



# Effizienzsteigerung in der Erdöl- und Erdgasindustrie durch den Einsatz neuer Technologien

Niedersächsische Energietage am 20.-21.11.2018 in Hannover

Prof. Dr.-Ing. Sven Krüger

**November 22, 2018**

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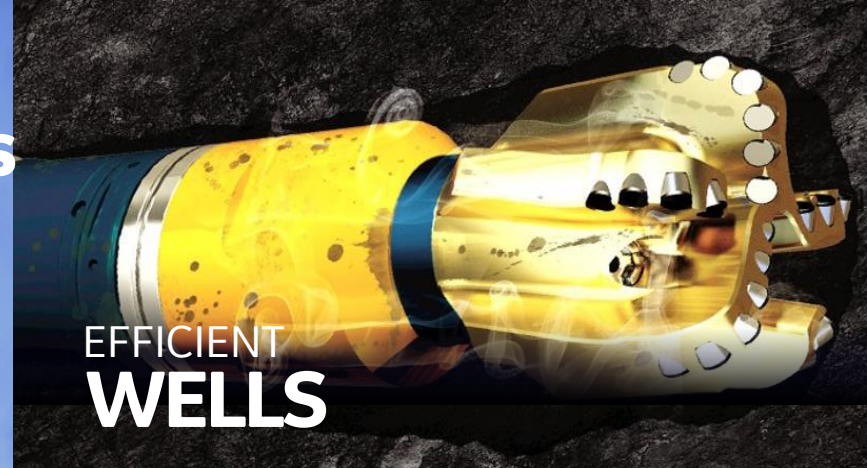
R.C. Baker

Howard Robard Hughes, Sr.

# BHGE Oilfield Services

**28,000**  
EMPLOYEES

**120+** COUNTRIES IN  
WHICH WE OPERATE



EFFICIENT  
**WELLS**



OPTIMIZED  
**PRODUCTION**



IMPROVED  
**RECOVERY**

# Global technology and research centers



## THE WOODLANDS TECHNOLOGY CENTER

The Woodlands, Texas, USA



## CELLE TECHNOLOGY CENTER

Celle, Lower Saxony, Germany



## CENTER FOR TECHNOLOGY AND INNOVATION

Houston, Texas, USA



## GINN CENTER

Sugar Land, Texas, USA



## HOUSTON TECHNOLOGY CENTER

Houston, Texas, USA



## ARTIFICIAL LIFT RESEARCH AND TECHNOLOGY CENTER

Claremore, Oklahoma, USA



## DHAHRAN TECHNOLOGY CENTER

Dhahran, Eastern Province, KSA



## OIL & GAS TECHNOLOGY CENTER

Oklahoma City, Oklahoma, USA

# Crude Oil Prices since 1988

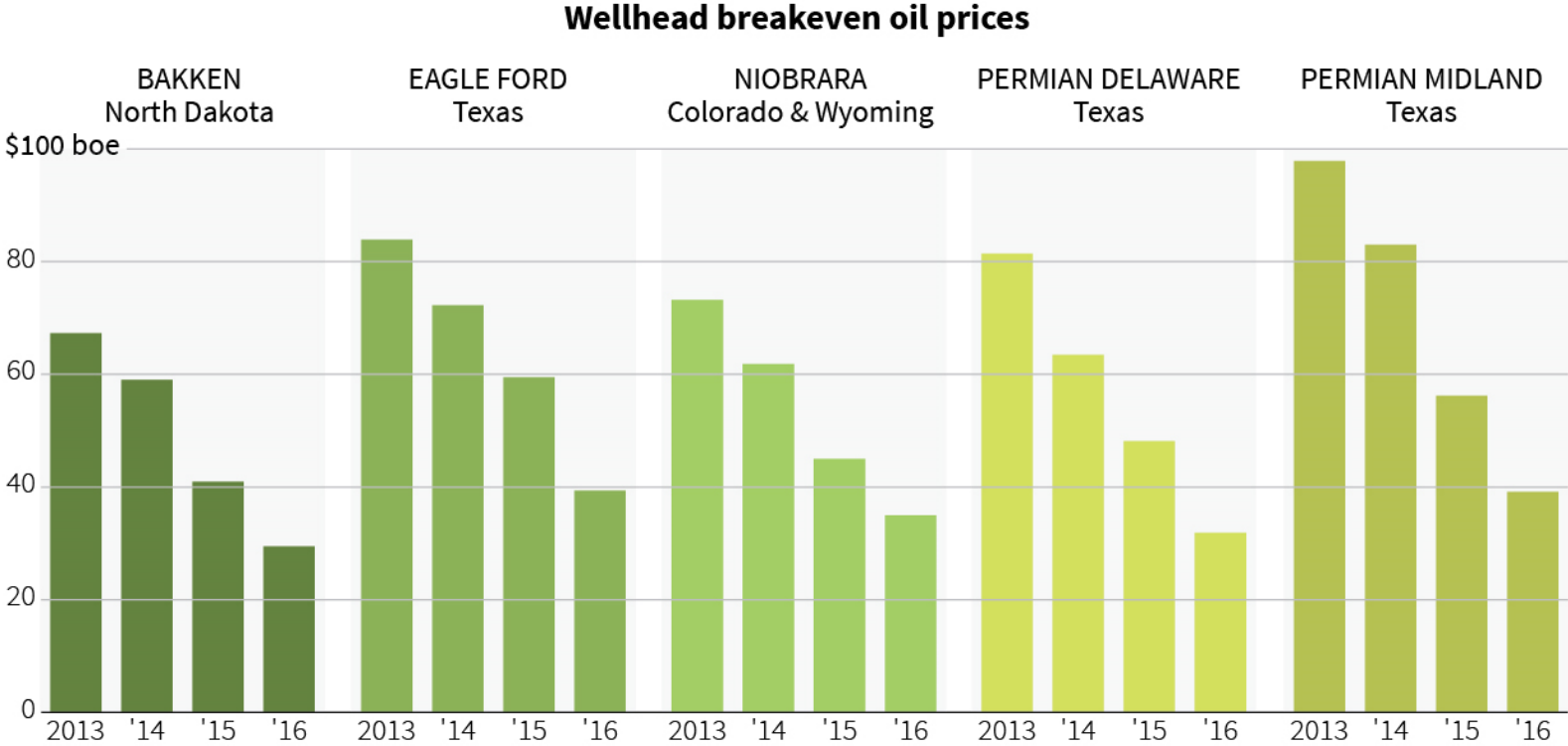


Oil Sands Magazine



# Falling Production Cost through use of new Technologies

## The falling cost of U.S. shale production



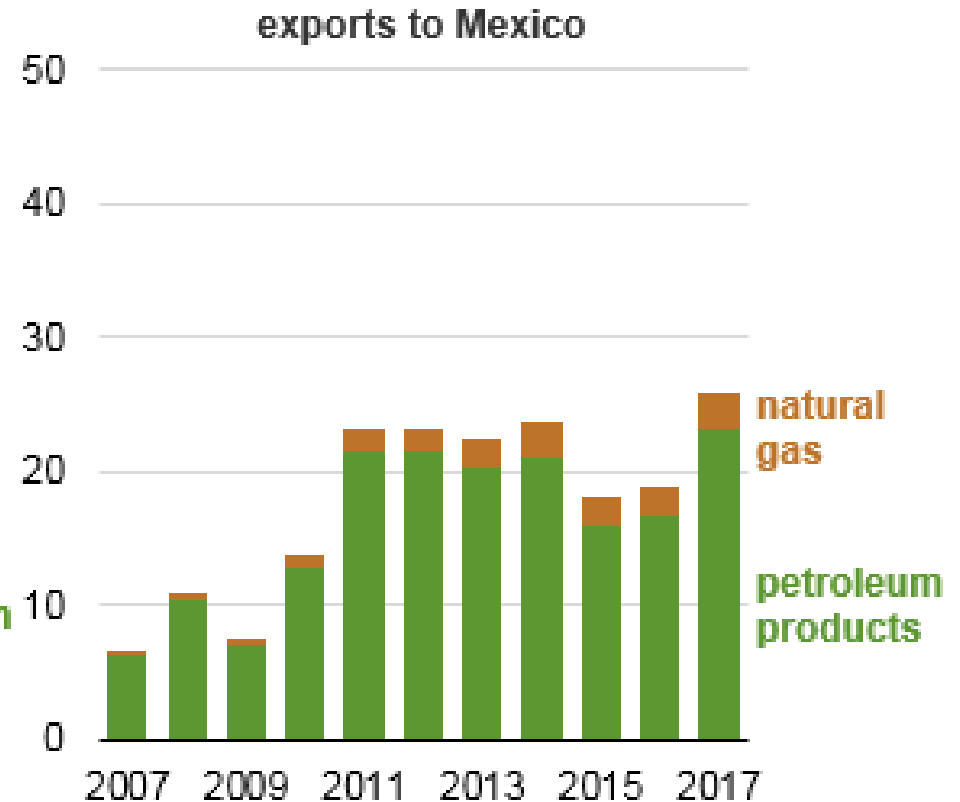
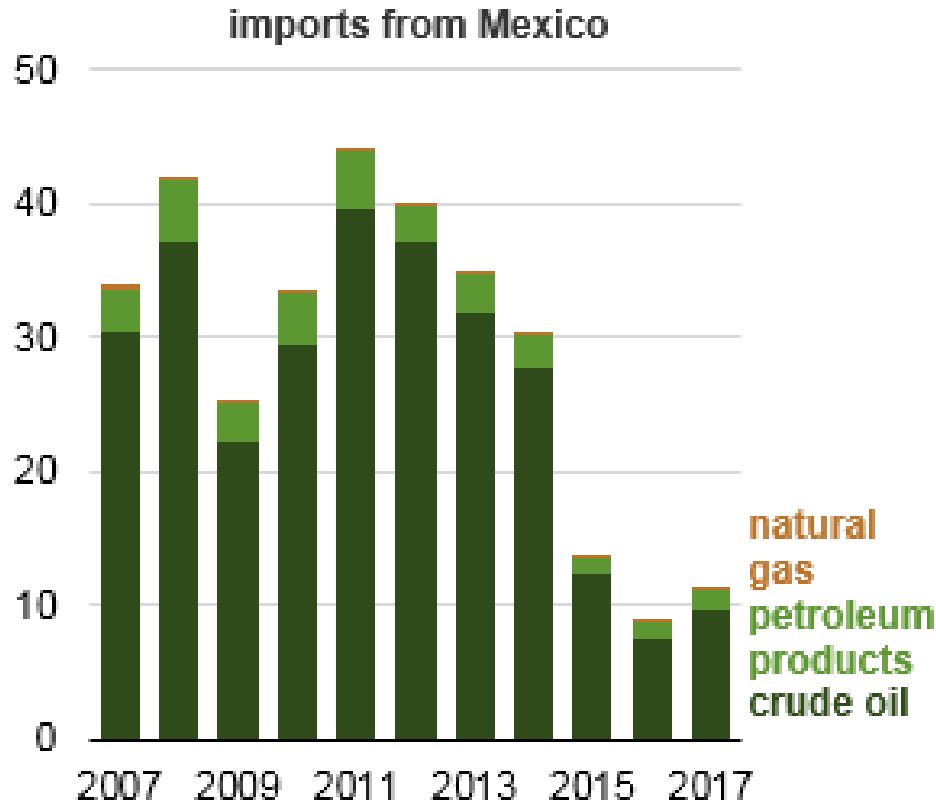
Source: NASWellCube

S. Culp, 29/11/2016



# New Technology Changes Market Dynamics

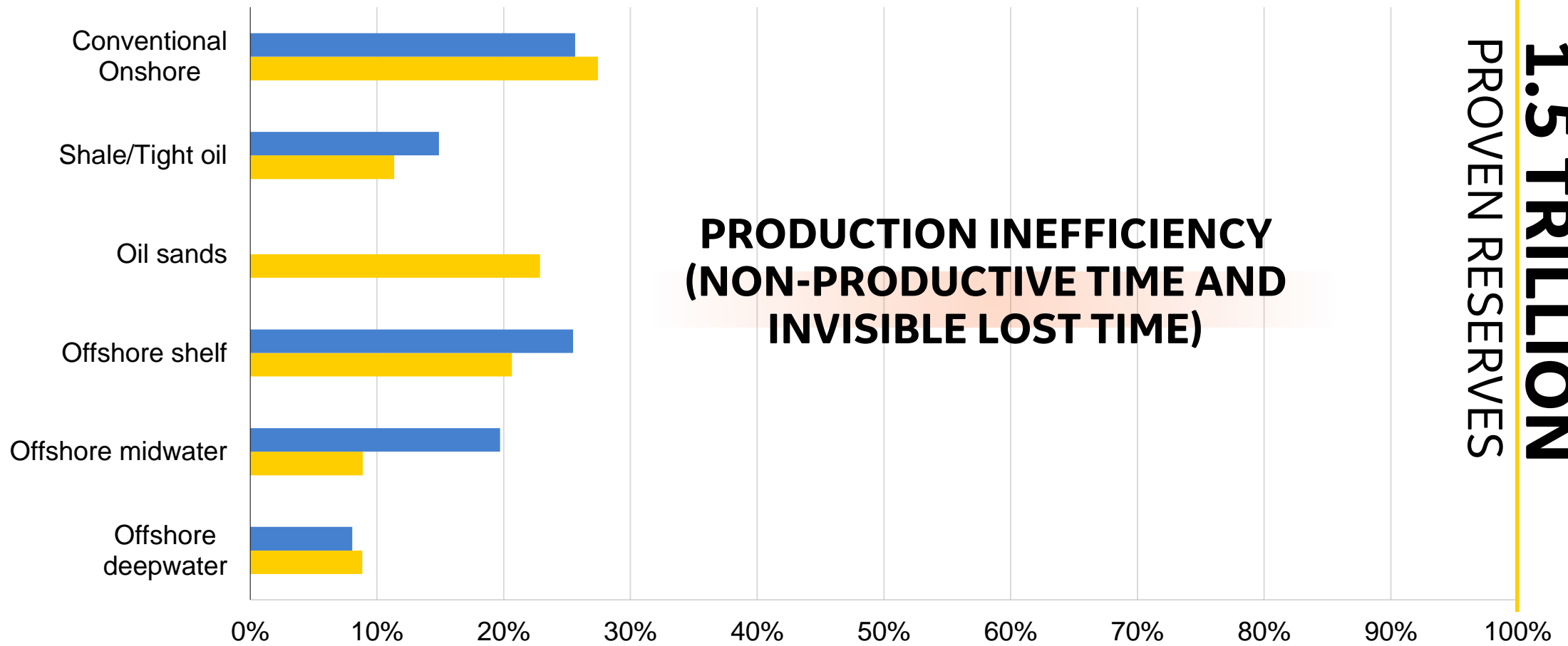
Value of selected energy trade between Mexico and the United States (2007-2017)  
billion dollars



# THE PRODUCTION/INEFFICIENCY GAP



■ Gas Proven (Bcf)



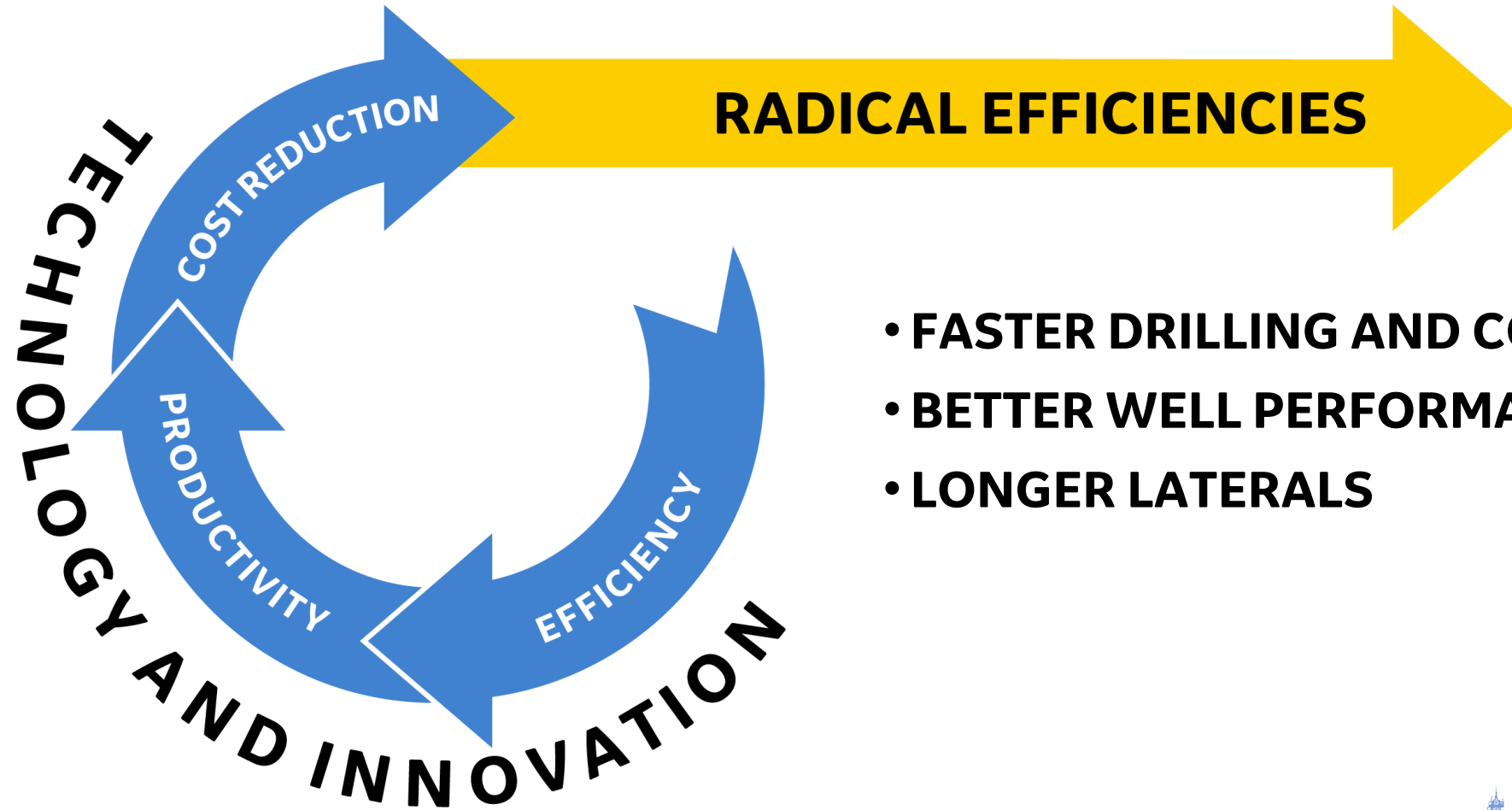
**PRODUCTION INEFFICIENCY  
(NON-PRODUCTIVE TIME AND  
INVISIBLE LOST TIME)**

**1.5 TRILLION  
PROVEN RESERVES**

**RECOVERY FACTOR**



# TECHNOLOGY AND INDUSTRY PERFORMANCE



- **FASTER DRILLING AND COMPLETIONS**
- **BETTER WELL PERFORMANCE**
- **LONGER LATERALS**





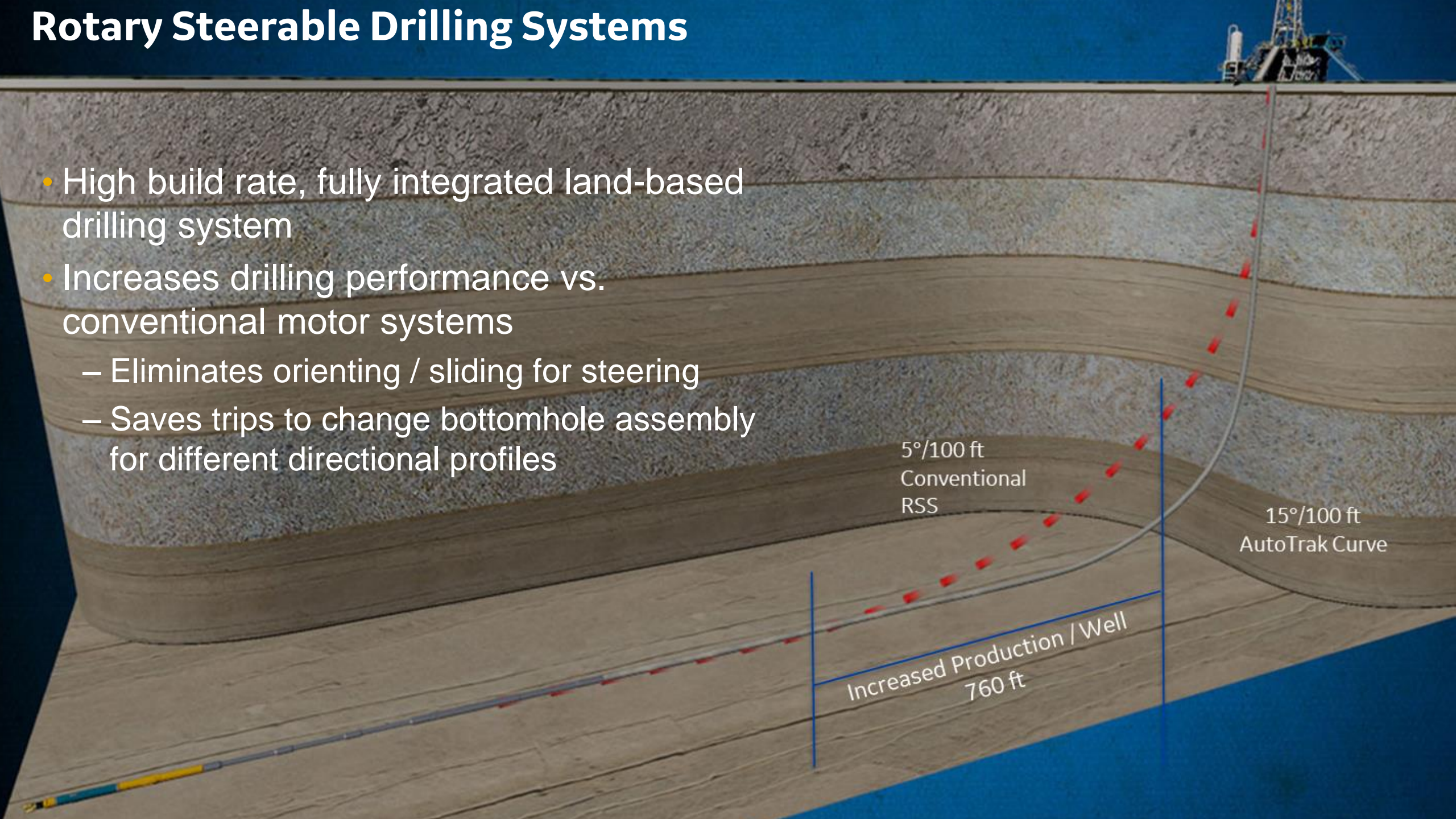
# Rotary Steerable Drilling Systems

- High build rate, fully integrated land-based drilling system
- Increases drilling performance vs. conventional motor systems
  - Eliminates orienting / sliding for steering
  - Saves trips to change bottomhole assembly for different directional profiles

5°/100 ft  
Conventional  
RSS

15°/100 ft  
AutoTrak Curve

Increased Production / Well  
760 ft



# The early days of modern drilling..1920s

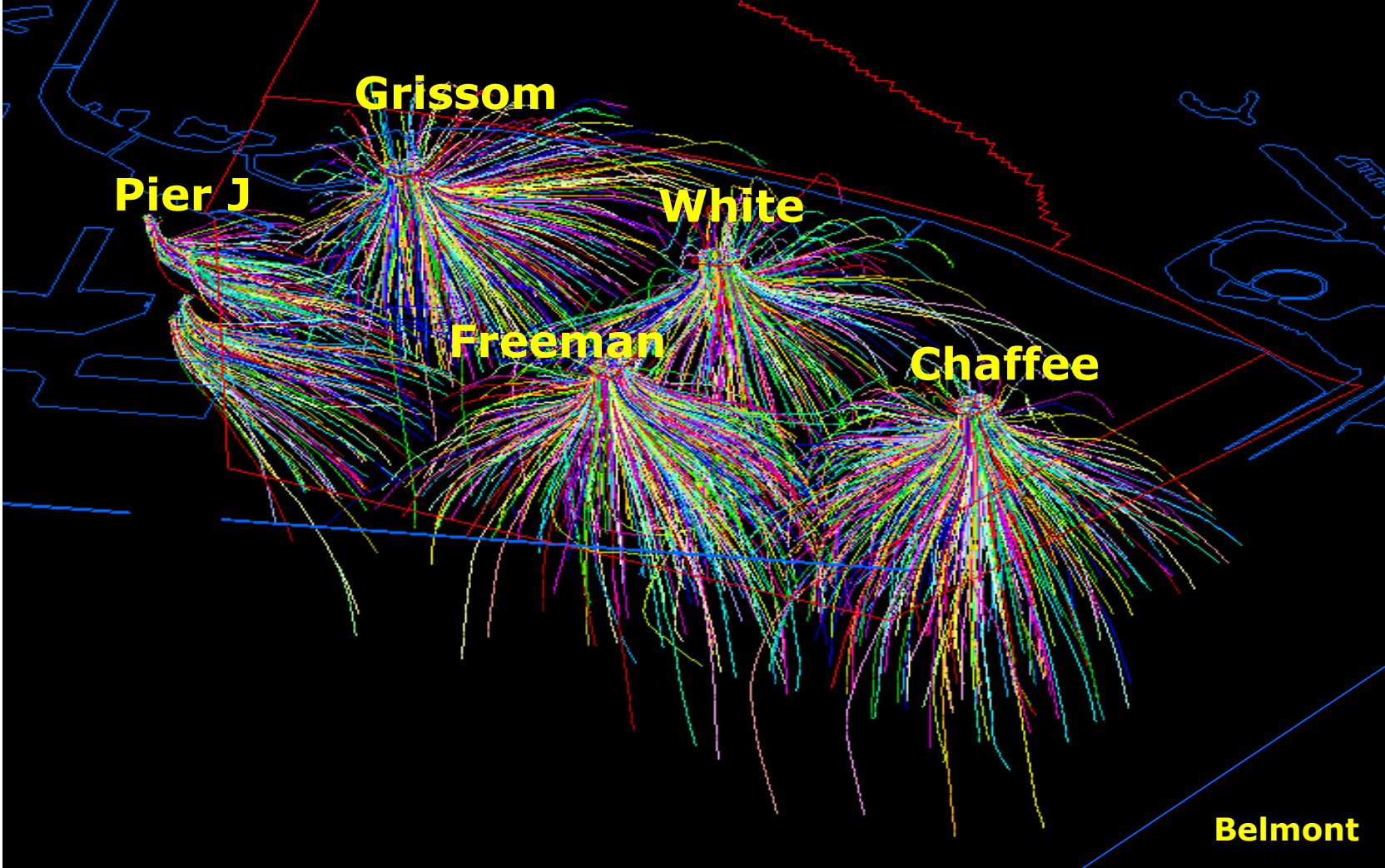


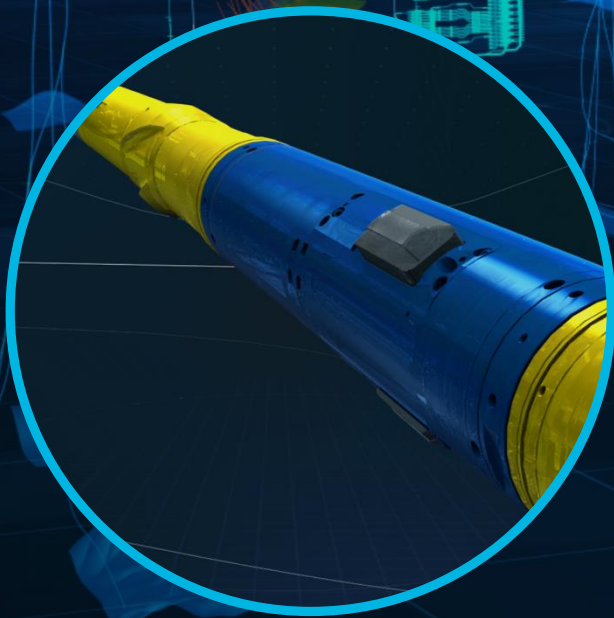
**Long Beach  
CA., Shoreline  
Drilling  
(1930's)**

# Today



# Directional Drilling

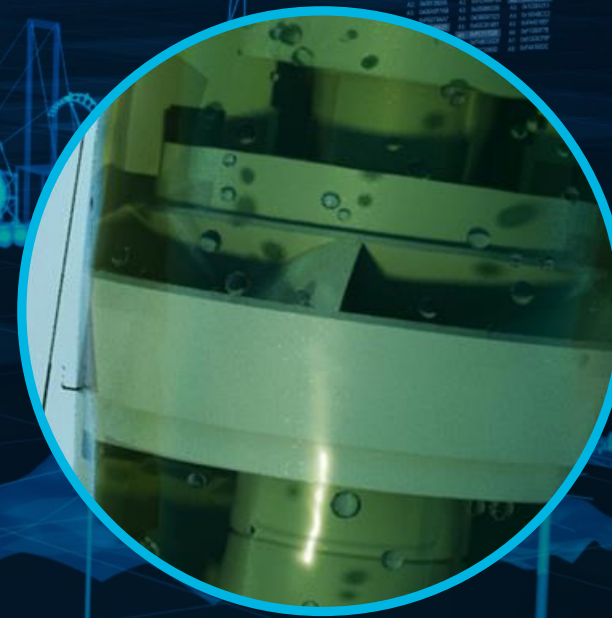




**ROTARY STEERABLE  
CLOSED-LOOP SYSTEM**



**SELF-ADAPTING  
DRILL BIT**



**AUTOMATED ESP  
MONITORING SYSTEM**



**EXACT  
WELL PLACEMENT**

**Landed thousands  
of complex wells  
flawlessly**

**SUPERIOR  
HOLE QUALITY**

**Drilled 120+ million  
feet of quality hole**

**FAST AND RELIABLE  
PERFORMANCE**

**Established numerous  
drilling records  
worldwide**



**MINIMAL  
TORQUE**

**Generated  
35% lower  
surface torque**

**FEWER  
TOOL FAILURES**

**Completed entire  
run with zero NPT**

**FASTER  
DRILLING**

**Improved ROP  
by 27%**

**MORE CONSISTENT  
PERFORMANCE**

**Reduced torque  
variation 90%**



**LOWER  
OPEX**

**\$800K USD  
monthly savings**

**FEWER  
FAILURES**

**Zero ESP  
shutdowns**

**FAST AND RELIABLE  
PERFORMANCE**

**25% production  
increase**



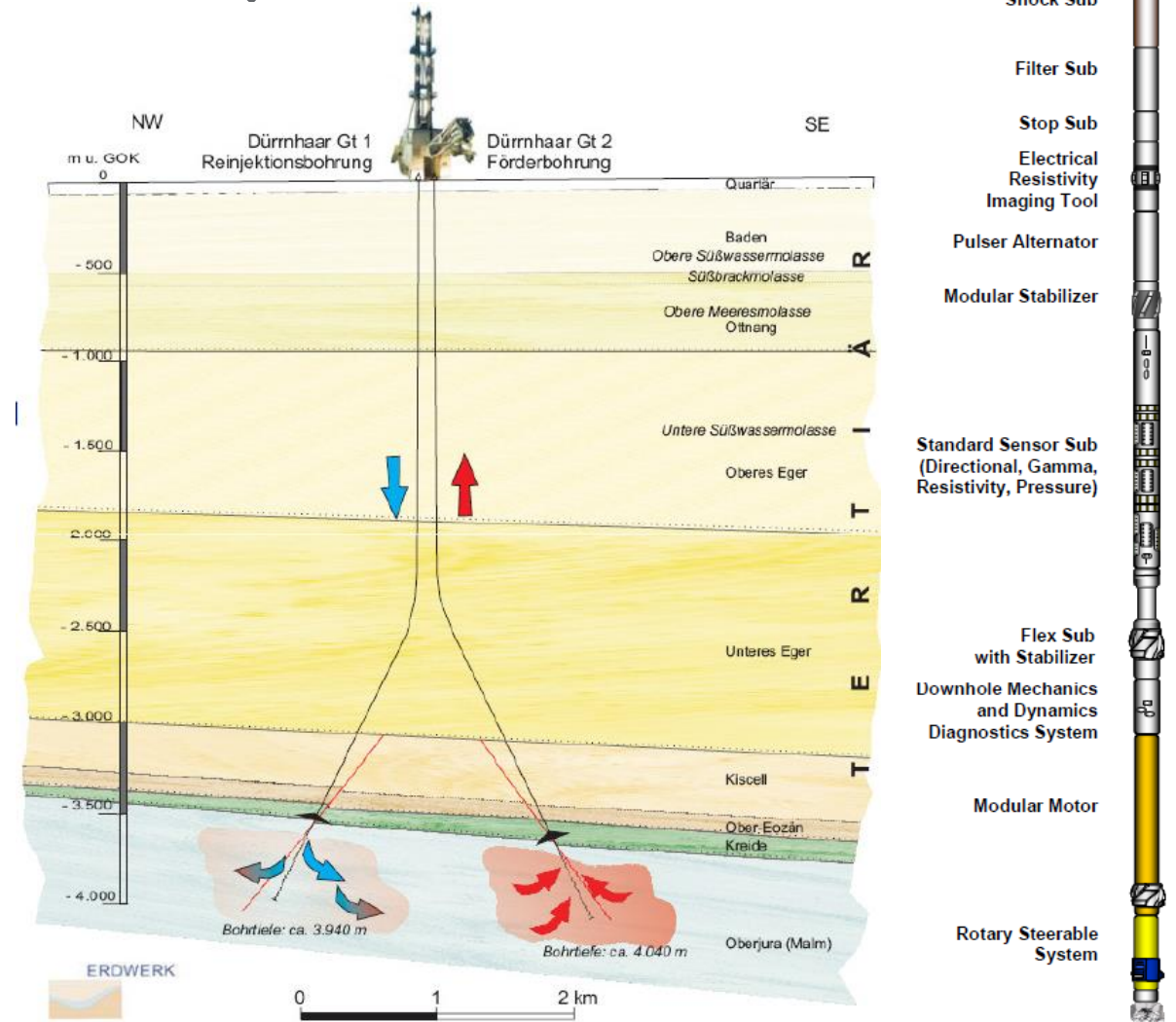


# Geothermal Drilling Example Germany

## Geothermal Wells in Bavaria

### Duerrnhaar and Kirchstockach KST GT2

- Central Well places
- Cost ~ 25 Mill EUR
- High build rate 8 ½“ hole to secure 125 – 140 l/s production rate
- BHGE Drilling Service enables ~80 % increase in drilling efficiency, saving 16 days of KST GT2
- 8 days saved for completion of well due to high wellbore quality



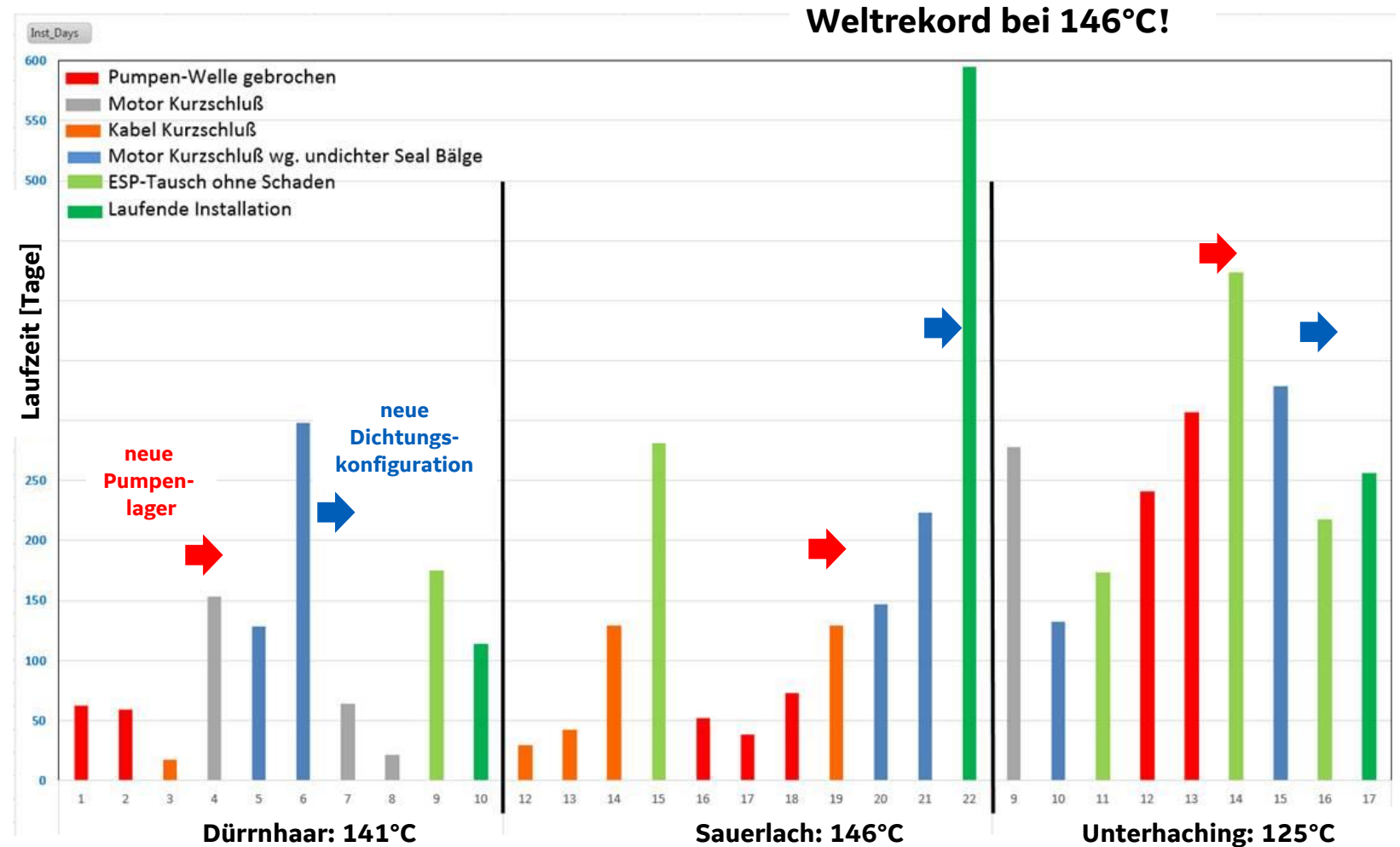
# 75% Cost Reduction of Operating Costs for Geothermal Pumps

## Neuentwicklung der Pumpenlager und Dichtungssysteme:

- Laufzeitverlängerung von durchschnittlich 60 auf 500 Tage
- Kosteneinsparungen von durchschnittlich 75%

### Aktuelle Laufzeiten (seit 2012)

Duerrnhaar	175T
Kirchstockach	499T
Oberhaching	723T
Sauerlach	600T
Traunreut	455T
Unterhaching	260T





EFFICIENCY  
TECHNOLOGY  
VALUE CREATION