EURASIA PROJECT
THE CHALLENGE OF A LIFETIME

CHALLENGES OF SUPER DEEP WELL

(CASPI-1)

IN THE PRE-CASPIAN BASIN

(A presentation on behalf of the Eurasia Project)

MAY 2018

KaraTau Consulting

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(The Eurasia Project Consulting Group)

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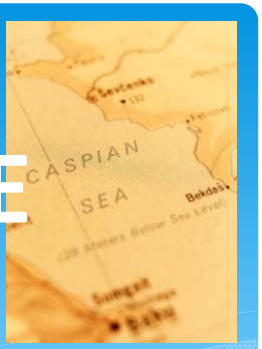

The Conceptual Exploration Project Program:

The project will be implemented in 3 stages

I. Collection, processing and reinterpretation of existing geological and geophysical materials taken from past years

II. Conducting large-scale complex geophysical studies, including the undertaking of regional seismic profiles (Geotraverse), in depth study (to a depth of 25-30 km.)

III. Planning, programming and drilling of a superdeep (up to 15 km) parametric vertical exploration well

The projected budgetary investment for all three stages is estimated to be in the order of $520 million United States Dollars spread over a 6 year period

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A **Memorandum of Understanding** was signed on June 21, 2017 with all current interested parties (KazMunayGas, Agip, Rosneft, CNPC, SOCAR, NEOS) on the one hand and the Minister of Energy and Chairman of Geology Committee on the other hand on behalf of the RK Government. In the **MOU** signing ceremony Mr. Sagintayev, RK Prime-Minister was also present. After that, according to the **MOU**, negotiations are currently being held for creation of the Consortium with the companies which signed this document.

Also, regional geological & geophysical data from the Pre-Caspian basin are being at present collected and updated.

Проект сверхглубокой скважины планируется начать в будущем году

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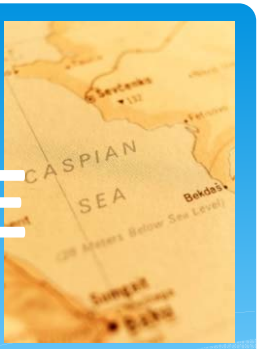

Historical Benchmarks …….

- KOLA well, Kola Peninsula, Russia, 1970-1994, Depth 12,262m. (Projected TVD 15km)
- Bertha Rodgers well, Oklahoma, USA, 1973-1974, Depth 9,583m. (Projected TVD 10km)
- KTB well, Bavaria, Germany, 1990-1994, Depth 9,100m (Projected TVD 10km)

……to a new generation of record breaking innovators who continue to push the limits …….
Recent Gulf of Mexico and Sakhalin-1 wells:

- UNOCAL – Green Canyon 512 – 10,423m (vertical) 2005
- BHP – Green Canyon 817 – 10,353m (vertical) 2010
- HESS Corp – Green Canyon 468 – 10,038m (vertical) 2007
- Noble Energy – Mississippi Canyon 992 – 10,005m (vertical) 2013
- Anadarko Corp – Walker Ridge 51 – 9,788m (vertical) 2015
- BP TIBER – Keathley Canyon 102 – 10,685m (vertical) 2009
- EXXON-ROSNEFT-ONGC-SODECO: Sakhalin/Orlan – 15,000mD/3600mTVD (horizontal) 2017

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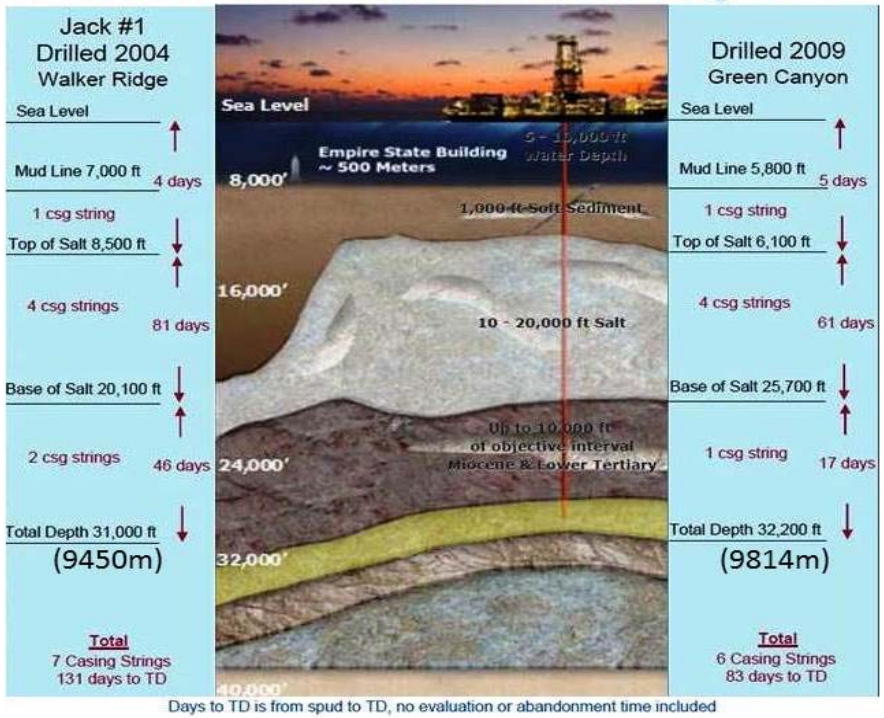
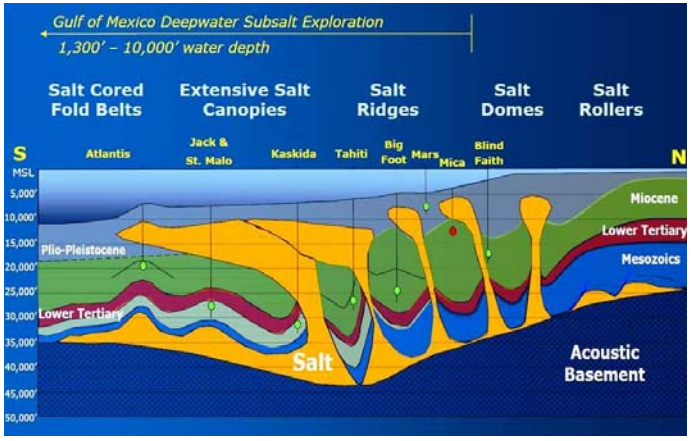
Chevron's Wilcox Drilling Performance Progression Since 1st Discovery Well



Days to TD is from spud to TD, no evaluation or abandonment time included

CHEVRON USA GOM
Vertical Deep Water Drilling
Through massive salt sections
9450mTVD, 7 casing strings, 131 days in 2004



GREEN CANYON - 9759mTVD, 6 casing strings, 83 days in 2009

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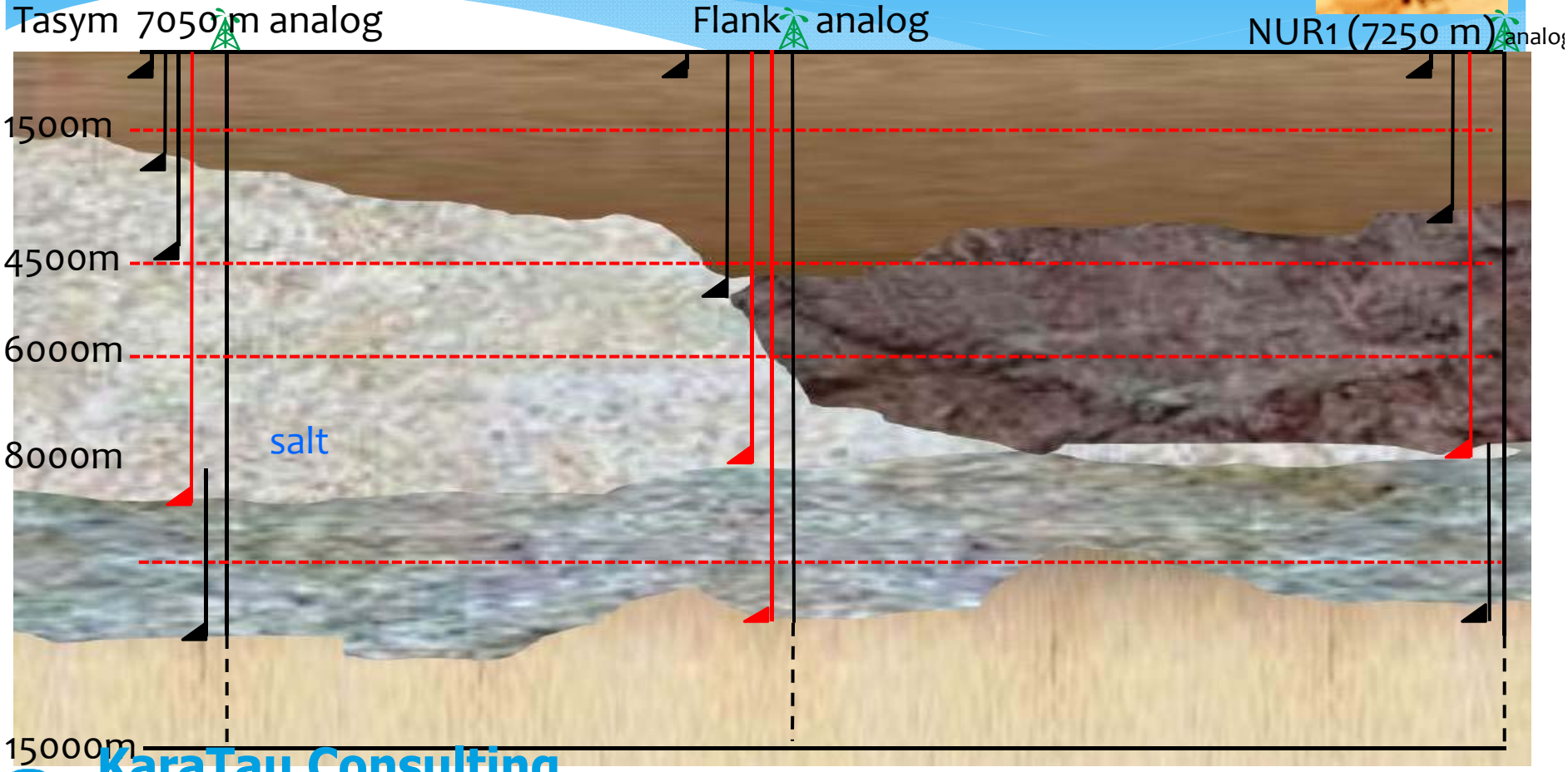

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When do we intend to start?
Where will the well be drilled?

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Technical Publications and Studies

The industry has already recognized that future exploration requires new equipment, processes and techniques. Recent technical papers published by the Society Of Petroleum Engineers report on a number of areas that are being addressed by operators and service companies alike as drilling reaches new depths and new challenges. The following are just a few of the papers published online (exact publication details can be provided by KTC or SPE):

- **Problems of Ultra-Deep High-Temperature, High-Pressure Drilling**
- **Ultra-Deep Drilling Pushes Drilling String Technology Innovations**
- **Titanium Drill Pipe for Ultra-Deep and Deep Directional Drilling**
- **Drilling Fluid Challenge During The Ultra-deep HT/HP/HS Drilling in The Mountainous Area, Tarim Basin**
- **Formation Evaluation in Ultra-Deep Wells**
- **Challenges of Drilling an Ultra-Deep Well in Deep water - Spa Prospect.**
- **Drilling of an Ultra-Deep Exploratory Well - Problems and Solutions: A Case Study.**
- **Drilling Technology of HTHP Ultra-Deep Well and the Crucial Technique Application**

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Some results of thinking outside the box:

New technologies with new materials being used in modern sciences and other industries (the space sector, seismology, subsea surveying) are being investigated to help develop casing, wellhead equipment, geophysical tools, drilling fluids, drilling bits and other in-hole tools that can withstand the extreme down hole conditions that can be expected when drilling an ultra-deep well to 15000mTVD. Listed below are just a few of the recent advancements being made in equipment fundamentals required to undertake this ultra deep project:

- Drilling rig capable of vertical drilling to 15000mTVD? **BENTEC's Giant Rig**
- BOP & choke manifold rated @ 35,000 PSI? **McMoRan-CAMERON 25,000 PSI EVO BOP**
- Drill pipe and casing grades and couplings rated for extreme loads at depths of 12000 to 15000m. **VAM VALLOUREC**
- Geophysical logging tools and in-hole mechanical tools (jars, bits, MWD, LWD, PDM, Turbines) capable of withstanding extreme pressures and temperatures. **HALLIBURTON, WEATHERFORD, SCHLUMBERGER, US DOE & BAKER HUGHES/GE**

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BIG RIGS FOR DEEP OIL AND GAS

Key Design of Main Drilling Rig

Hook load 750 t – 800 t
Mast height - Triple or Quad stands (Range 2)
Racking Capacity - 20,000m with BHA
DP - 6 5/8“ & 5“ DP/HWDP with HT connections
TQ app. 90,000 ft-lbf/122,000 Nm
Free Height under RT Beams - 9m minimum
Substructure skiddable – multidirectional
Standpipe - 7,500 psi / 518 bar
HP - 3,900 l/min @ 420 bar = 3,660 HHP
Pipe Handling mechanized, rig and catwalk max. 30“, pipes in doubles

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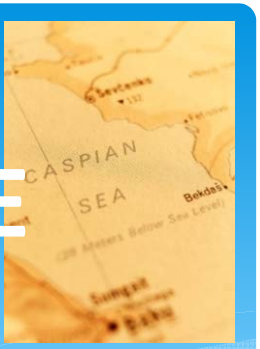
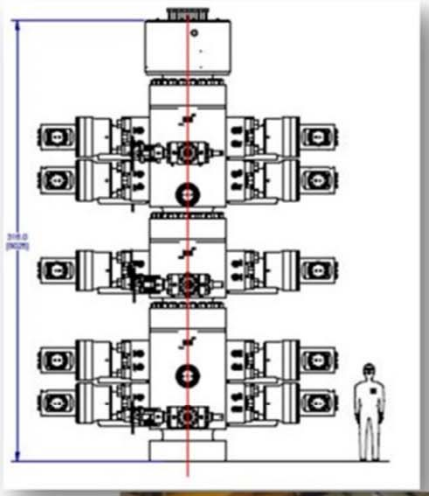


BIG BOP WELL CONTROL FOR DEEP OIL AND GAS



Investing in the Future – Technology

EVO™ 13-5/8"
25,000 psi BOP
The industry's first

McMoRan

CAMERON
A Schlumberger Company

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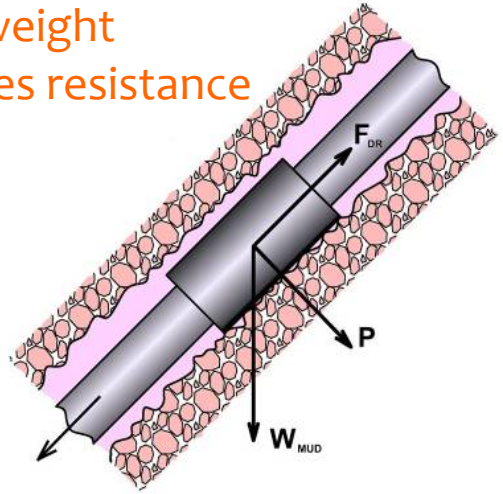
BIG DRILL PIPE FOR DEEP OIL AND GAS

Vallourec solutions for ultra deep 15 km well

Less weight reduces resistance force



- High torque connections
  - VAM Express
  - VAM X-Force
- High strength Drill pipe grades
- High strength sour service grades

DP 5”	Tensile yield	Weight per meter	ID
S-135, 5”, 0,361”wt	3167 kN	37,0 kg/м	108,7мм
VM-165 DP, 5”, 0,3” wt	3251 kN	30,9 kg/м	111,8 мм
VM-165 DP, 5”, 0,361”wt	3871 Kn	37,0 kg/м	108,7мм

* Weight per meter vs. resistance forces

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BIG CASING FOR DEEP OIL AND GAS

Vallourec solutions for ultra deep 15 km well

HP/HT connections for HP/HT applications

- The below connections have been used on HPHT wells around the world

Name	Perf	Compression	OD range	Application	Segment
VAM 21 /HT	CAL IV	100%	5"-14"	Highest Performance Casing	Advanced
VAM TOP HC	CAL IV	100%	4 ½"-9 5/8"	High compression	Advanced
VAM TOP HT	CAL IV	80%	4 ½"-7 5/8"	High Torque	Advanced
VAM TOP Tbg	CAL IV	100%	2 3/8"-4 ½"	All tubing	Conventionnal
VAM TOP Csg*	NAMTEO3 to CALIV	60%-80%	5"-16"	All Casing	Conventionnal
VAM HP	CAL IV	60%	7 5/8"-10 ¾"	High external pressure - HPHT	Advanced
VAM HTTC	CAL IV	100%	4 ½"	High Torque	Advanced
VAM SLIJ-II	CAL II to CAL IV	70%	4 ½"-16"	Liner, Clearance Casing	Conventional
VAM FJL	NA	40%	2 3/8"-11 7/8"	Flush liner, Extra Clearance	Conventional
VAM HTF	CAL IV	60%	4 ½"- 9 7/8"	High torque liner	Advanced
VAM MUST	NAM TEO3	60%	7 5/8"-10 ¾"	Salt dome, High collapse	Advanced
VAM SG	NA	70%	4 ½"-5 1/2"	Shale gas	Conventional
VAM BOLT	~ CAL II	100%	16"-18"	Offshore surface Csg	Advanced

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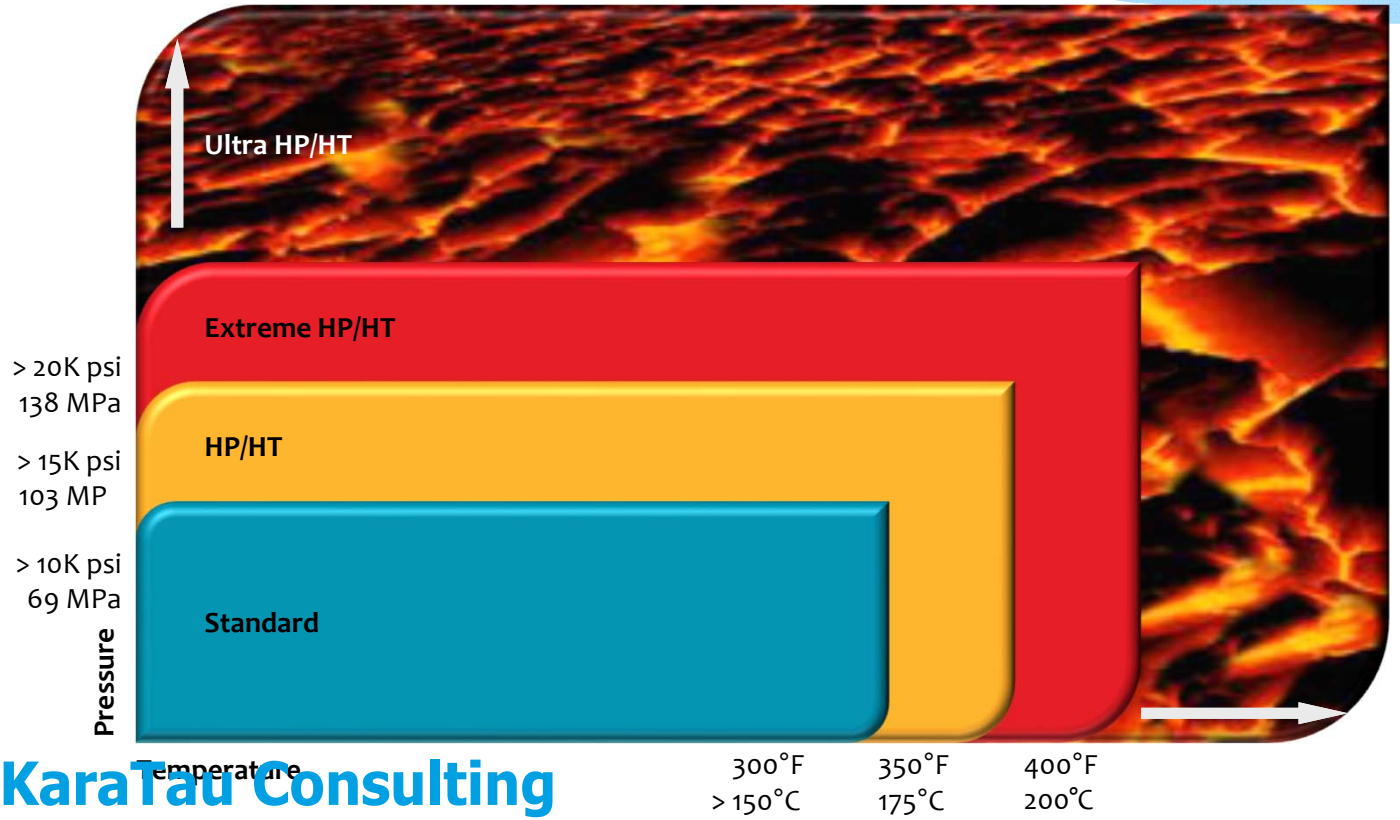
BIG SOLUTIONS FOR DEEP HPHT

How HALLIBURTON defines HP/HT



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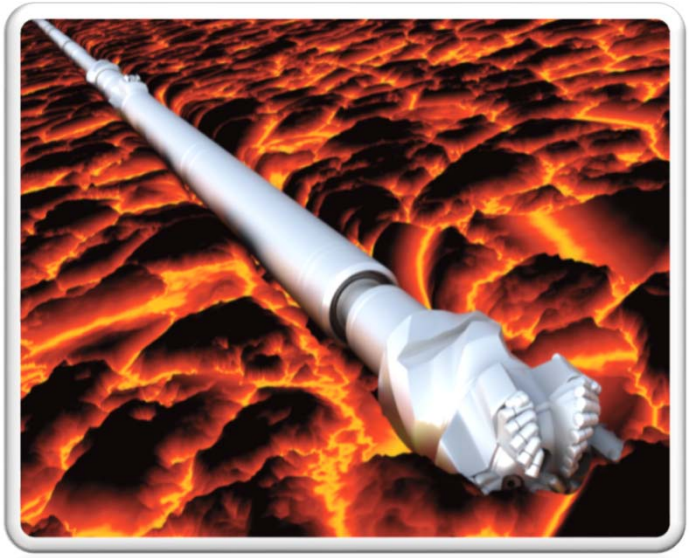
BIG SOLUTIONS FOR DEEP HPHT

HALLIBURTON drilling tools for HP/HT

- Reduced NPT through zero-impact tool control and unprecedented reliability
- Excellent quality logging and cementing operations
- Longer bit life, fewer trips
- High dogleg capabilities in soft formation
- **Rated up to 350°F/175°C and 30,000 psi**



* Geo-Pilot® Rotary Steerable Systems

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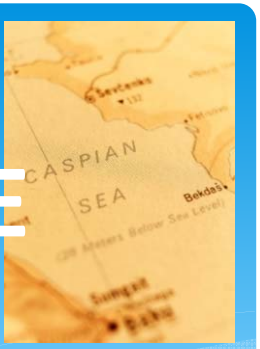
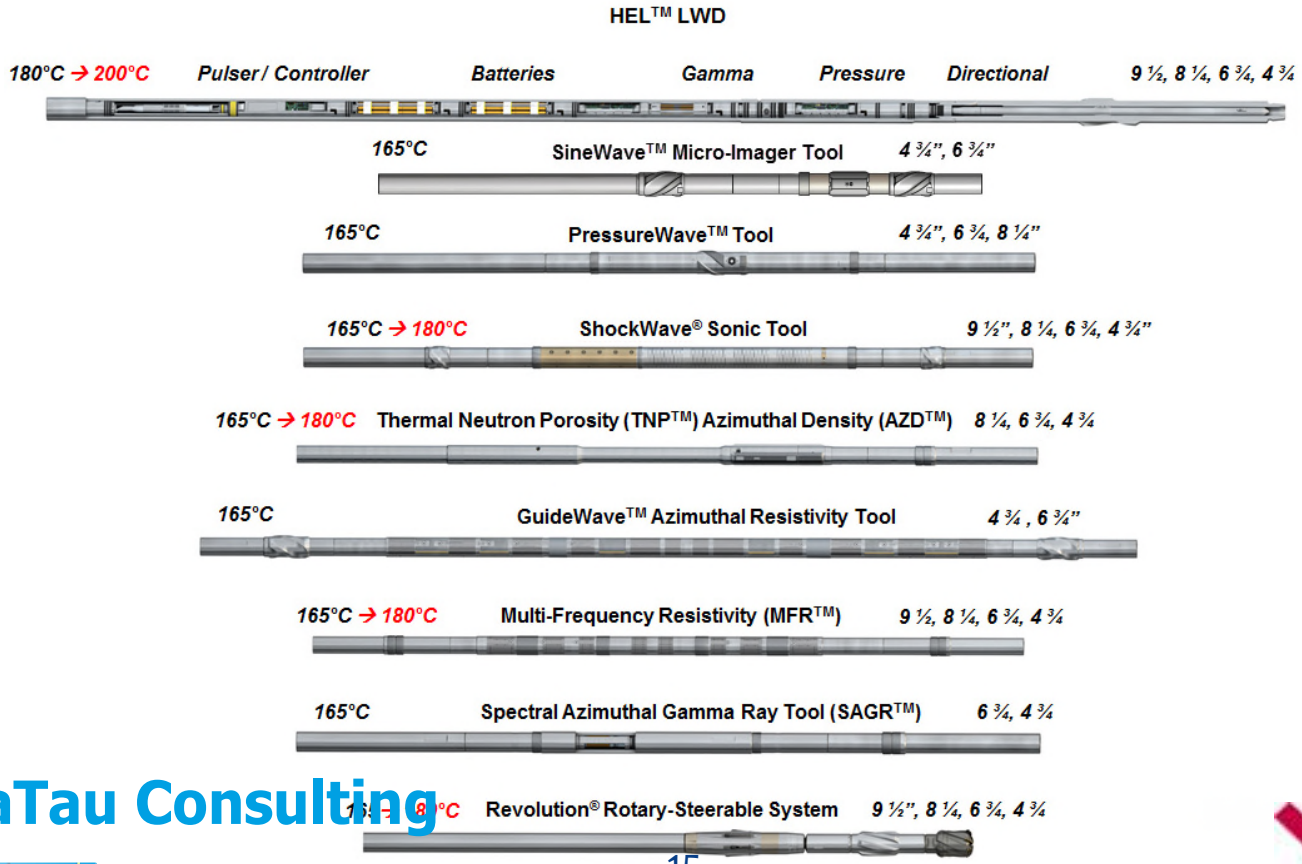
BIG SOLUTIONS FOR DEEP HPHT



WEATHERFORD LWD System 165-200 C, 30000 psi



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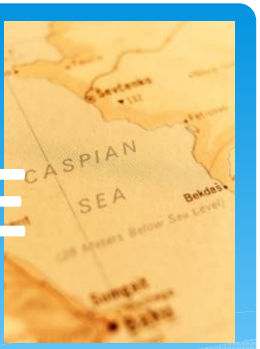
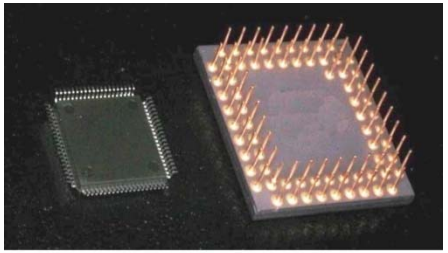
BIG SOLUTIONS FOR DEEP HPHT



SCHLUMBERGER



Plastic-encapsulated electronics on a plastic board (left), and ceramic-encapsulated electronics on a plastic board (right).

Proven, High Temperature Operating Envelopes

Reliable Schlumberger HT downhole tools reduce the risks inherent in drilling and evaluating HT wells. We have a full range of DD/MLWD services.

Service	Tool	Max. Operating Temperature		
		825 Collar	675 Collar	475 Collar
Turbodrill	Neyrfor Turbodrill	●	●	●
Motor	PowerPak HT	●	●	●
	PowerPak ERT HT	●	●	●
RSS	PowerDrive X6 HT	●	●	●
	PowerV HT	●	●	●
	PowerDrive vorteX HT	●	●	●
MWD	TeleScope HT	●	●	
MWD-GR	SlimPulse HT	●	●	●
MWD-GR-Res	ImPulse HT			●
APWD	VPWD HT			●
GR-Res-APWD	arcVISION HT	●	●	
Dens-Neut	adnVISION HT		●	●
Sonic	sonicVISION HT	●	●	
Sonic	SonicScope HT			●
Full LWD	EcoScope HT		●	
FPWD	StethoScope HT		●	

● Rated to 260 degC [500 degF] ● Rated to 190 degC [375 degF] ● Rated to 175 degC [350 degF] ● Rated to 165 degC [330 degF]

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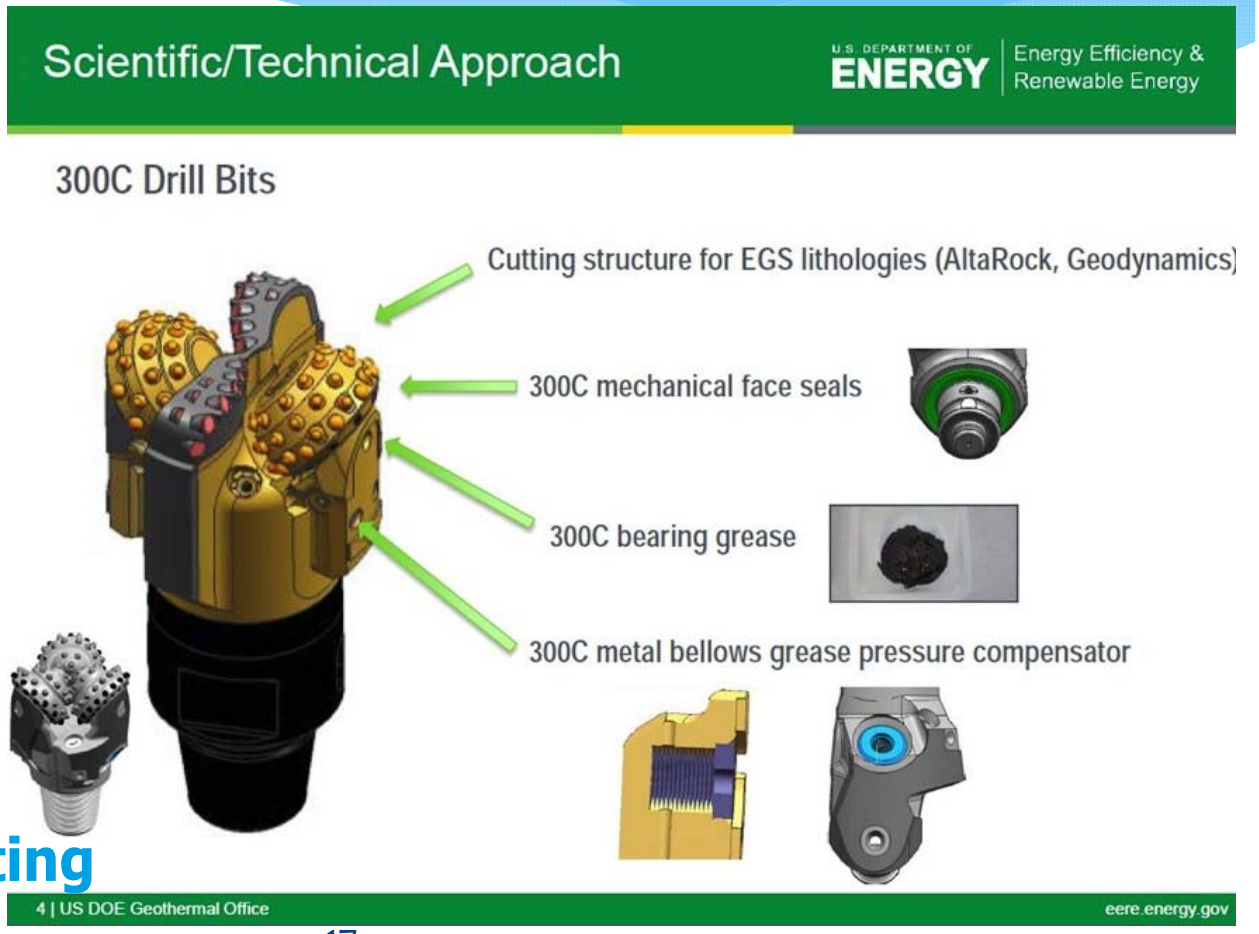
BIG SOLUTIONS FOR HPHT GEOTHERMAL

BAKER HUGHES

Collaboration between the US Department of Energy and leading service companies such as Baker Hughes resulted in R&D for drilling bits to combat extreme temperatures in geothermal drilling



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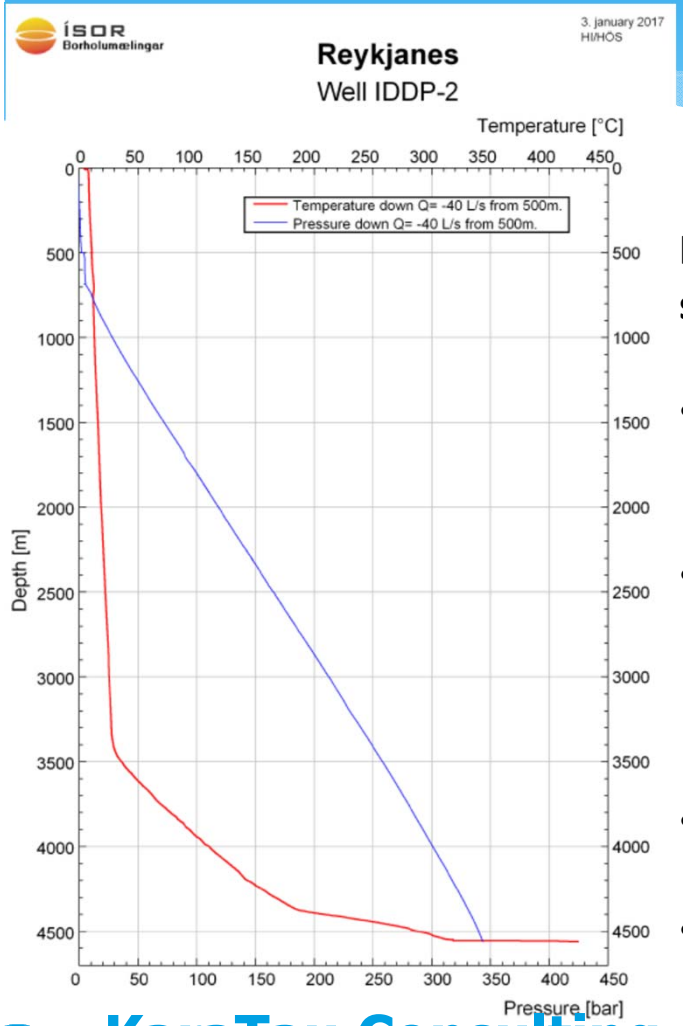
DEEP GEOTHERMAL WELL PRODUCES INCREDIBLE BHT



Iceland's Deep Drilling Project geothermal well at Reykjanes successfully completed.

- **Drilling of the IDDP-2 well was completed on the 25th of January 2017 at 4,659 meters depth.**
- **Temperature at the bottom of the well has already been measured at 427°C**
- **Bottom hole fluid pressure of 340 bars**
- **The drilling operation took 168 days since we began the drilling operation 11th August 2016.**

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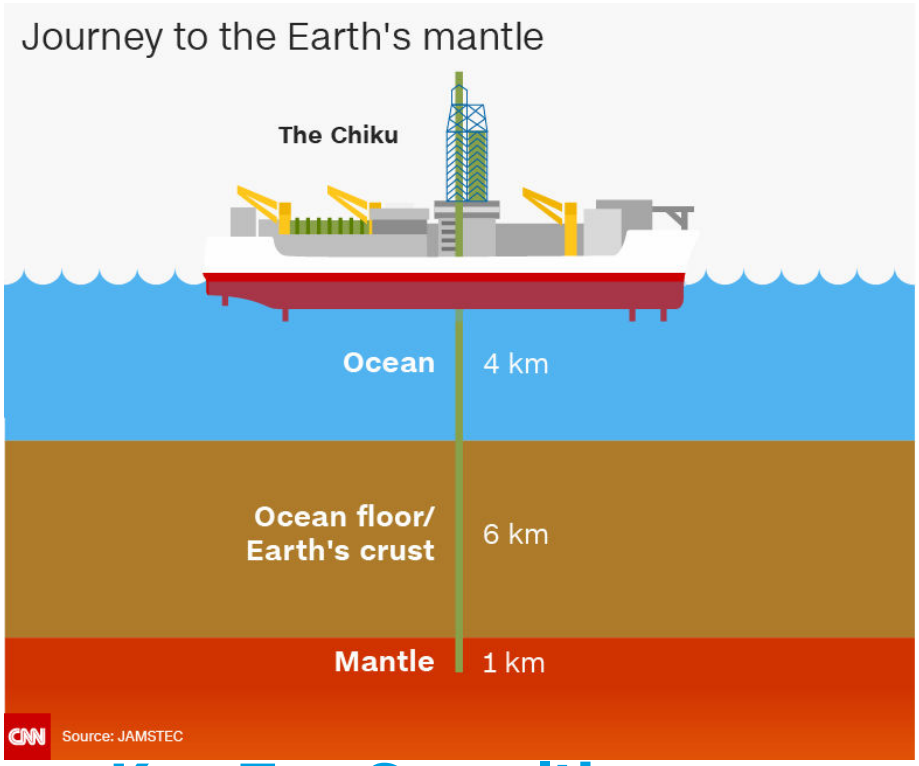
FUTURE COLLABORATIVE PARTNERS?



Japan's Agency for Marine-Earth Science and Technology's (JAMSTEC) largest drilling ship "Chiku" is planned to be used by a group of international researchers to drill into the Earth's mantle for the first time. The JAMSTEC team will conduct preliminary studies offshore Hawaii in September 2017 to determine if that's the best site to drill. Alternative sites are offshore Costa Rica and Mexico. Drilling will have to go through 4km of water and 6km of crust to reach the mantle. The Japanese government is providing partial funding for the project as part of a study on surface phenomena. The project will investigate the boundary between the oceanic crust and the mantle and also see if microbial life exists at that depth. They hope to begin drilling by 2030. First, they need to find the perfect location and figure out where to get the $542 million funding the project needs.

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ANY QUESTIONS?

ANY IDEAS?

ANY TOPICS FOR DISCUSSION?

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