

DEEPLIGHT drilling, how it works?

DEEPLIGHT - Novel concepts to construct cost effective geothermal wells with Electro Pulse Power Technology

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The contents of this presentation reflect only the view of the author(s) and do not necessarily reflect the opinion of any of these funding agencies.

The image shows the "Deep Light" logo in white text on a yellow background. The word "Deep" is on the top line and "Light" is on the bottom line, with a small star icon below the "t" in "Light". The background of the entire slide is a composite image: on the left, a dark silhouette of an oil drilling rig against a sunset sky; on the right, a large, bright orange and yellow sun or moon in a dark space background. A white diagonal line separates the two scenes.

Deep
Light

Advancing geothermal energy

Hard rock drilling

Non-mechanical rock breaking

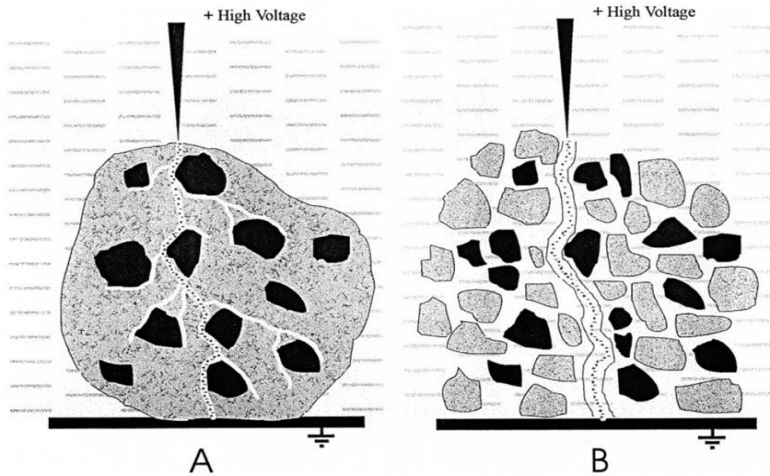
Electro Pulse Power Drilling

Energy efficient drilling

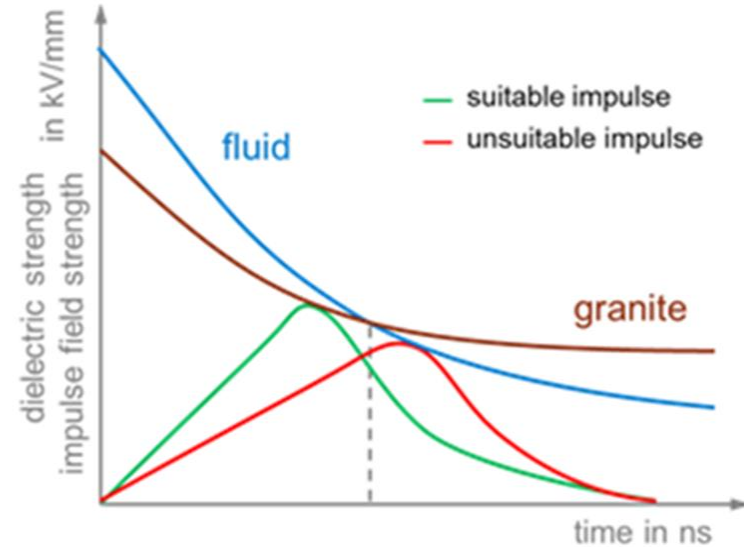
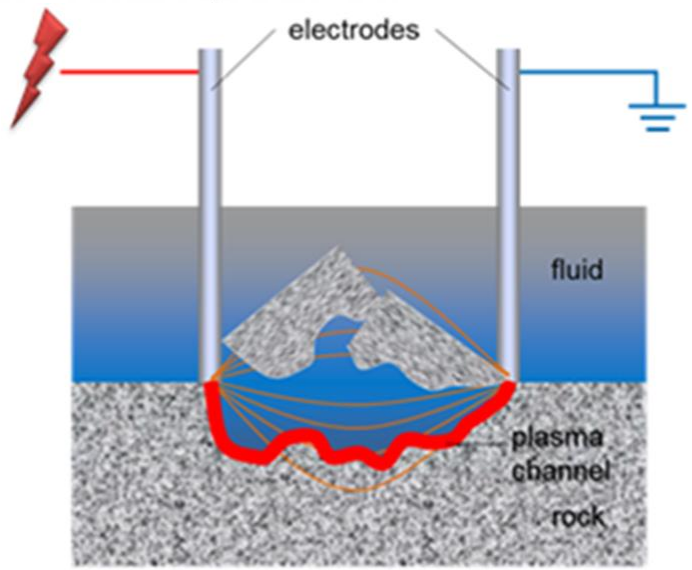
Enabling technology



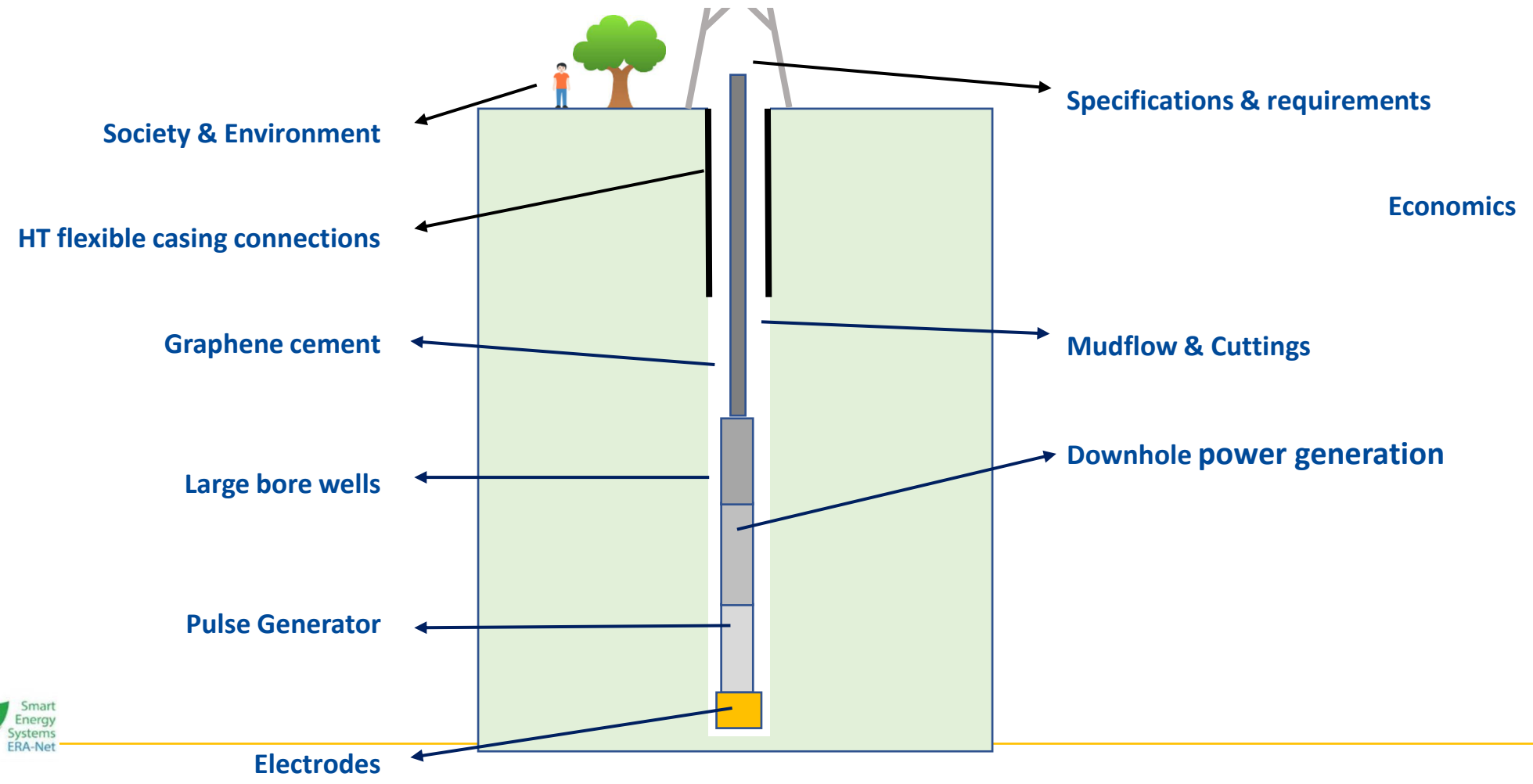
EPP principle



Voltage ↑
Pulse-rise time ↓
Reliability ↑



System development



Defined Functionality

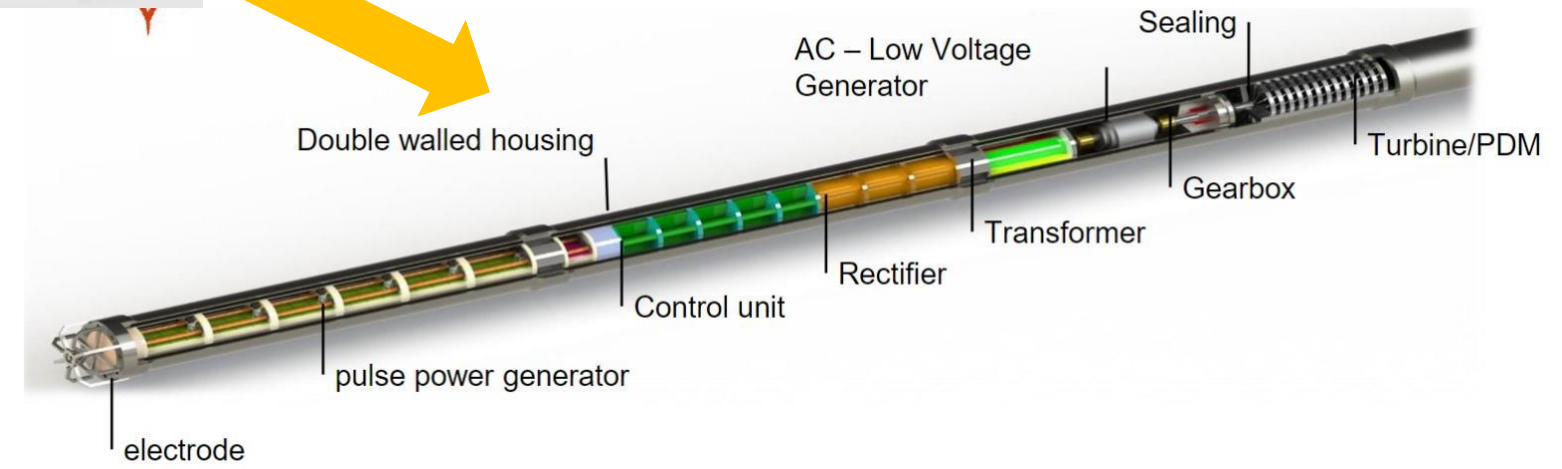
- ★ Hole sizes: **12-1/4"** (DeepLight prototype) & 8-1/2"
- ★ Casing while Drilling: 13-3/8" casing: 12-1/4" x 16"
- ★ Directional drilling
- ★ Compatible with variety of geology with large range of porosity (0%-50%) & hardness (UCS; 2-70 MPa)
- ★ Water & Water based drilling fluids
- ★ All designs, rigs, equipment, etc. in line with global drilling standards

Bottom Hole Assembly



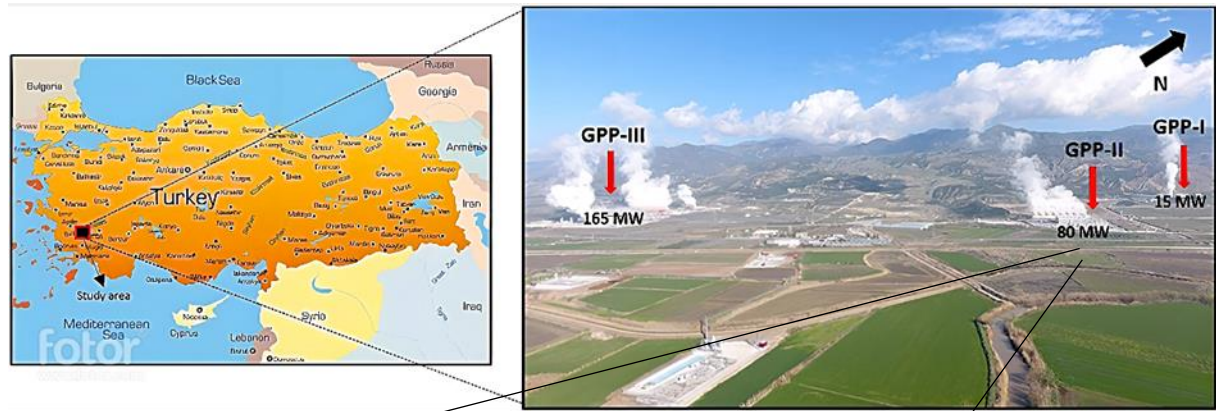
Positive Displacement Motor with PDC bit

Turbine + pulse generator + electrodes



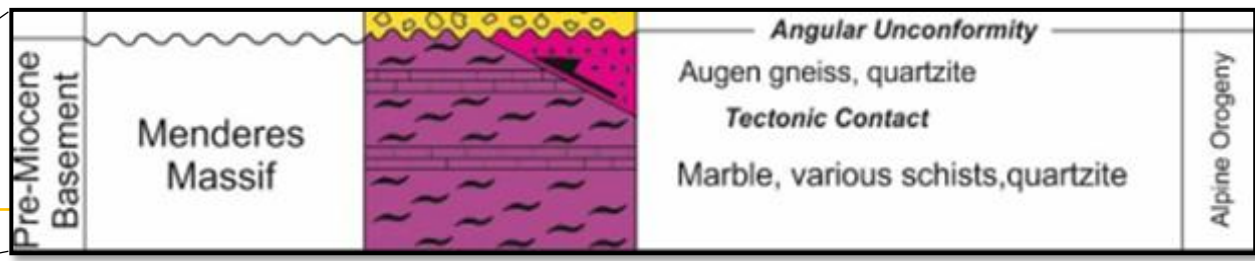
Applications: hard rock drilling

Complex & hard formations



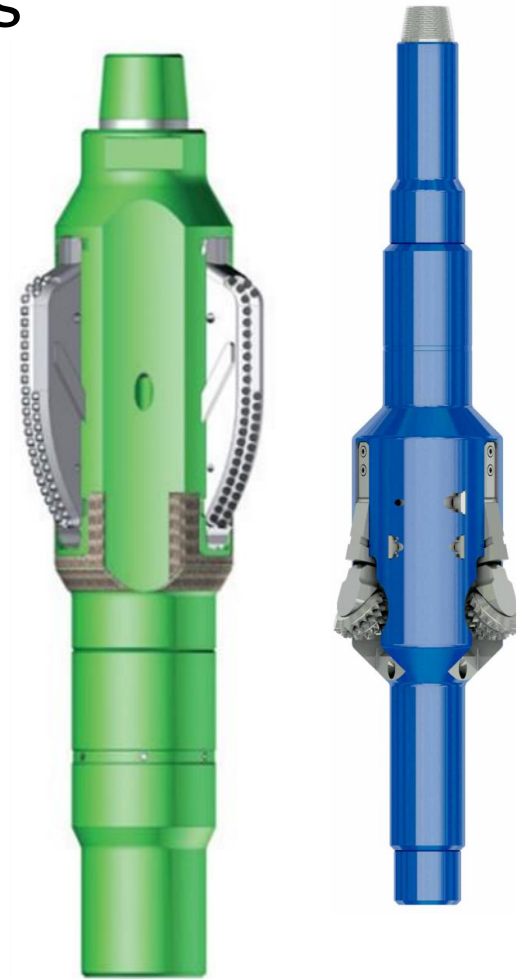
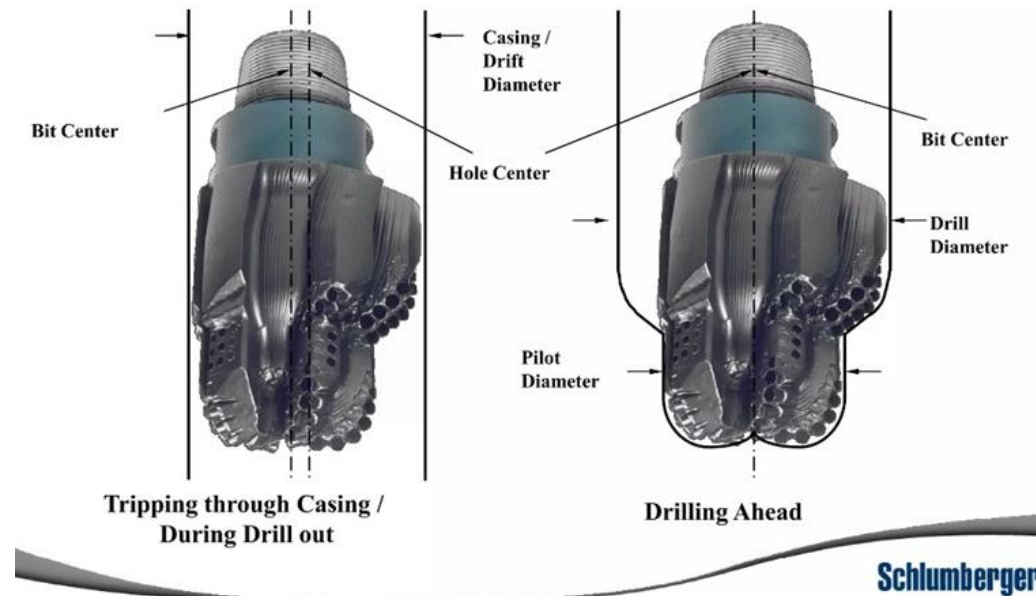
- ↓
- * ROP: 1 - 6 m/hr
 - * Bit runs: ~5
- ↓
- * ROP: >10 m/hr
 - * Bit runs: <5

Age	Unit/Thickness	Lithology
Quaternary	Alluvium, Alluvial fan	
	Tosunlar Formation (~50 m)	
Late Miocene - Late Pliocene	Kolankaya Formation (~500m)	
	Sazak Formation (~300m)	
Early - Middle Miocene	Kizilburun Formation (~300m)	
Pre-Miocene Basement	Menderes Massif	

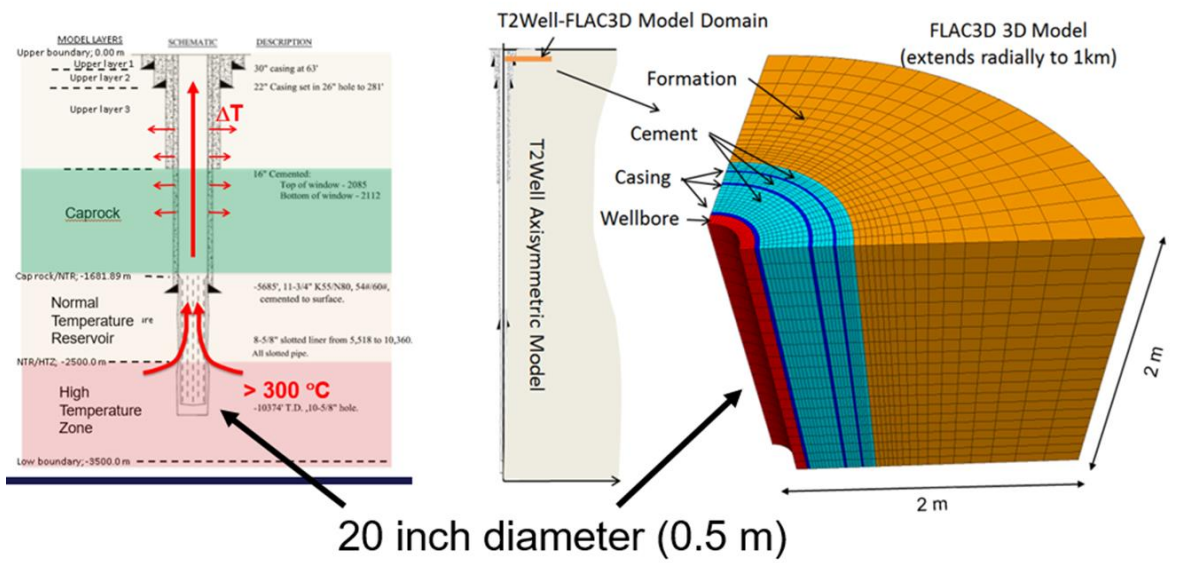


Applications: hole enlargement

- * Equipment less reliable due to high mechanical loads
- * Low performance due to reduced operational limits
- * Less effective because of 2 different cutting points

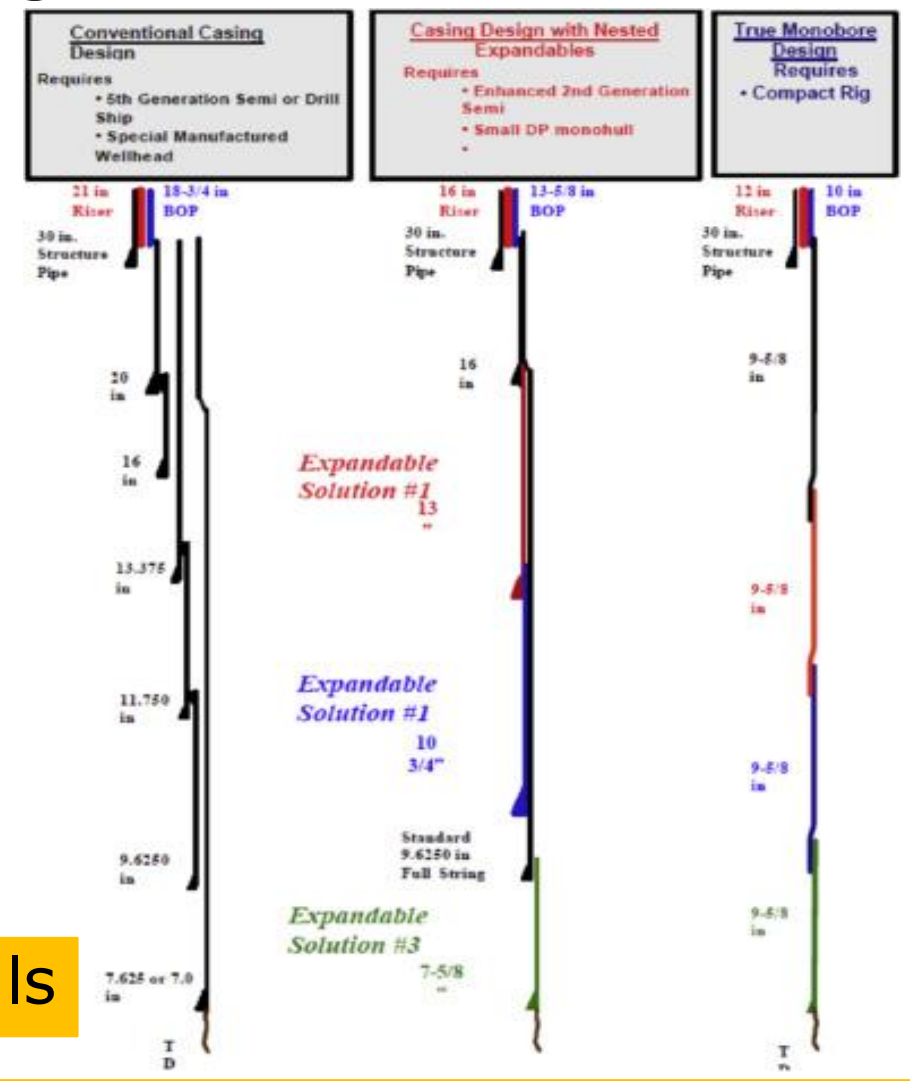


Applications – hole enlargement

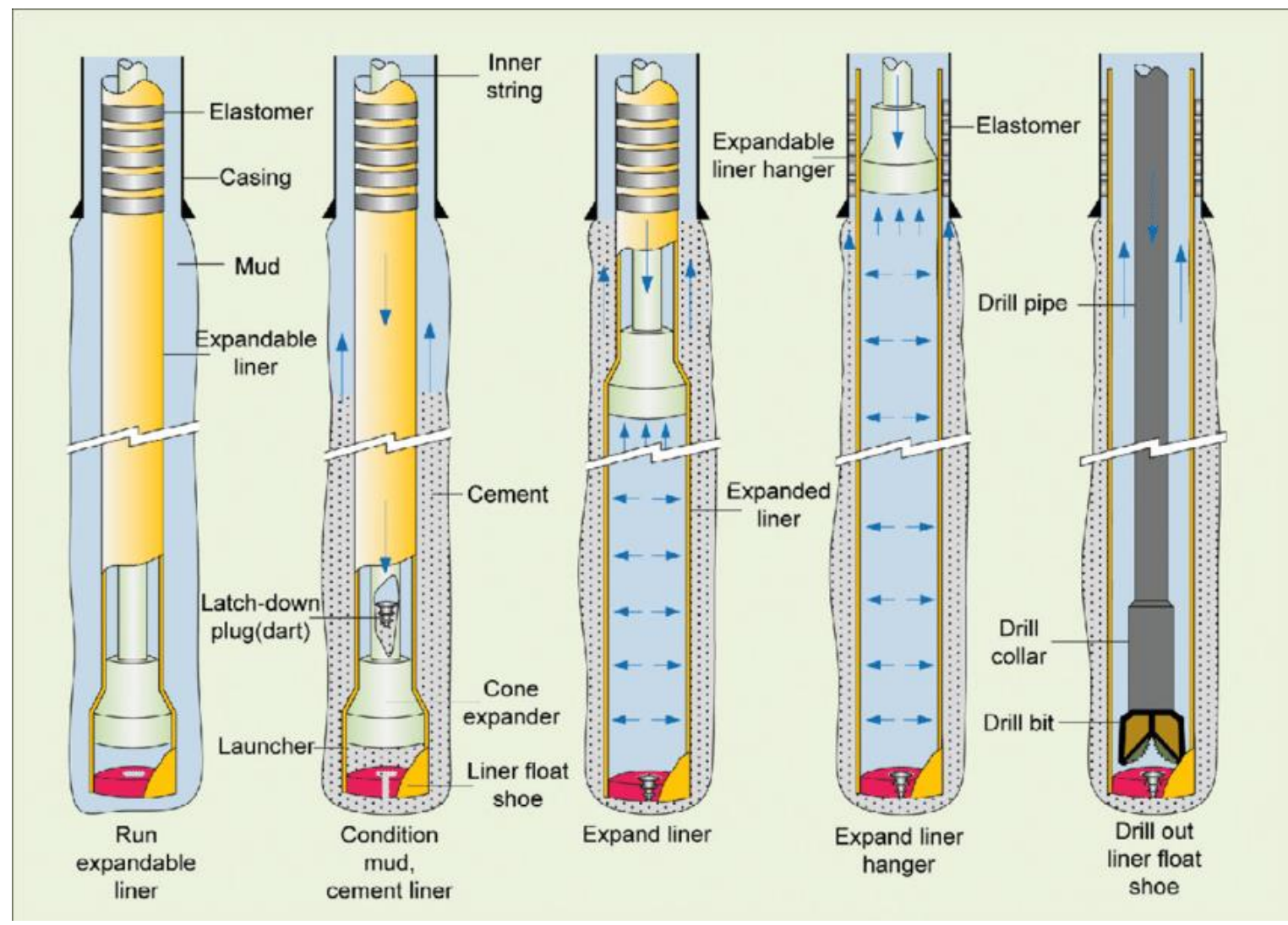


Very high-power wells

Monobore wells



Monobore wells



Conclusion

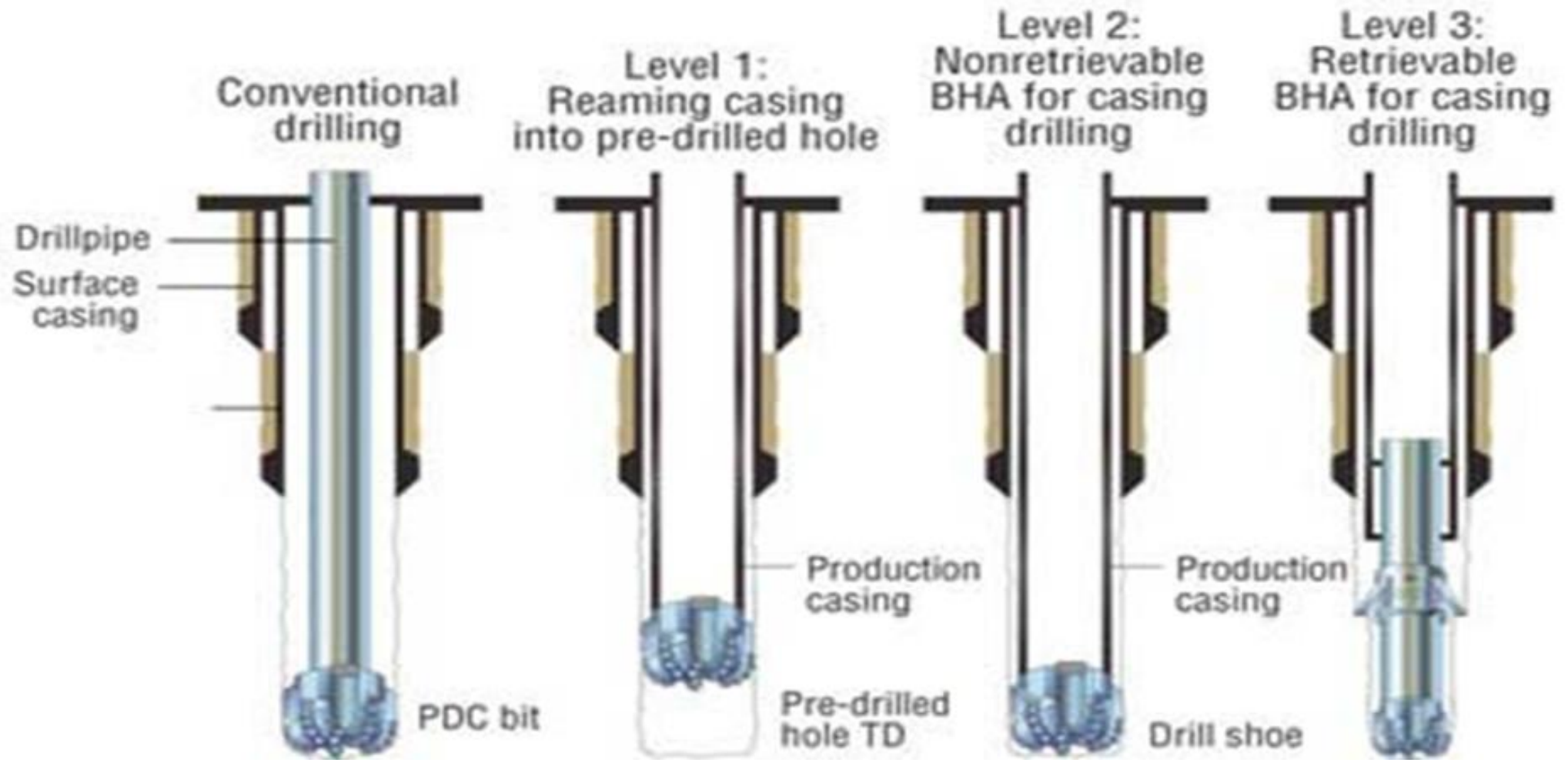
- ✦ EPP as direct replacement of conventional PDM-bit
- ✦ Direct application: faster & efficient hard rock drilling -> new geothermal concepts become viable
- ✦ EPP hole enlargement applications enabling promising concepts as CwD and monobore wells

Novel concepts to construct cost effective geothermal wells
with Electro Pulse Power Technology

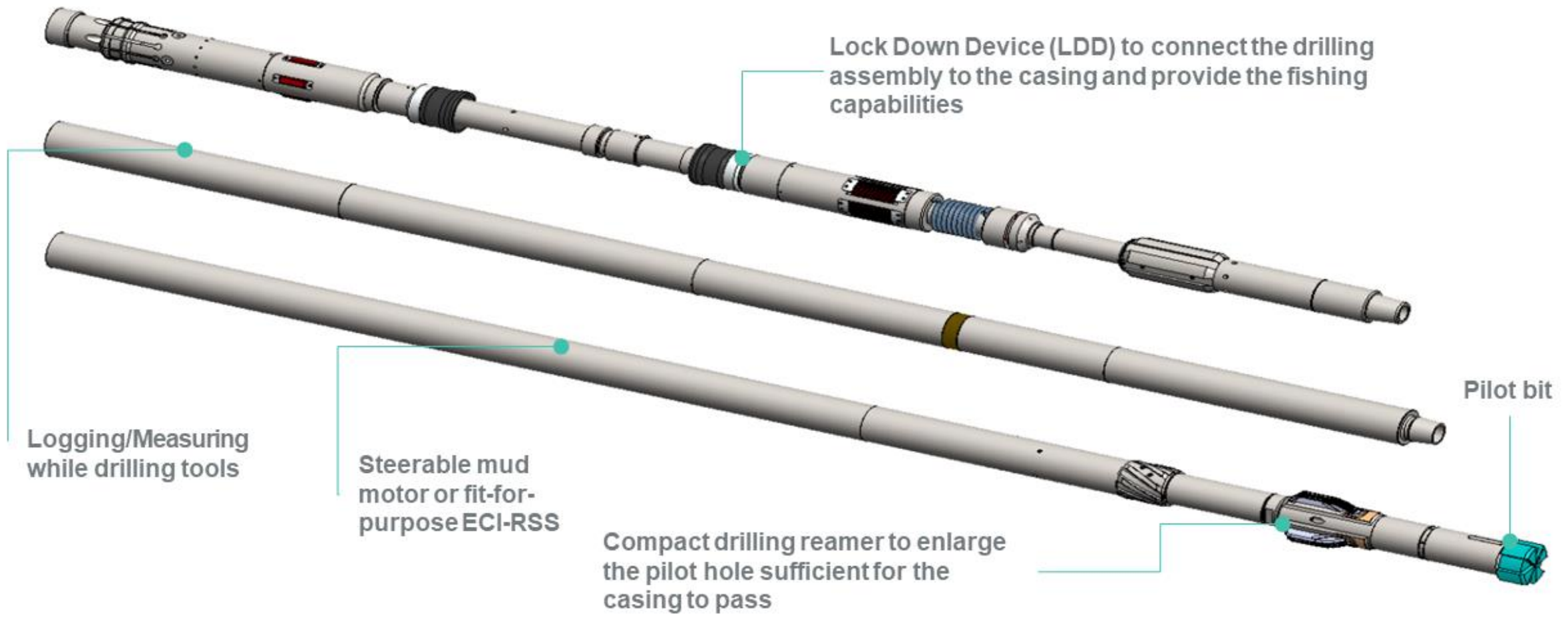
Deep Light

Thank you for your attention

Casing while Drilling (Cwd)



CwD Bottom Hole Assembly



CwD benefits

- * Casing in place when TD is reached: minimal risk
- * No time lost on check trips or extra hole cleaning;
- * Less pump power (~50%) needed due to better hole cleaning
- * Simpler mud systems possible -> adaptable to EPP
- * Minimum of BHA & pipe handling: pipe handling causes most accidents in the drilling industry
- * Excellent solution for drilling with losses
- * Cable based tripping (>2000m /hr) from TD without swabbing or maximum speed drill pipe tripping time saving from 20% to 50%
- * Less shocks, vibrations and stick&slip resulting in more efficient drilling and great match with EPP

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Thank you for your attention