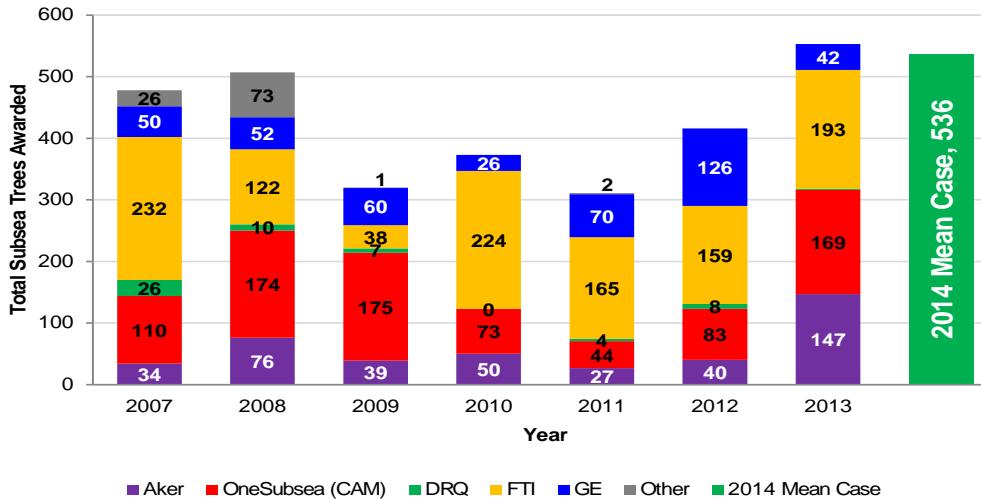


Subsea Production System



Source: FMC Technologies, Oceaneering International, Umbilical Manufacturers' Federation

OFS – Subsea Equipment



Source: Company data and Quest Offshore

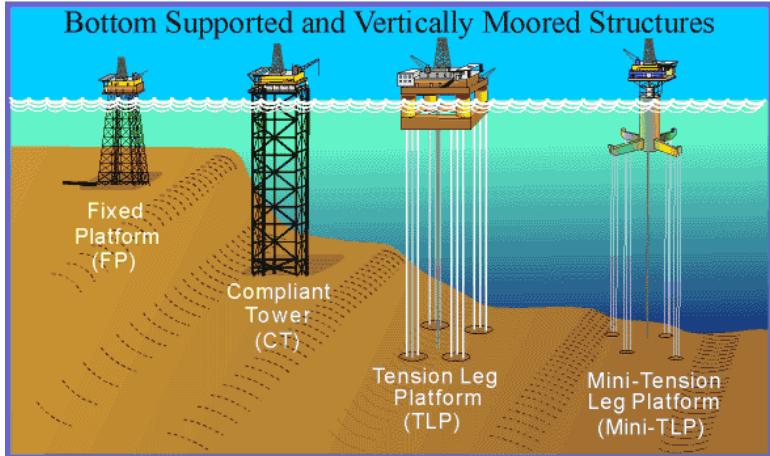
OFS – Production: Offshore Systems

Offshore production infrastructure includes:

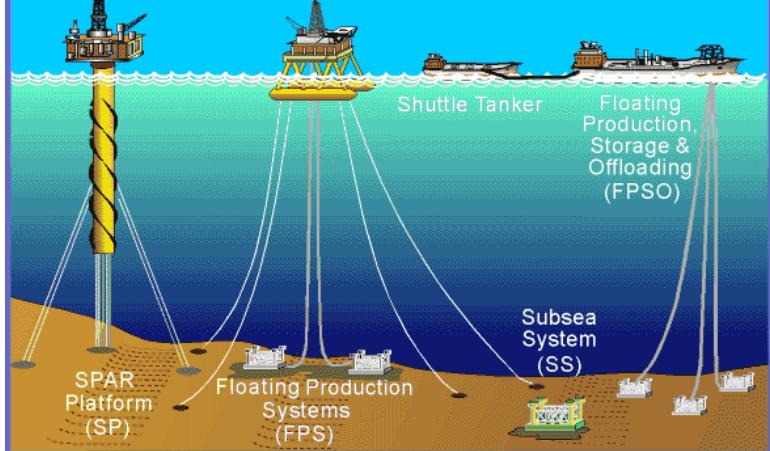
- **Fixed Platforms** consist of a jacket driven into the seabed with a deck; water depths up to 1,500ft.
- **Compliant Towers** can sustain significant lateral deflections; water depths 1,000-2,000ft.
- **Tension Leg Platforms** float but connected to the sea floor by vertical tendons; water depths up to 4,000 ft.
- **SPAR Platforms** have a large single vertical cylinder supporting a deck; water depths beyond 4,000 ft.
- **Floating Production Systems** are semi-submersibles anchored by wire rope and chain, or dynamically positioned; water depths beyond 4,000 ft.
- **Floating Production, Storage & Offloading Systems (FPSO)** are large tanker vessels moored to the seafloor; process and stow production from subsea wells and offload to a small tanker; suited for remote deepwater areas with no pipeline infrastructure; water depths beyond 4,000 ft.

Source: MMS, Credit Suisse

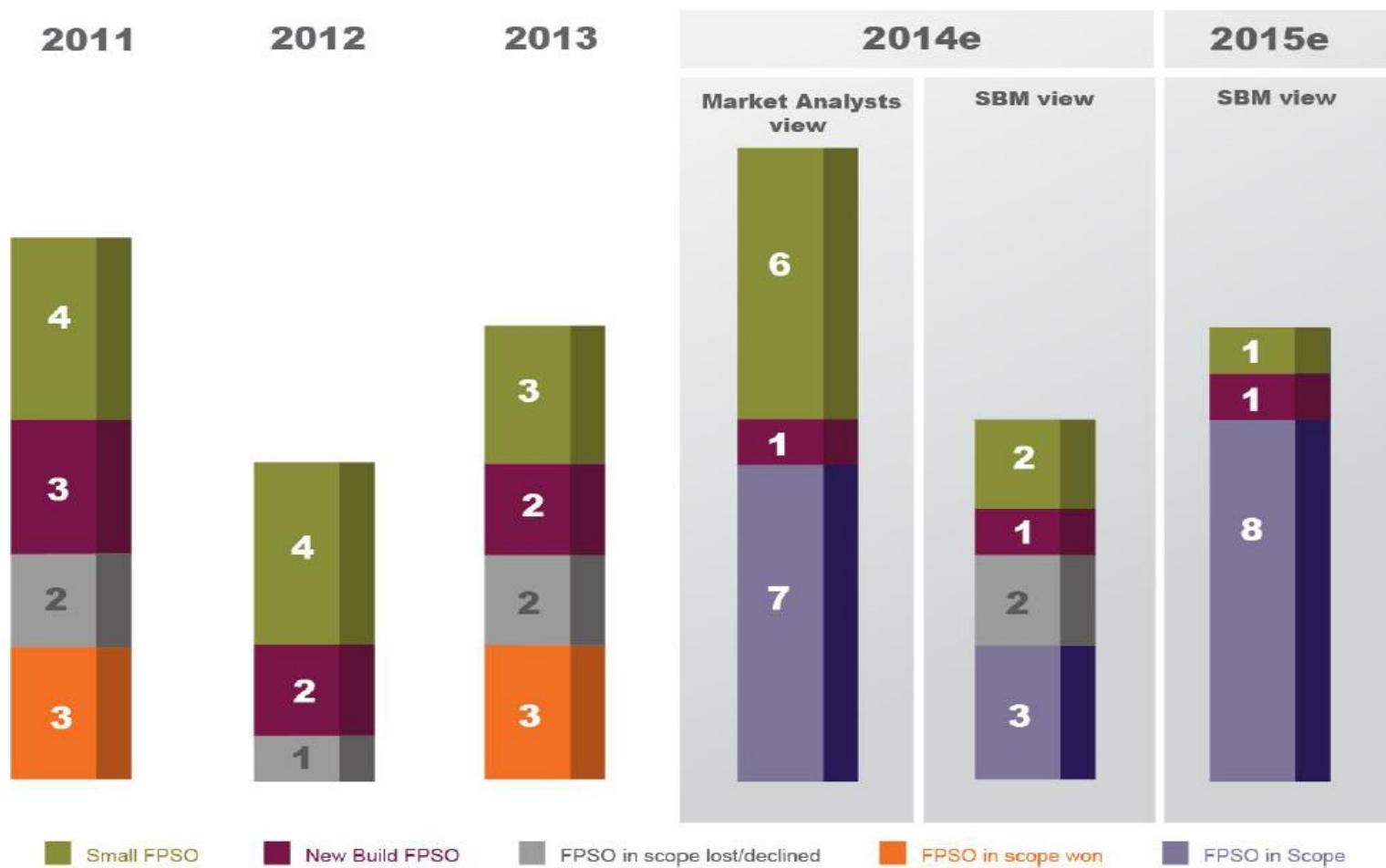
Offshore Production Development Systems



Floating Production and Subsea Systems



OFS – Floating Production, Storage & Offloading System Awards



Source: SBM Offshore presentation

OFS – Production: Artificial Lift

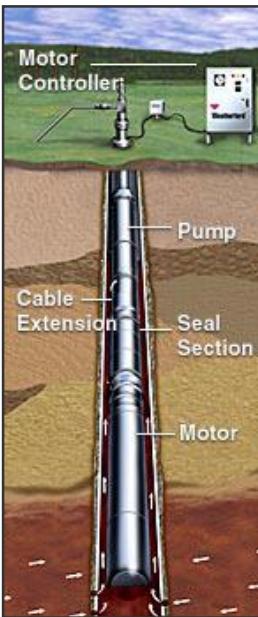
Artificial Lift is a technology for mature oil and gas wells that need to boost fluids out of the wellbore, particularly as they produce water. 90% of existing producing oil wells and gas wells requiring water removal utilize some type of artificial lift. Main types of artificial lift include:

- *Reciprocating rod pumps* – a plunger and valve assembly driven by surface motor (low tech)
- *Electric Submersible Pumps (ESPs)* – typically several centrifugal pump stages to access different wellbore sections driven by a downhole electric motor (highest tech)
- *Progressive Cavity Pumps (PCPs)* – a surface motor rotates the sucker rods using a stator and rotor to cause fluid to flow upward

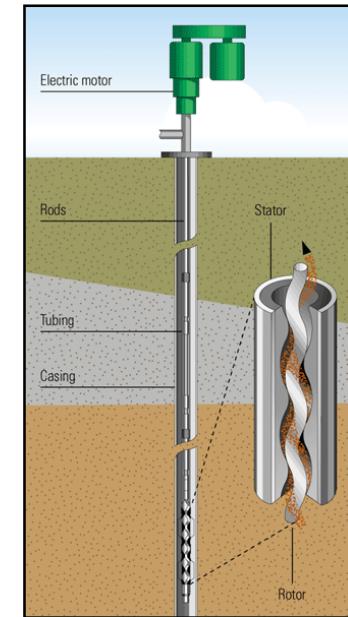
Rod pump



ESP



PCP



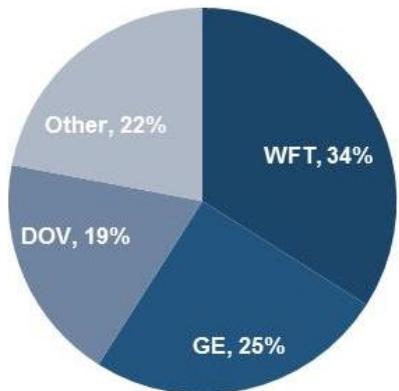
Source: Spears & Associates, Weatherford, Independent Oil & Gas Service, Schlumberger

OFS – Production: Artificial Lift

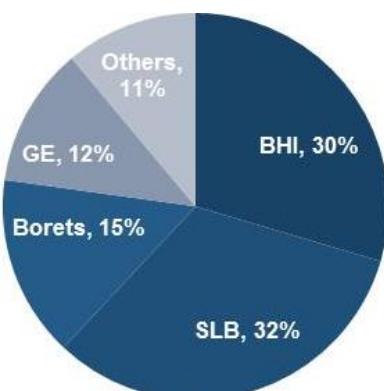
Artificial Lift has gained recent attention due to a global increase field decline. 95% of active oil wells utilize some type of artificial lift.

- **M&A, 2013** – GE bought Lufkin Industries, a primarily rod-lift oriented company, for \$3.3B, or ~13.5x EBITDA. Although rod lift is lower tech, it is the favored technology for low flow wells. WFT sold its Russian ESP business for 8.5x EBITDA
- **Baker Hughes FLEXPump™** – In 2Q13 BHI announced its FLEXPump™ series, an ESP that can operate in low-flow wells similar to rod lift.

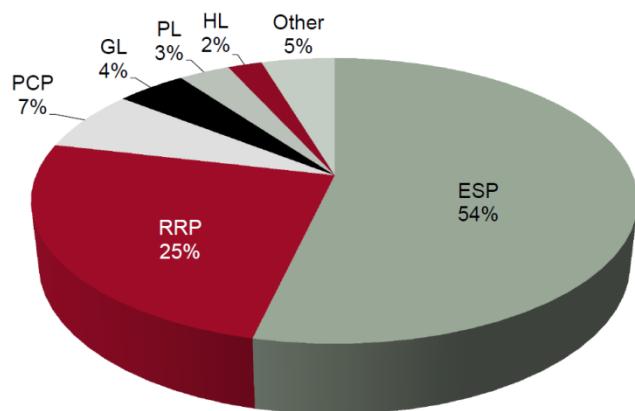
Rod Lift Market Share



ESP Market Share



Artificial Lift Spending by Type



Lift Type by Well

Case Study Major Producer Operating 26k Wells

	Plunger Wells	62%
	PCP Wells	15%
	ESP Wells	12%
	Rod Lift Wells	4%
	Other / Natural Flowing Wells	8%

OFS – Production: Compression

Compression raises the pressure of natural gas in the reservoir so that it will flow into pipelines and other facilities. There are three segments to the field compression market:

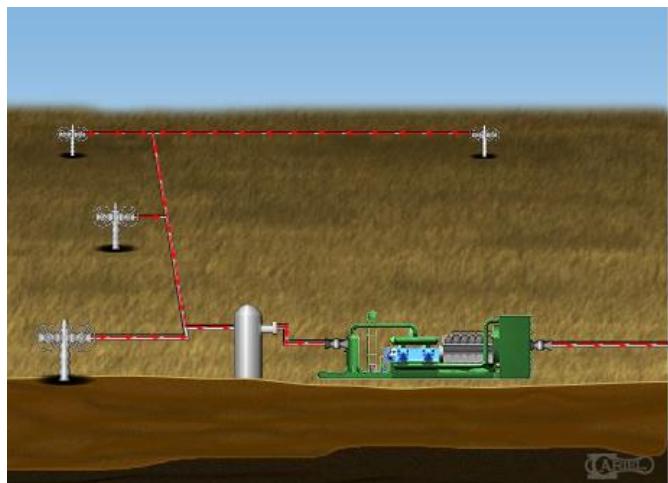
- Wellhead
- Gas gathering (production tank – vapor recovery)
- Processing

Compressors have historically been owned and operated by oil companies, but the U.S. is now approximately 1/3 outsourced to contract compression providers.

Compressor

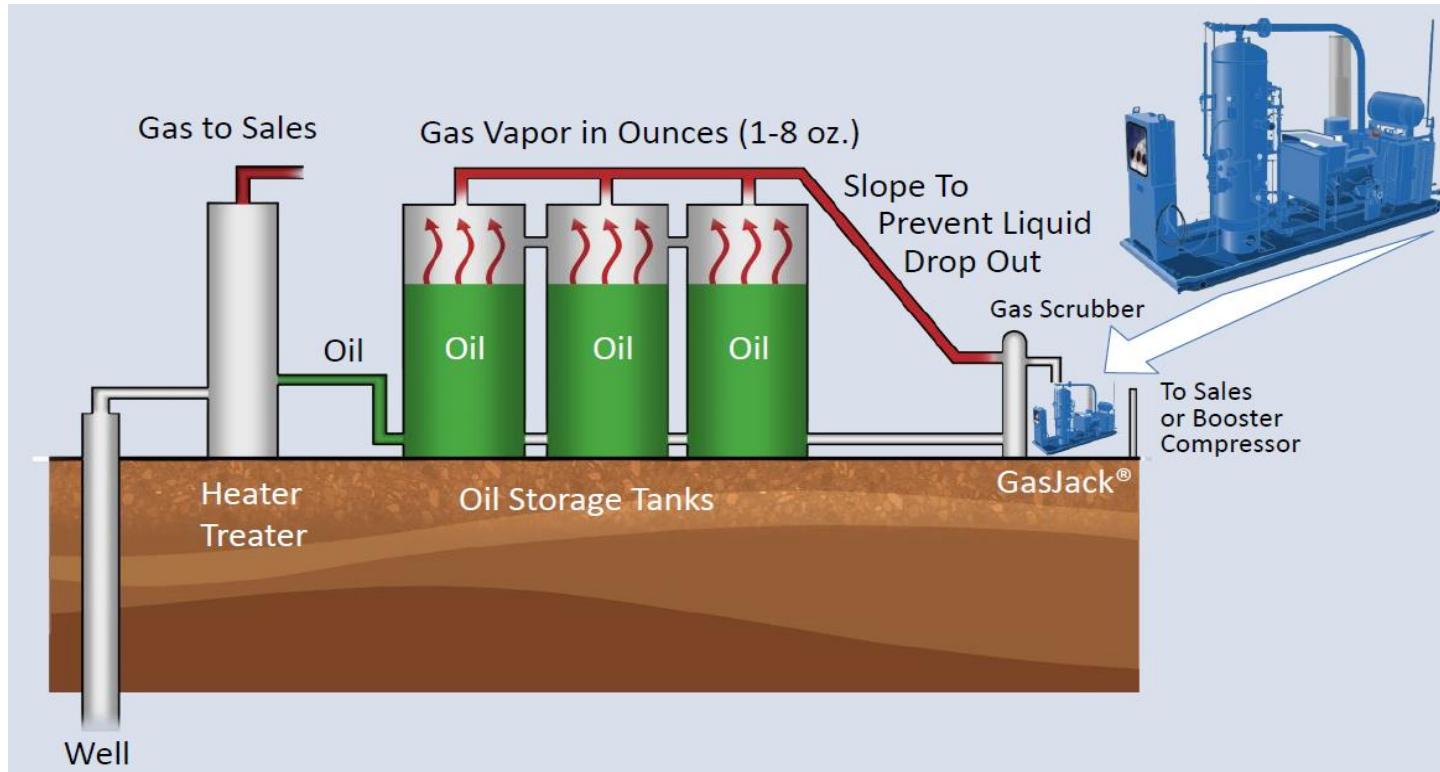


Gas Gathering Compression



Source: TETRA Technologies (Compressco), Ariel

Unconventional Compression Services – Vapor Recovery



Used primarily in connection with oil and gas liquids production

- Vapor recovery captures gas vapors from oil storage tanks
- Casing gas systems enhance oil production by reducing down-hole pressure

Source: TETRA Technologies (Compressco)

OFS – Production: Well Servicing

Well Servicing refers to the maintenance procedures that take place on a well after the well has been completed and production from the reservoir has begun. It is done to sustain and enhance the productivity of the well. Key products/services include:

- *Workover* – the process of performing major maintenance or remedial treatment on a well (**KEG and BAS**).
- *Coiled tubing* – tubing used for the placement of fluids or manipulation of tools during workover (**BHI, SLB, SPN, and KEG**)
- *Snubbing* – the process of putting drill pipe into the wellbore when the BOPs are closed and pressure is contained in the well
- *Plug and Abandonment* – the process of preparing a well to be permanently closed

Workover rig



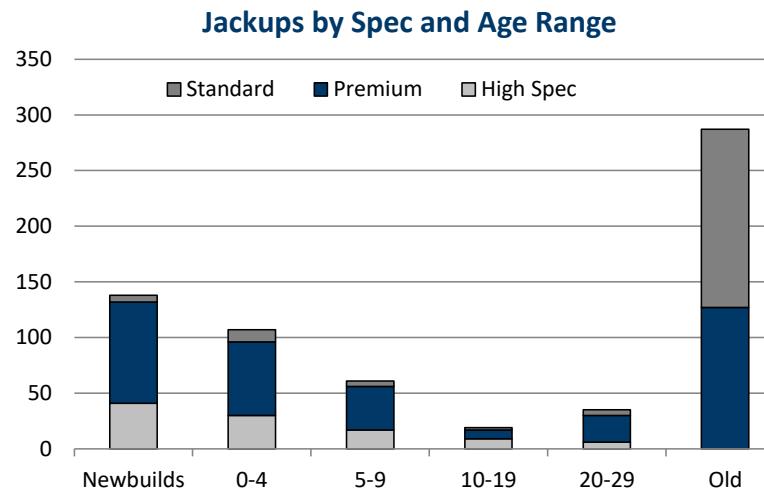
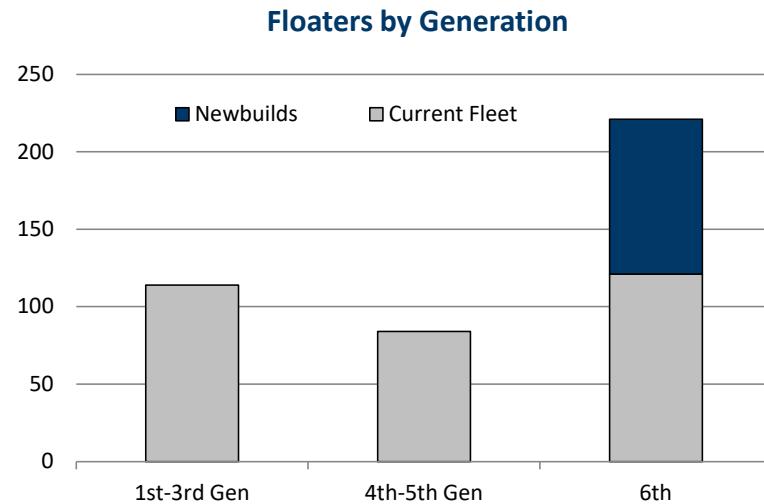
Coiled tubing unit



Source: Schlumberger, MTG

OFS – Offshore Drilling: Offshore Rigs by Type

- **Floater**: A floating mobile offshore drilling unit that operates in midwater (MW), deepwater (DW) and ultra-deepwater (UDW).
- Floater were constructed in Generations with each successive Gen adding new technology/capabilities
 - **Semisubmersibles** float on pontoons and are moored to the ocean floor or dynamically positioned (good for development drilling)
 - **Drillships** are independently mobile (do not need towing vessels) and are generally dynamically positioned (good for exploration)
- **Jackup**: A mobile offshore drilling unit that operates in shallow water and rests on the ocean floor when drilling.
 - **High Spec** Jackups are capable of drilling High Pressure, High Temp (HPHT) Wells (predominately in NW Europe and MENA)



Source: IHS Petrodata

OFS – Offshore Drilling: Offshore Rigs by Water Depth

- **Shallow Water (0-999')** Dominated by Jackup rigs and occasionally semis (harsh environments).
 - New Jackup construction is focused in the 350-400' range.
- **Midwater (1,000-4,999')** Typically carried out by early generation semis or harsh environment semis in NW Europe.
 - Very few (11) midwater rigs have been ordered in the last 5 years
- **Deepwater/UDW (5,000'+)** The deepwater and especially the UDW requires newer gen semis and drillships
 - The newest deepwater rigs are being ordered with dual BOPs and dual activity drilling capabilities with water depth ratings up to 12,000'

Jackup



Semisubmersible

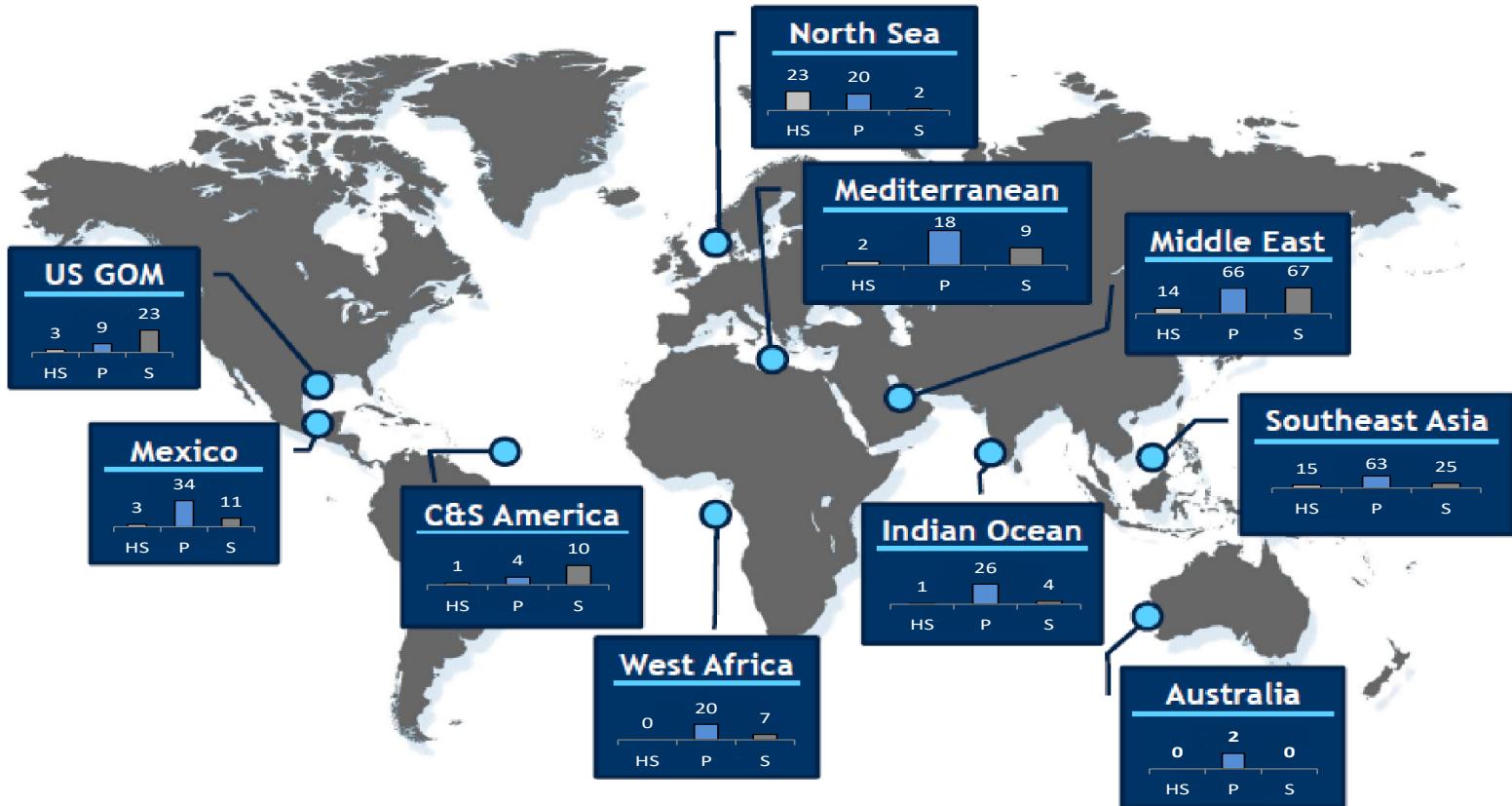


New Gen, Dual BOP, Dual Activity Drillship



OFS – Offshore Drilling: Rigs by Geography - Jackups

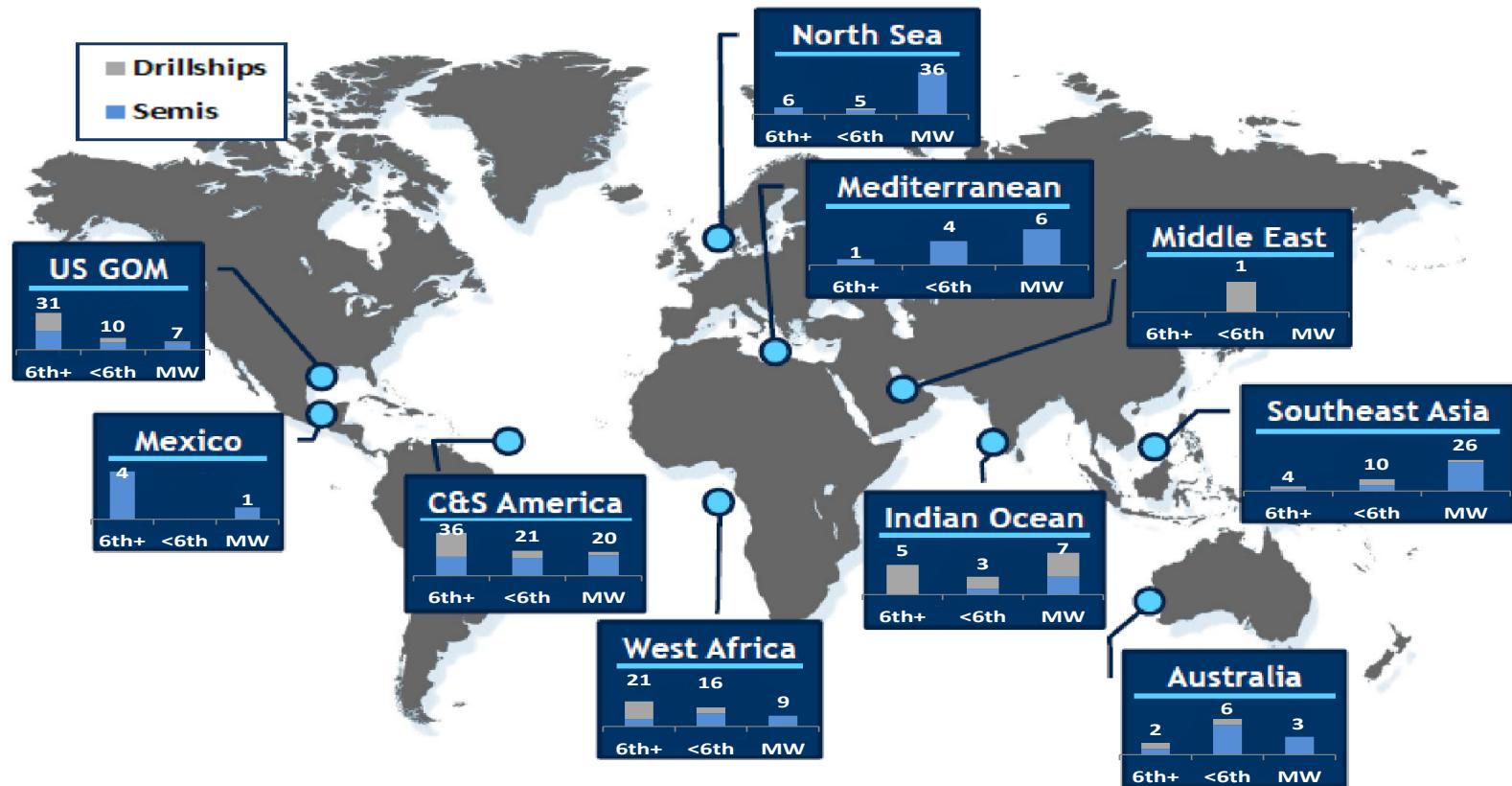
- *Middle East and Asia/Pac* are the largest jackup markets (50% of market).
 - Not All Jackups Are Created Equal - The North Sea is predominantly a premium market



Source: ODS-Petrodata, note figures exclude newbuilds

OFS – Offshore Drilling: Rigs by Geography - Floater

- *The Golden Triangle (Brazil, US GoM and WAFA)* are the largest basins for deepwater floaters



Source: ODS-Petrodata, note figures exclude newbuilds

OFS – Offshore Drilling: Offshore Logistics

Helicopters are used for transporting personnel between onshore bases and offshore platforms, drilling rigs, and installations. Operators include **BRS**, **ERA** and **HELI**.

Lift Boats are self-propelled, self-elevating vessels with a relatively large, open deck for carrying equipment in support of offshore exploration and production, and which can serve as a platform from which maintenance and construction work can be conducted. Operators include **CKH** and **HERO**.

Supply Boats are ships specifically designed to transport goods (i.e. drilling mud, cement, diesel fuel, chemicals, water, tools) and personnel to and from offshore oil rigs/platforms. Operators include **TDW**, **HOS**, **GLF** and **CKH**.

Lift Boat



Supply Boat



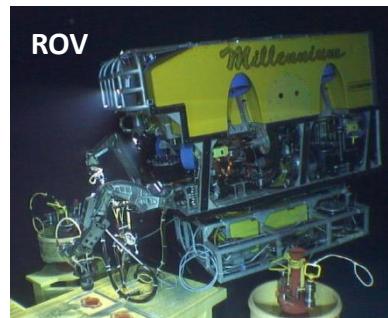
OFS – Production: Offshore Construction

Pipelay vessels use either the *S-lay* method in water depths <2K ft where pipe is laid into the water horizontally and bends twice in an S-shape, or the *J-lay* method in deep water where pipe is laid vertically and only bends once as it hits the seabed.

Derrick barges have cranes used to lift heavy structures such as platforms/topsides.

Diving support vessels (DSVs) support divers performing inspection, maintenance, repair (IMR) and welding. *Surface diving* can be performed in depths up to 200 ft; *saturation diving* can be performed in 200-1,000 ft depths. *Offshore Support Vessels (OSVs)* are equipped with *Remotely Operated Vehicles (ROVs)*, tethered underwater robots used for IMR, construction and drill support in deep water.

Combination Pipelay/Derrick Barge



Source: CalDive, Oceaneering



The background of the slide features a large, abstract graphic composed of several overlapping diagonal bands of varying shades of blue, creating a sense of depth and motion. A solid black rectangular area is positioned in the upper-left quadrant of this graphic.

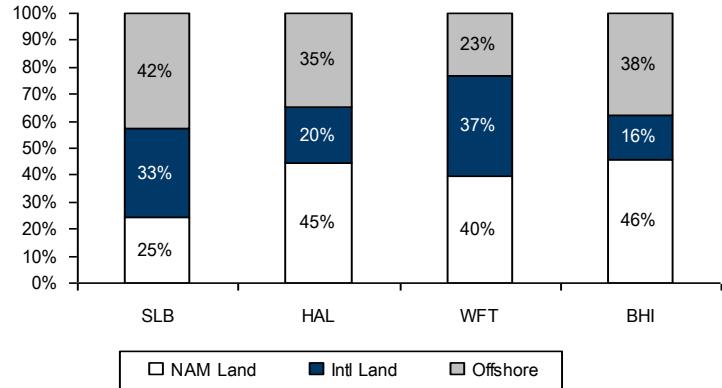
Oilfield Services Company Specific Detail

OFS: Life Cycle Exposure and Selected Co's

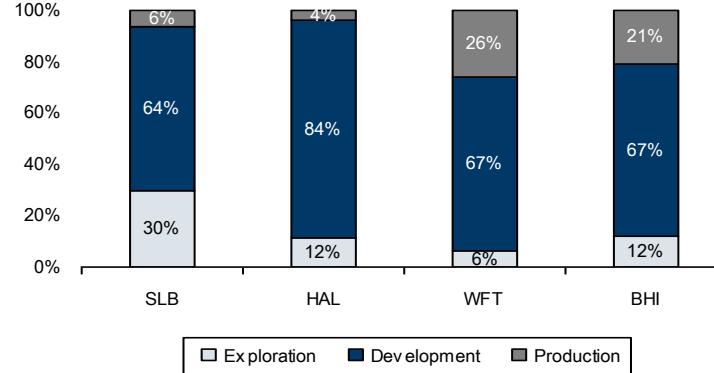
Life Cycle Stage	Oil Services Activities	Examples of OFS Co's	Life Cycle Stage	Oil Services Activities	Ex. of OFS Co's
EXPLORATION					
Initial Reservoir Analysis	Seismic Acq./Processing Reservoir Imaging	CGG, SLB, PGS.NO HAL	Evaluation	Wireline Logging Production Testing Coring	SLB, HAL, BHI SLB, Expro, HAL CLB
DRILLING					
Contract Drilling	Land Shallow Water Deep Water	NBR, HP, EDCL, PTEN HERO, RDC RIG, ESV, SDRL, NE DO, ORIG, PACD, RDC, ATW	Drilling Services	OCTG Directional Drilling Fluids Bits	TS, V&M, X SLB, BHI, HAL, WFT SLB, HAL, BHI SLB, BHI, HAL
COMPLETION					
Completion Services	Pressure Pumping "Tools" Casing Handling	HAL, SLB, BHI, TCW.CN HAL, BHI, WFT, SLB FI, WFT			
PRODUCTION					
Well Servicing	Workover Rigs Coiled Tubing Cased Hole Wireline Logging	KEG, NBR, BAS SLB, HAL, BHI, SPN SPN	Logistics Support	Supply Boats ROV Services Helicopter	TDW, CKH, GLF, HOS OII, HLX BRS
Production Enhancement	Artificial Lift Chemicals Nat Gas Compression	WFT, SLB, GE, BHI Nalco, BHI, SLB EXH, TTI, NGS			
EQUIPMENT/INFRASTRUCTURE					
Development	Engineering/Design Fabrication Installation	TEC.FP, SUBC.NO, SPM.IM MDR, GIFI HLX, TEC.FP	Capital Equip.	Rig Equipment Seismic Equipment Production Unit Equip.	NOV, Aker, CAM IO, CGG NOV, OIS
Production	Subsea/Surface Equip. Umbilicals Risers/Flowlines	FTI, CAM, Aker, GE OII, TEC.FP GE, DRQ			

OFS: Diversified Service Segmentation

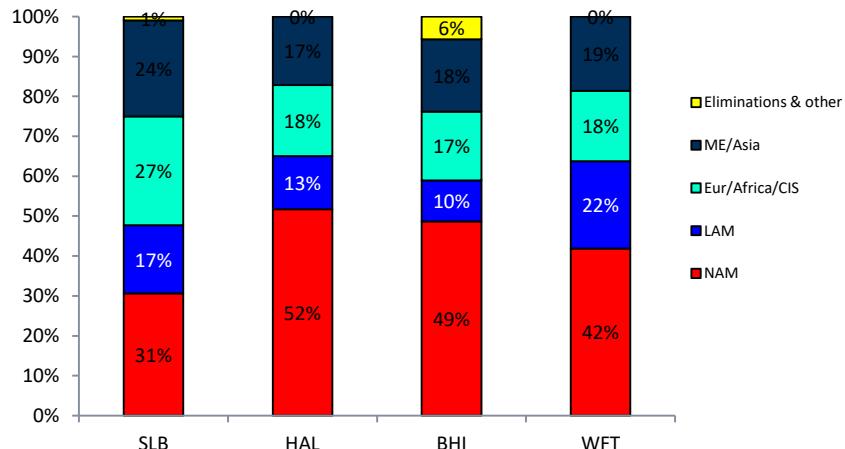
Geographic Revenue Segmentation



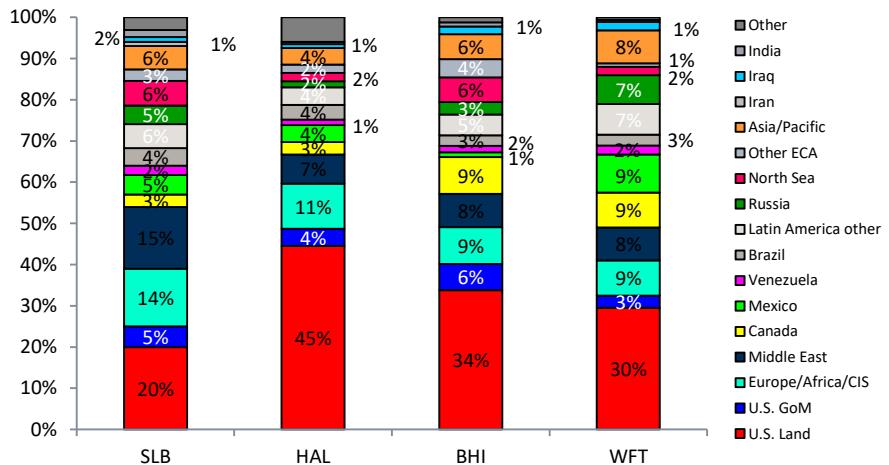
Life Cycle Segmentation



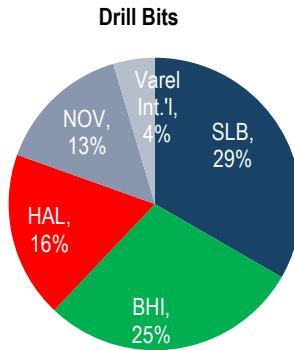
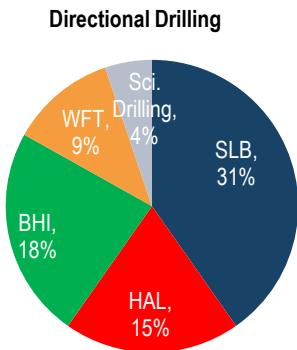
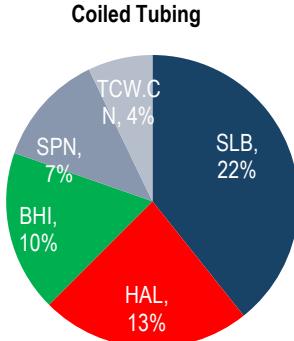
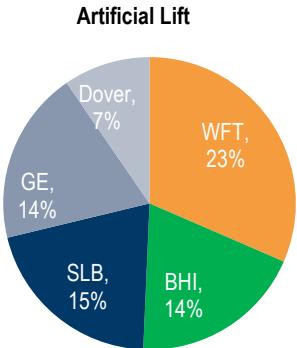
Diversified Service Revenue by Region (2013)



Diversified Service Revenue by Country (2013)



OFS: Market Shares for Key Services/Products



2013 Revenues

Artificial Lift = \$13.2B

Coiled Tubing = \$5.4B

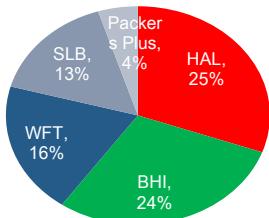
Directional Drilling = \$14.6B

Drill Bits = \$5.1B

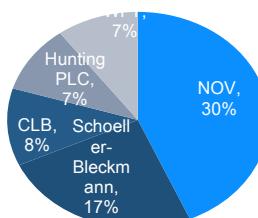
Source: Spears & Associates

OFS: Market Shares for Key Services/Products

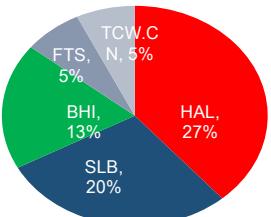
Completion Equipment & Services



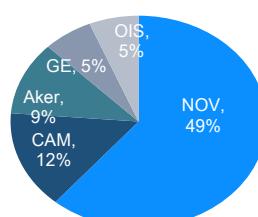
Downhole Tools



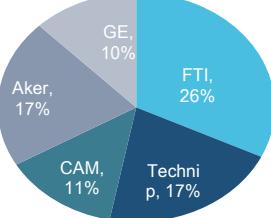
Pressure Pumping



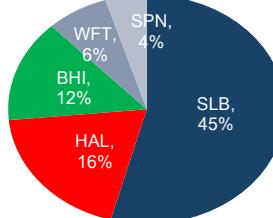
Rig Equipment



Subsea Equipment



Wireline



Source: Spears & Associates

2013 Revenues

Completion Equipment & Services = \$13.1B

Downhole Tools = \$3.7B

Pressure Pumping = \$34.5B

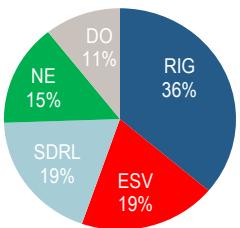
Rig Equipment = \$18.3B

Subsea Equipment = \$17.5B

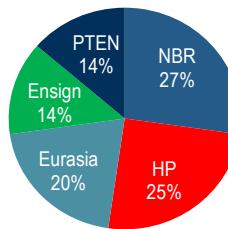
Wireline = \$13.9B

OFS: Market Shares for Equipment/Infrastructure

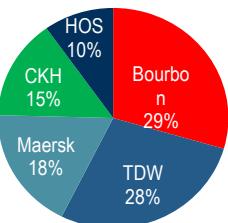
Offshore Contract Drilling



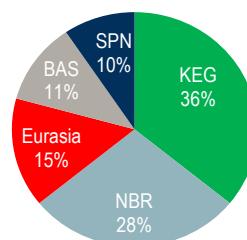
Land Contract Drilling



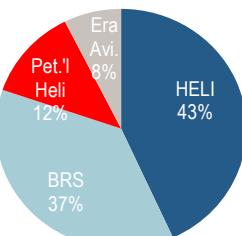
Supply Vessels



Well Servicing



Petroleum Aviation



2013 Revenues

Offshore Contract Drilling = \$54.5B

Land Contract Drilling = \$29.5B

Supply Vessels = \$8.0B

Well Servicing = \$6.4B

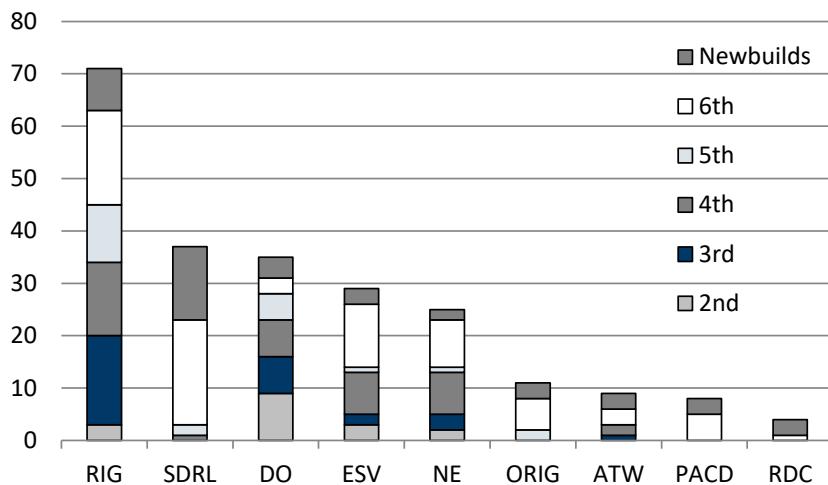
Petroleum Aviation = \$4.9B

Source: Spears & Associates

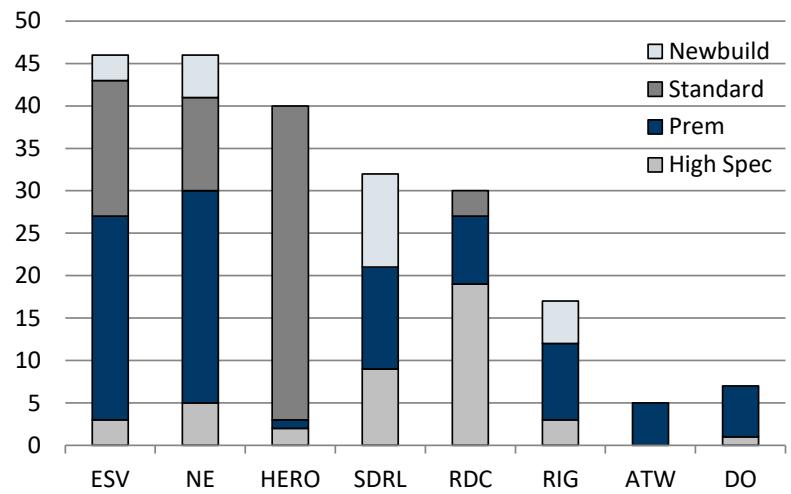
OFS – Offshore Drilling: Fleet Profiles

- *RIG* is the largest floater operator in the world with a mix of new and old generation floaters.
 - *SDRL, PACD, and ORIG* have premium UDW fleets.
 - *ESV* and *NE* have the largest JUs fleet –premium and standard rigs.
- *Stacking/Scraping* We expect older gen rigs to be idled and removed from the fleet.

Fleet Profile by Company (Floaters)

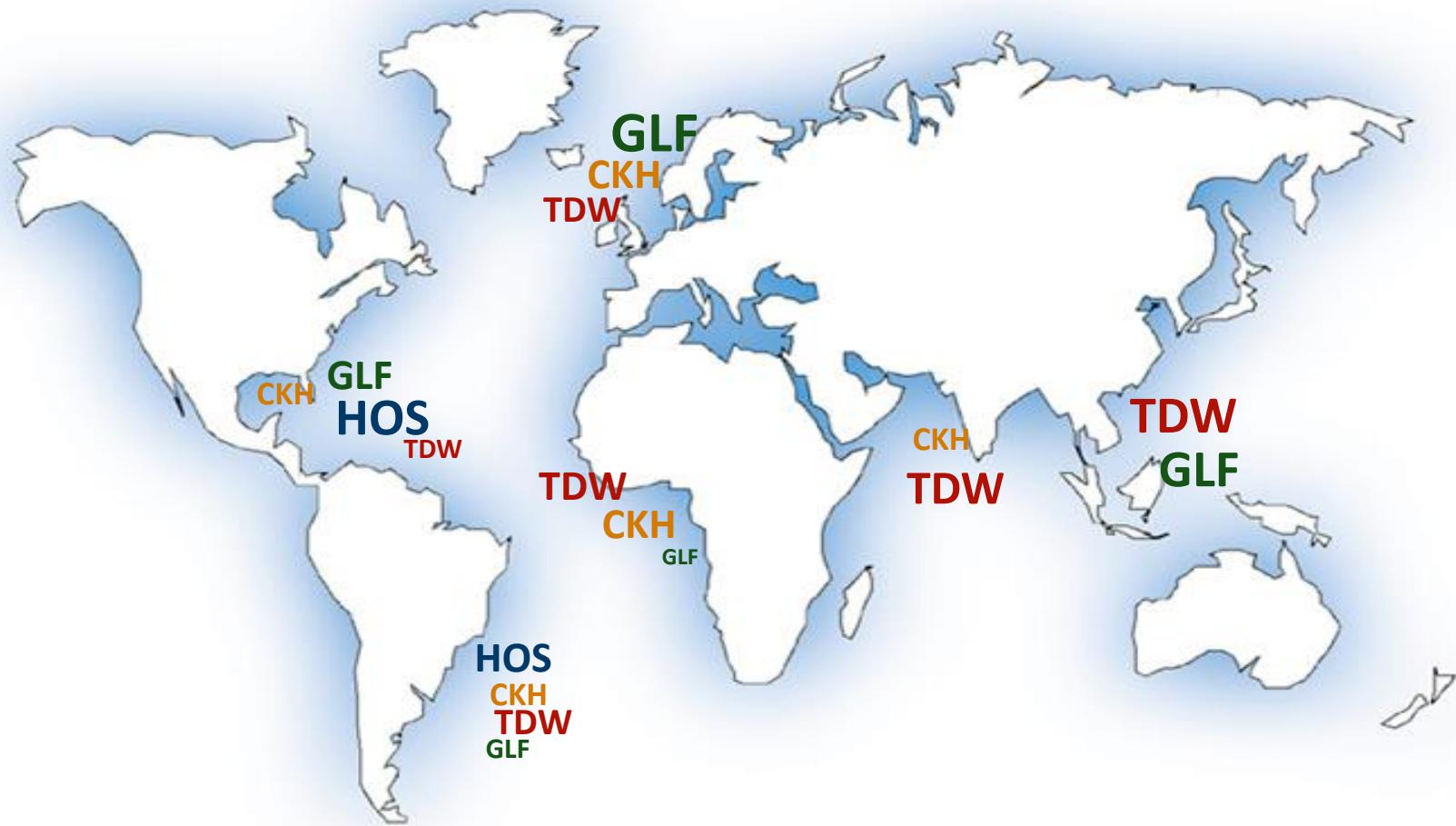


Fleet Profile by Company (Jacksups)



Source: IHS Petrodata

OFS – Offshore Drilling: Supply Boats by Region



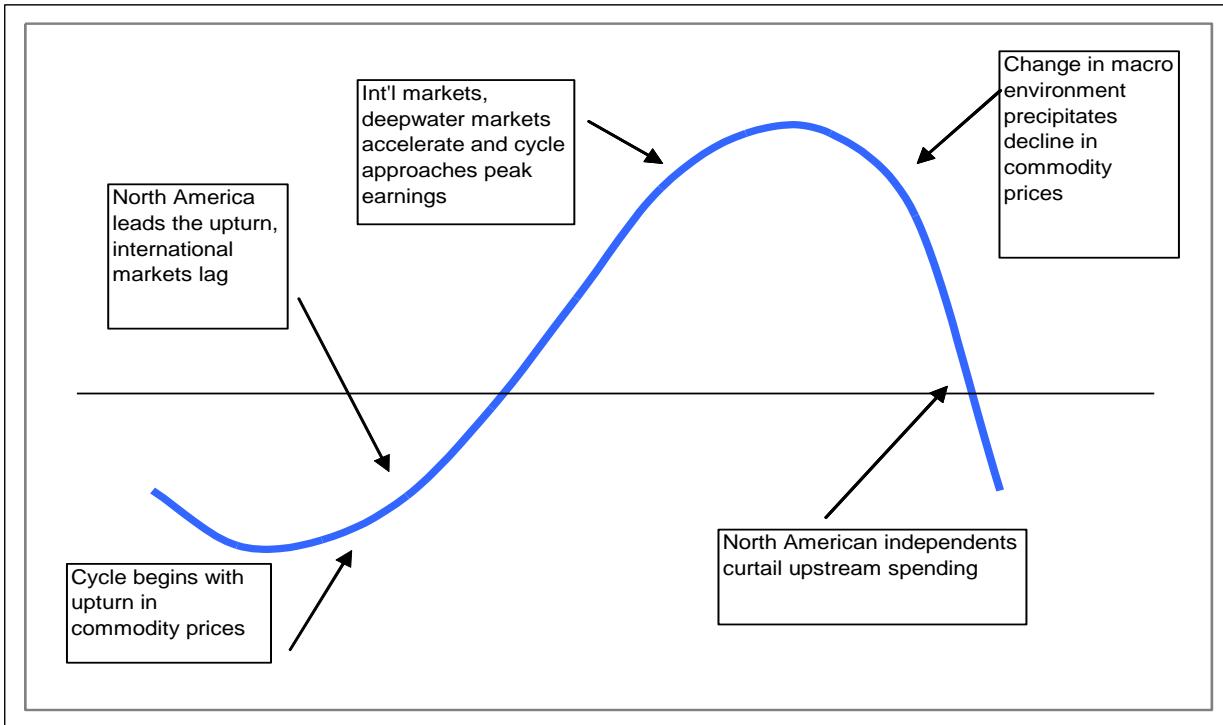
Source: Company Data



**INVESTING IN OILFIELD SERVICES &
DRILLING**

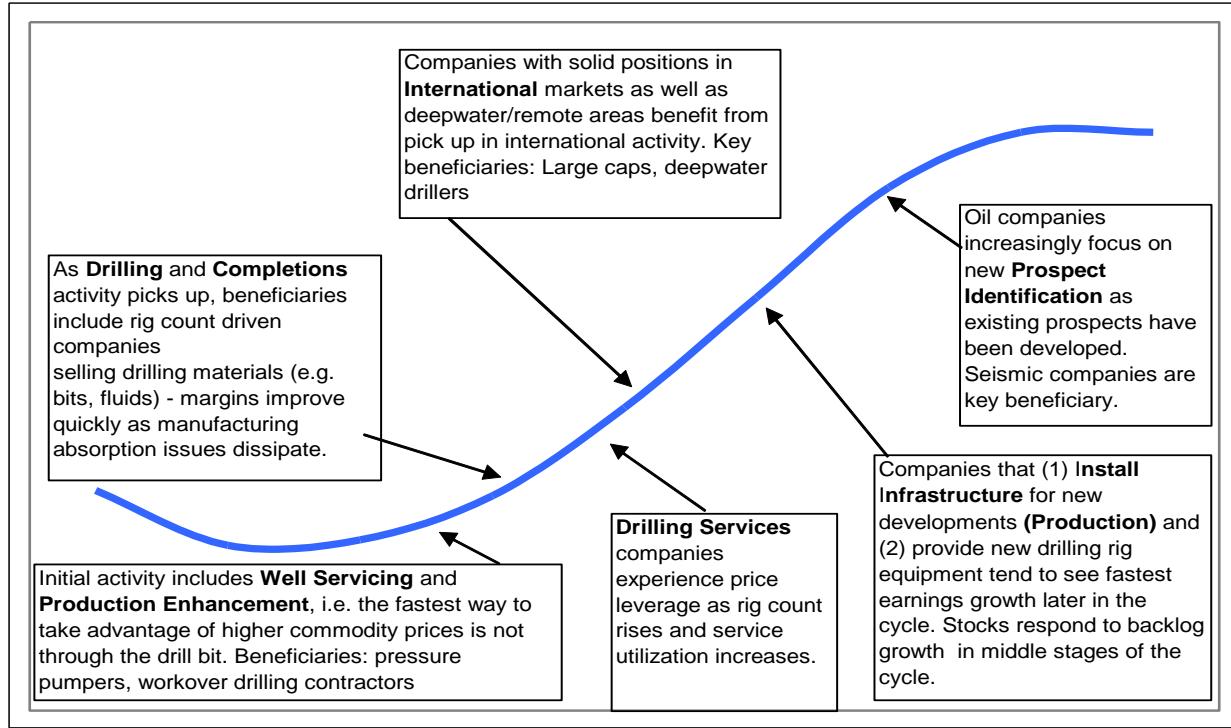


OFS: The Traditional Upstream Spending Cycle



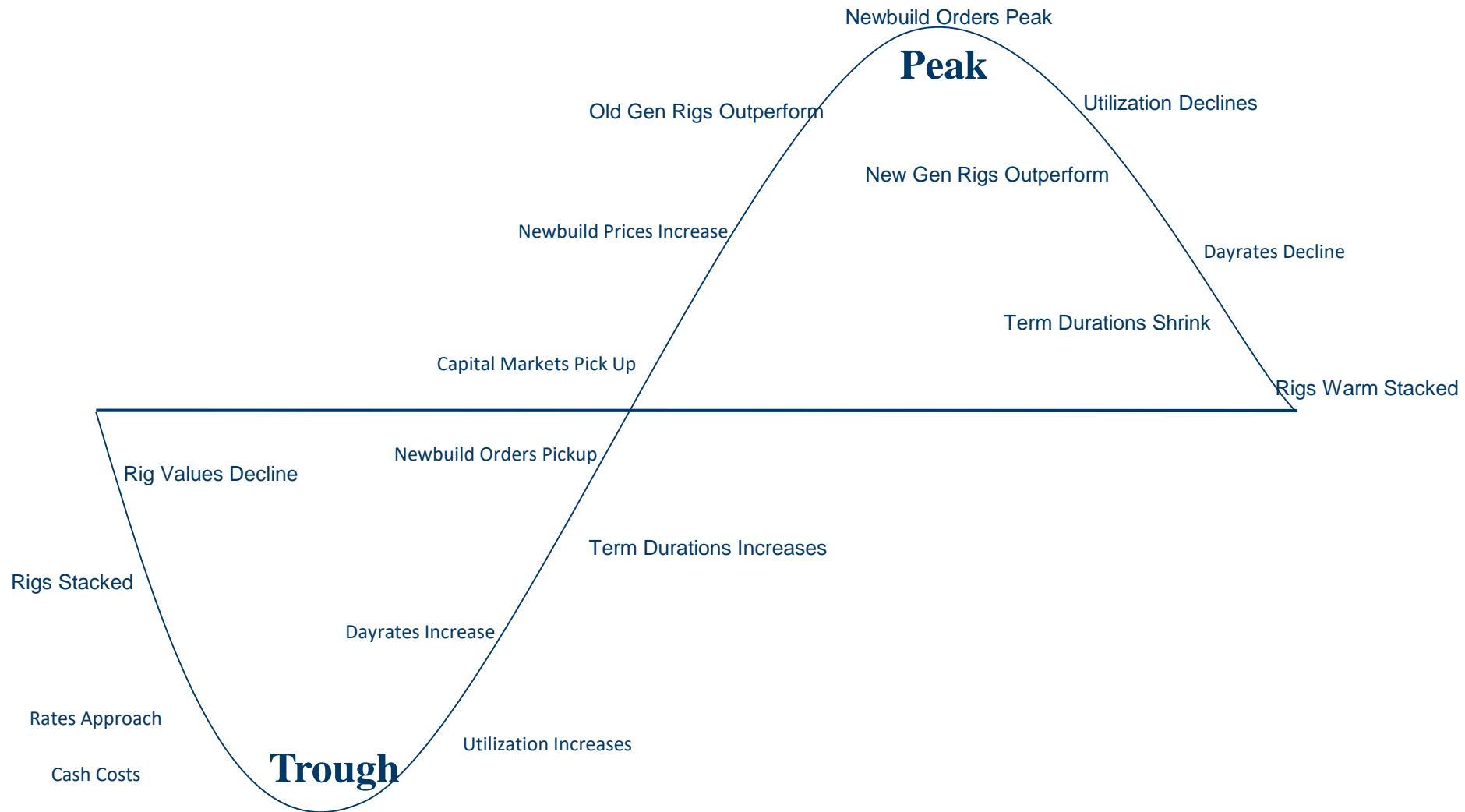
- North America generally leads in a resumption in upstream spending because more of the activity is conducted by smaller (and therefore more nimble) operators (E&P companies). With shorter time horizons, generally, the North American operators are also the first to curtail spending in a downturn

OFS: Oil Services Activities Through the Cycle



- Production related services are the most resilient and the earliest to “revive”, but traditionally have the lowest Beta. Secular challenges related to hydrocarbon production have sustained higher-than-expected growth in the latest upcycle.
- With more confidence in sustained higher commodity prices, drilling and completion related activity responds. Exploration is generally the last to strengthen and the first to fall in a downturn in oil prices.

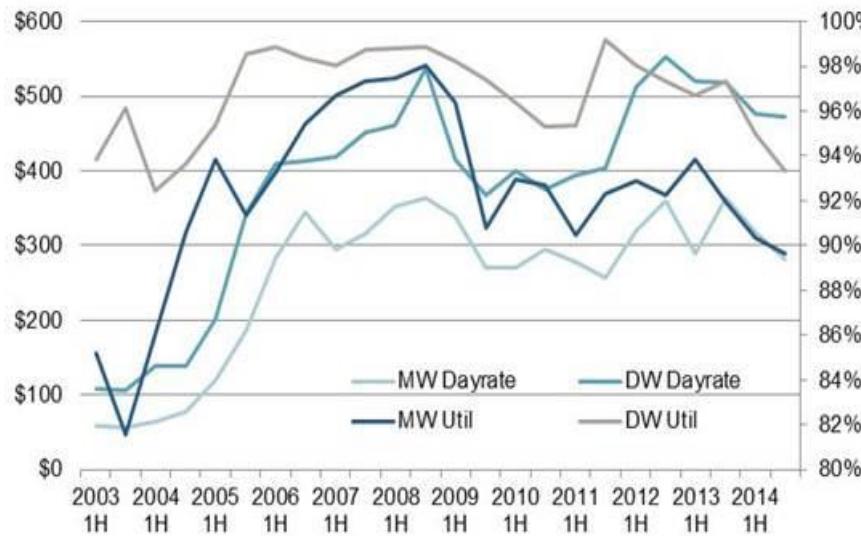
OFS – Offshore Drilling: The Cycle



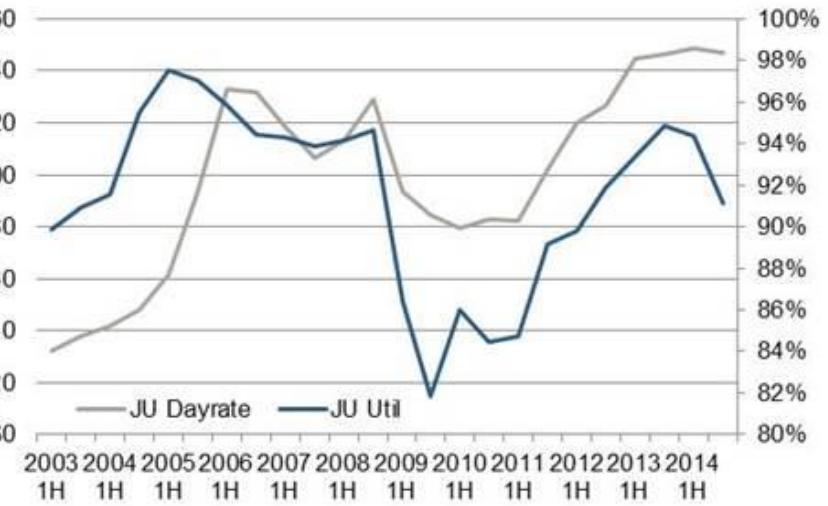
OFS – Offshore Drilling: Dayrates

- *Dayrates* and *utilization* are key drivers of driller earnings power

Worldwide Floater Dayrate/Utilization



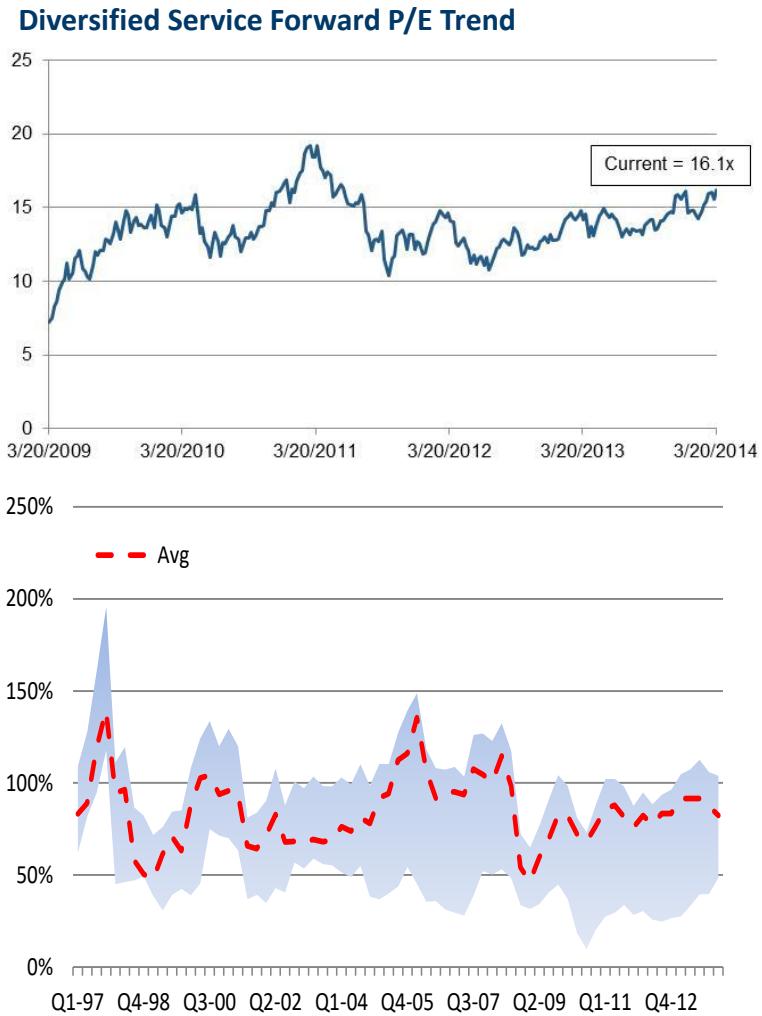
Worldwide Jackup Dayrate/Utilization



Source: IHS Petrodata

OFS: Traditional Valuation Methodologies

- **Services** – as an earnings momentum group, we believe shares have generally been valued on forward year P/E and to a lesser extent forward EV/EBITDA. During trough periods, P/E or EV/EBITDA is applied to normalized or “mid-cycle” earnings estimates
- **Equipment** – the backlog visibility, which can extend out as far as three years, lends itself to DCF. However, forward earnings metrics are also used
- **Drillers** – with high asset intensity associated with owning the rigs, and different depreciation methods used by the companies, the industry tends to use forward year P/CF (EV/EBITDA). In the recent upcycle, backlog visibility lends itself to DCF. In troughs, replacement value metrics are also used



OFS: Indicators

- Leading Indicators
 - *Seismic* – Licensing rounds, Oil company exploration budgets, Sustained higher commodity prices
 - *Drilling and Completion* – Oil company spending budgets (generally set early in the calendar year, although they are revised intra-year), Permitting activity
- Coincident Indicators
 - *Oil and natural gas prices*
 - *Earnings*. As a traditionally earnings momentum-driven group, quarterly earnings matter.
 - *Pricing (day rates for drillers)*. Contract drilling shares are generally highly correlated with the trajectory of day rates.
 - *Rig count*. North American rig counts are updated weekly (sources include Baker Hughes, M-I) or bi-weekly (The Land Rig Newsletter). Non-North American rig counts are updated monthly



Current Oilfield Service Trends



Oil Now Has a Very Different Role - Suppression

- Oil prices have always risen to “pull” production levels higher so supply and demand balance, with demand driving its action
- Due to the success of US shale, our ability to almost double US oil production in less than five years, in a market that had peaked production decades ago, the role of the oil price has changed
- Now oil prices act as a “governor” on US production growth since our ability to increase production at a price exceeds the rest of the world
- The US is now the world’s swing producer, due to our volumes if not our economics, and the responsibilities that implies
- The “collateral damage” to global conventional production accelerates its decline and increases the call on US shale over time
- It forces a change in behavior across the industry, as it adjusts to the new, and likely lower, role of the oil price

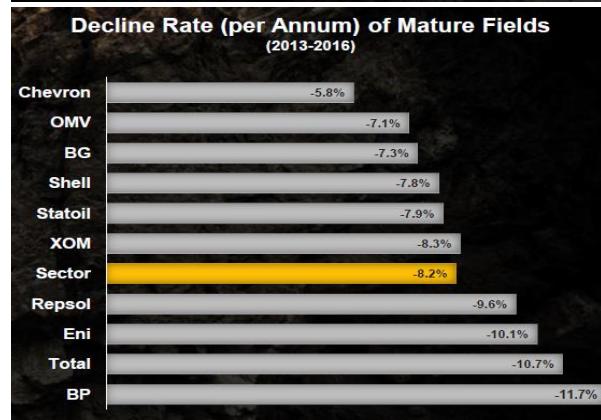
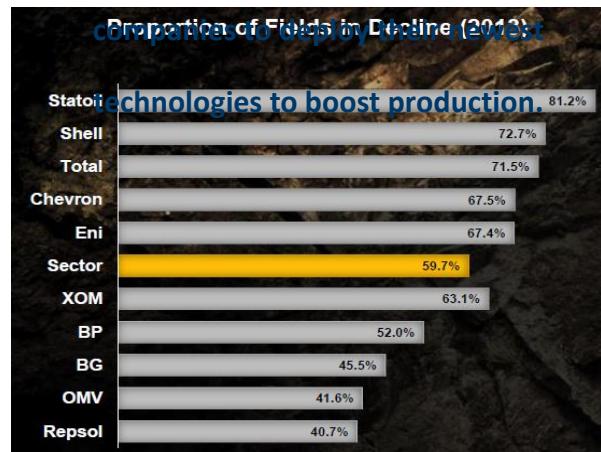
“Managed Shale” Will Revolutionize OFS in the Next Five Years

Managed Shale is a term used to describe a business model in which an OFS company takes over all aspects of development, Integrated Project Management (IPM), in return for a pre-determined fee or a profit-sharing agreement. We expect to see accelerated adoption of Managed Shale among National Oil Companies (NOCs) and in mature fields. The results:

- *Higher Returns for OFS and the Asset Owner* – lower costs and higher production will grow returns
- *Higher Margins for OFS* – less competition because fewer players can compete in this market and increase in risk leads to better reward
- *Diversified OFS Companies Reap the Rewards* – The large, diversified OFS companies with a full product service line offering are suited for these projects

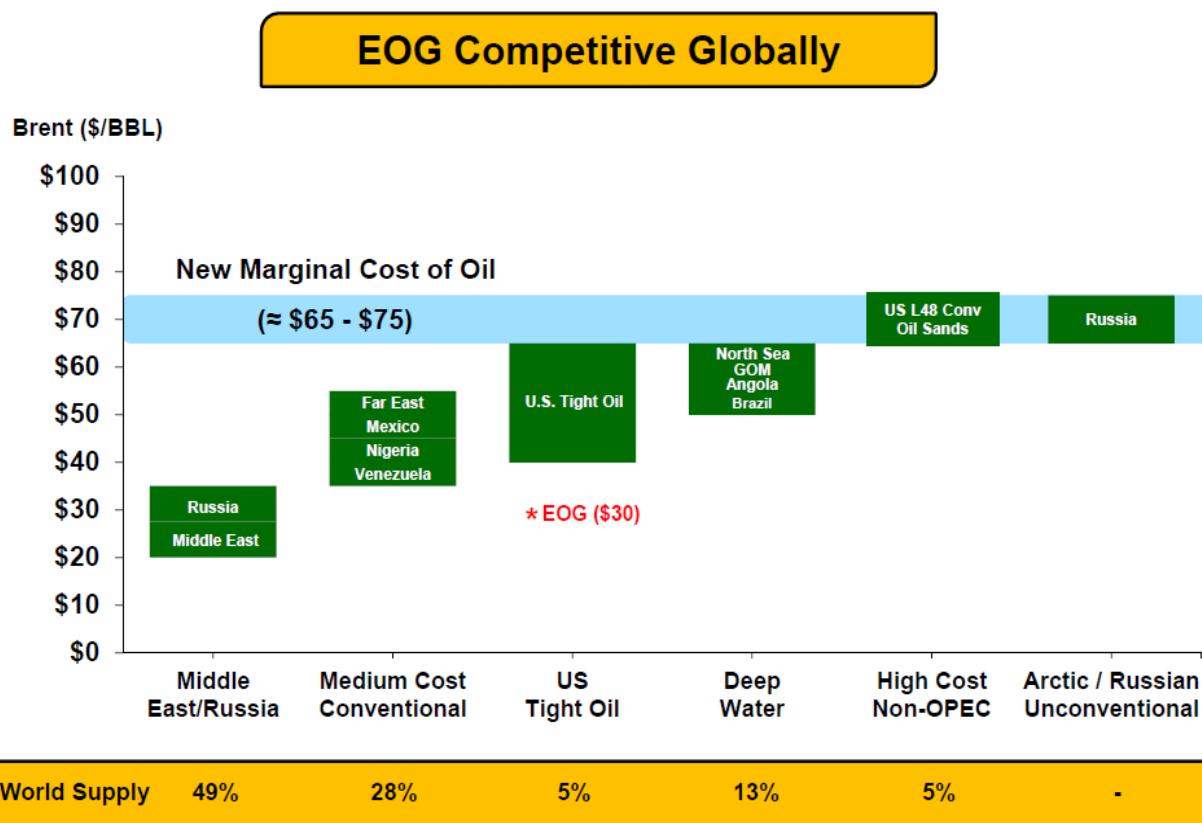
60% of NOC's production is declining at 8%

p.a. which creates an opportunity for OFS



What Oil Price is Needed?

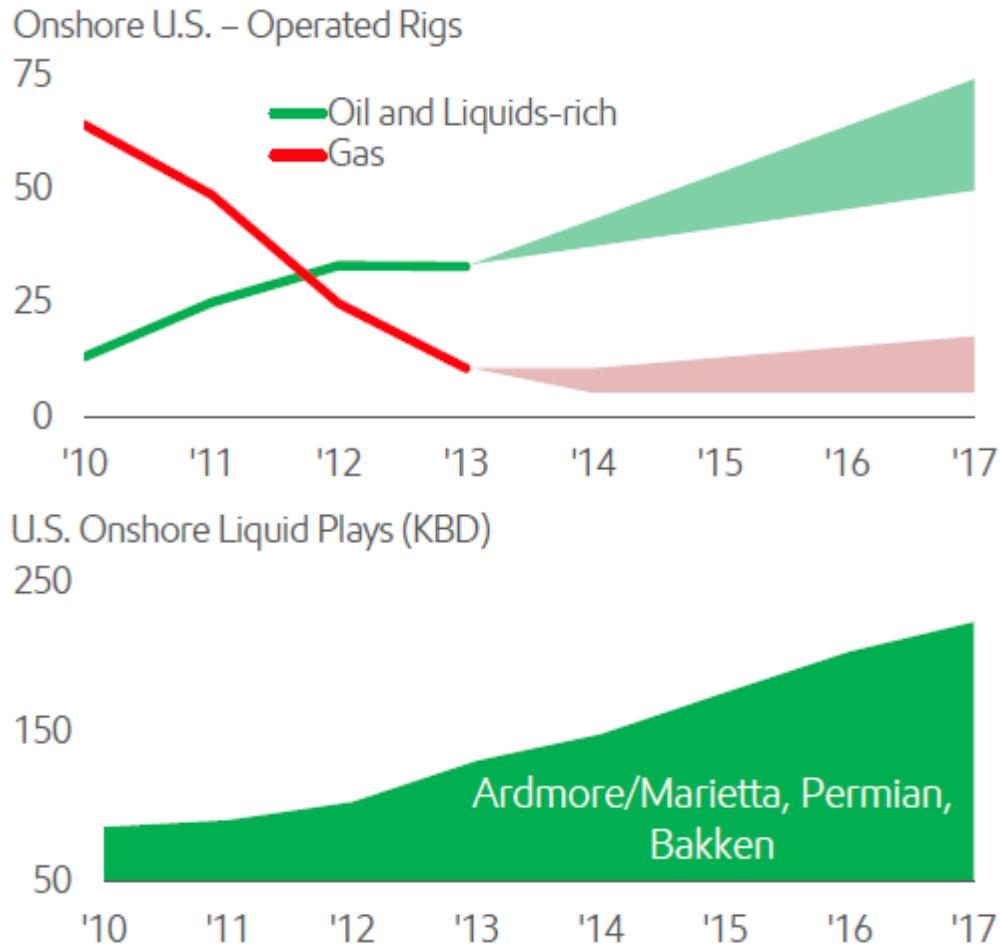
Breakeven* Oil Price in Key Worldwide Basins



* Brent equivalent price required to achieve 10% Direct ATROR (see reconciliation schedules).
Source: PIRA.



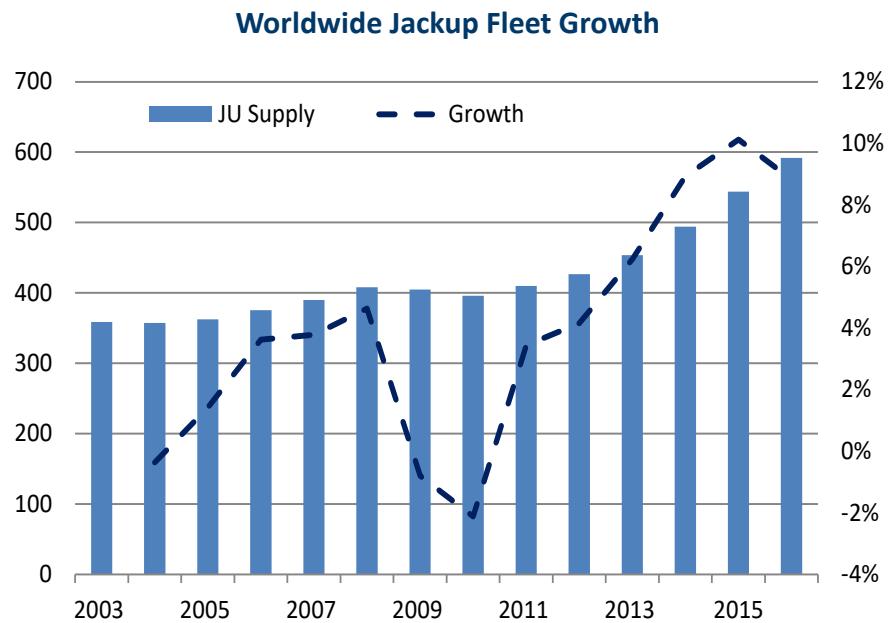
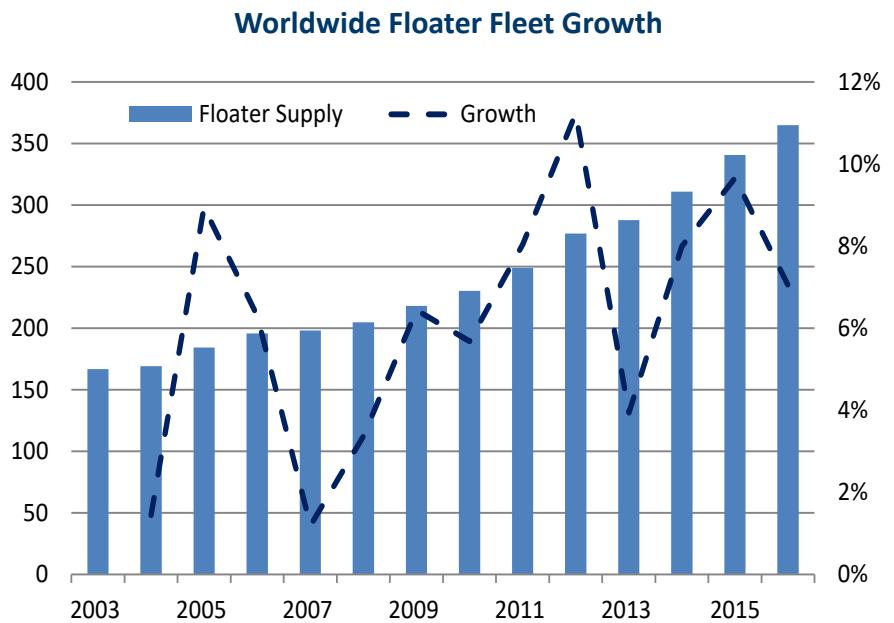
Majors focused on liquids-rich plays



- IOCs & Majors searching for “better wells”
- Near-term focus is on high-margin liquids production (onshore)
- ExxonMobil’s (**XOM**) focused on the Bakken, Woodford Ardmore/Marietta and the Permian; rig count from 30 or so up towards 45-70 rigs
- Chevron’s (**CVX**) Permian rig count to 50 from 25; adding in Duvernay over time too
 - “Small capital projects have high rates of return” (Chevron’s ‘13 Security Analyst Meeting presentation)

OFS – Offshore Drilling: Lots of Rigs Delivering

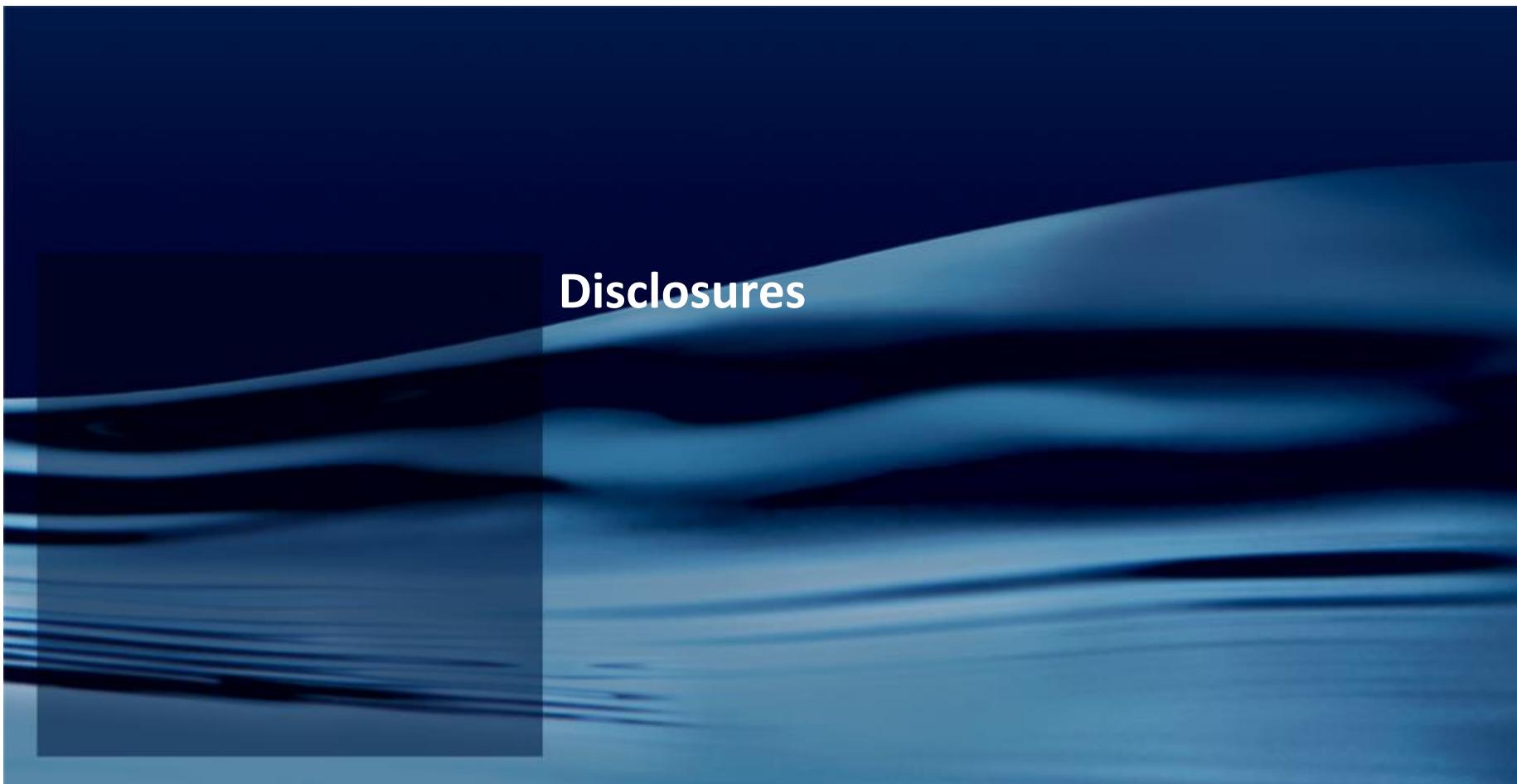
- 2013-2015 record years for floater deliveries (2014 peak ~25 deliveries)
- 2014-2016 record year for jackup deliveries (2015 peak ~60 deliveries)



Source: IHS Petrodata, Company data, Credit Suisse estimates



Disclosures



Companies Mentioned (Price as of 27-Mar-2014)

Atwood Oceanics, Inc. (ATW.N, \$49.56)
 Baker Hughes Inc. (BHI.N, \$63.6)
 Cameron International Corp. (CAM.N, \$61.1)
 Diamond Offshore Drilling, Inc (DO.N, \$47.09)
 Enserco Plc. (ESV.N, \$52.57)
 FMC Technologies, Inc. (FTI.N, \$51.71)
 Frank's International (F.I.N, \$24.86)
 GulfMark Offshore (GLF.N, \$44.12)
 Halliburton (HAL.N, \$58.09)
 Helmerich & Payne, Inc. (HP.N, \$105.88)
 Hercules Offshore (HERO.OQ, \$4.59)
 Hi-Crush Partners, LP (HCLP.N, \$39.43)
 Hornbeck Offshore (HOS.N, \$39.48)
 Nabors Industries, Ltd. (NBR.N, \$24.43)
 National Oilwell Varco (NOV.N, \$76.03)
 Noble Corporation (NE.N, \$32.03)
 Ocean Rig UDW Inc (ORIG.QQ, \$17.51)
 Oceaneering Intl, Inc. (OIL.N, \$70.6)
 Oil States International (OIS.N, \$95.84)
 Pacific Drilling (PAC.D.N, \$10.79)
 Patterson-UTI Energy, Inc. (PTEN.QQ, \$30.15)
 Precision Drilling Corporation (PDS.N, \$11.67)
 Rowan Companies (RDC.N, \$33.09)
 SEACOR Holdings (CKH.N, \$85.53)
 Schlumberger (SLB.N, \$96.49)
 Seadrill (SDRL.N, \$34.28)
 Superior Energy Services, Inc. (SPN.N, \$29.35)
 Tetra Technologies, Inc. (TTI.N, \$12.2)
 Tidewater (TDW.N, \$48.25)
 Transocean Inc. (RIG.N, \$40.36)
 Weatherford International, Inc. (WFT.N, \$16.98)

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Underperform/Sell*	14%	(45% banking clients)
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