UltraDeep Energy Company
Deep & Ultradeep Well Construction
Proprietary Dual Gradient Drilling Technology

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UltraDeep Energy Overview Revision 1.0
Dual Gradient Technology – Enabling Large Bore Geothermal & Deep Gas

- More than one fluid gradient used in well construction.
- Significantly reduced casing strings creating time and cost savings.
- Increased well integrity with superior wellbore cement construction.
- Enables large bore access to deep and ultradeep targets.
  - Deep - depth range 15,000 – 25,000 ft TVD
  - Ultradeep - depth range 25,000 – 35,000 ft TVD
- Reduced carbon footprint through reduced materials and time savings.
Technology Brief - Dual Gradient Drilling vs Single Gradient

DGD vs. Conventional Top-Down Casing Point Selection (Pressure Only)
The Dual Gradient Drilling System re-establishes a margin of safety not obtainable in a single gradient system. Even the popular variant of Managed Pressure Drilling called Constant Bottomhole Pressure falls short of providing all of the well control benefits associated with DGD.

The most impressive aspect of Dual Gradient Drilling is that it is as safe or safer than current conventional drilling techniques AND provides for full riser margin, where the well is fully controlled in the event of riser disconnect AND problem wells can be drilled and completed....
Onshore & Shelf New Technology Well Construction
Deepwater Origin & Future Enabler

Original Technology Development
- Deepwater

New Technology Adaptations
- Onshore Adaptation
- Shelf Adaptation
- Adaptation Applications
  - Geothermal well construction.
  - Deep and ultradeep gas.
  - Well construction time & cost savings.
  - Over pressurized reservoir solution.
**Dilution DG – Technology Adaptation**

*Surface & Subsurface Proprietary Technology*

**Surface Equipment**
- Drilling fluid separation package 500gpm
  - Whole Mud
  - Dilution Mud

**Subsurface**
- Flow Stop Valve
  - Controls U-Tube effect

![Flow Stop Valve](Image)
Ultra Deep Well Construction & Days vs. Depth

**DG - 80 days / SG - 140 days**

**Days vs Depth**

- Set 36" Install Diverter
- Run and Cut 26" Lar
- Install 16" Inj Lar
- Run and Cement 20" Install Test BOP
- Run and Cut 16" Lar
- Run and Cement 13 5/8" Liner
- and TB at 9,000 ft
- Run & Cut 14 7/8" Lar
- Drill 12 1/4" Hole w/Dual Gradient Mud
- Run and Cement 9 5/8" Lar
- E-Log / Run and Cement 4 1/2" Lar

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**ULTRA DEEP WELL DESIGN**

- Single Gradient versus Dual Gradient Mud
- SG - 8 x Casing Strings / DG - 4 Casing Strings

- Reason we can drill deeper w/ Dual Gradient Mud, it creates
  - 1.5 ppg Mud Window at each test Casing Shoe

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**Mud Weight (PPG)**

- MWD-DOG
- MWD-DGS
- Overbalance Pressure
- 0.5 ppg below Fac
- SG MW Shake off
- SG MW Deep
- RP Estimate
- 0.5 ppg above HP
- PPU Estimate
- Casings
**Ultradeep GoM Onshore & Shelf Gas Reserves**

**Overview**

**Conventional attempts & demonstrated presence of deep and ultradeep reservoirs**

- McMoRan attempt: Davy Jones – spend $800M+
- ExxonMobil attempt: Blackbeard – spend $300M
- Shell attempt: Joseph – spend $120M
  - (Note: Dr. Eric van Oort participated in this effort)
- Freeport McMoRan: Onshore Highlander Discovery (29,400 ft TVD)
  - 75MMcf/Day successful production test (2/20/2015)
  - Sold Q1 2019 to Magnolia Oil & Gas Corporation.
- Chevron – Lineham Creek – abandoned at 24,000 ft.

**Discovery Well**

- Wilcox Sands with 13-15% Porosity

**Wilcox Sands**

- Gas-bearing
- Resistivity log
Drilling activities to date have successfully confirmed geologic model and have indicated the potential for a major new geologic trend spanning 200 miles in the shallow waters of the GOM and onshore in the Gulf Coast area.

Source: Freeport-McMoRan, Management Presentations; New York City; June 24, 2013
Gross Unrisked Potential* Exceeds 100 Tcfe

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