DEEPLIGHT drilling, how it works?

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

Workshop Istanbul, 27 February 2025

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The project DEEPLIGHT is subsidized through the GEOTHERMICA and JPP Smart Energy Systems Joint Call by Netherland Enterprise Agency, RVO, German Federal Ministry for Economic Affairs and Energy BMWi, Icelandic Research Institute, RANNIS, The Scientific and Technological Research Council of Turkey, TÜBİTAK, United States Department of Energy, DOE.
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Advancing geothermal energy

Hard rock drilling

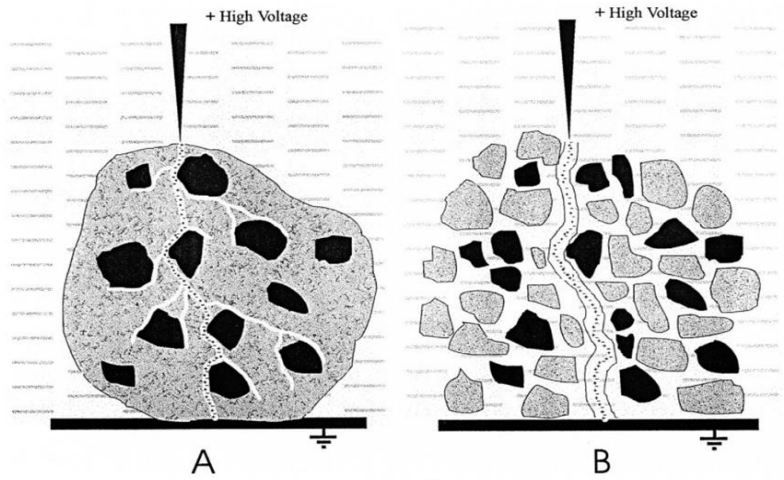
Non-mechanical rock breaking

Electro Pulse Power Drilling

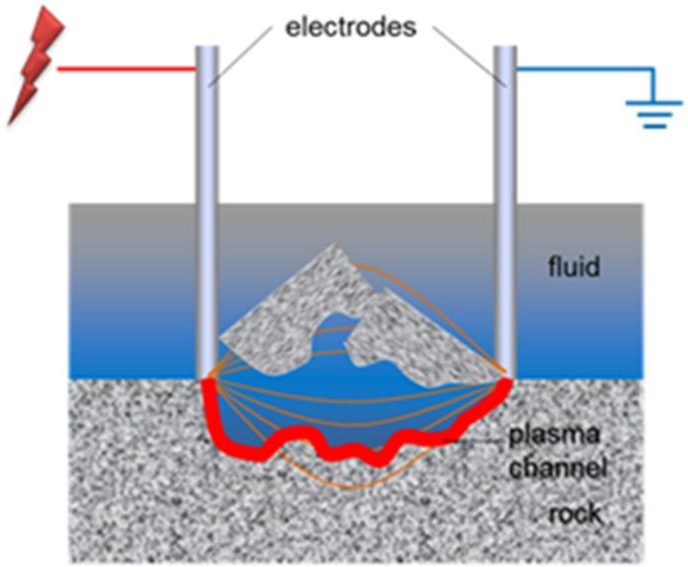
Energy efficient drilling

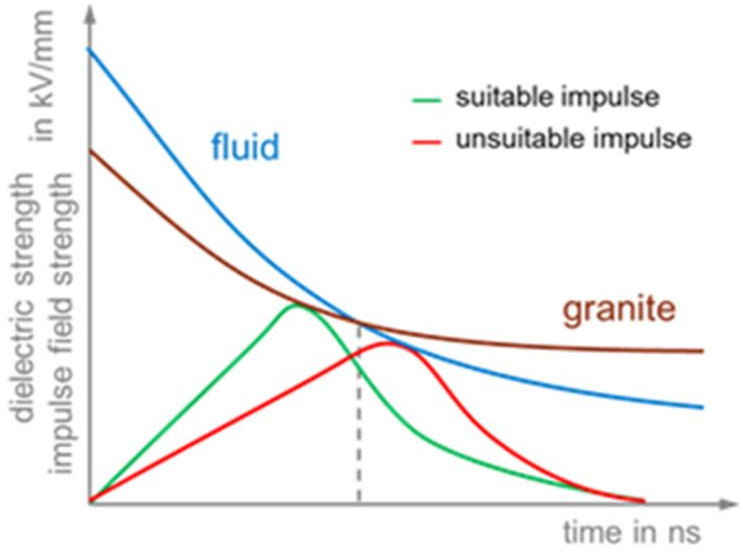
Enabling technology

EPP principle

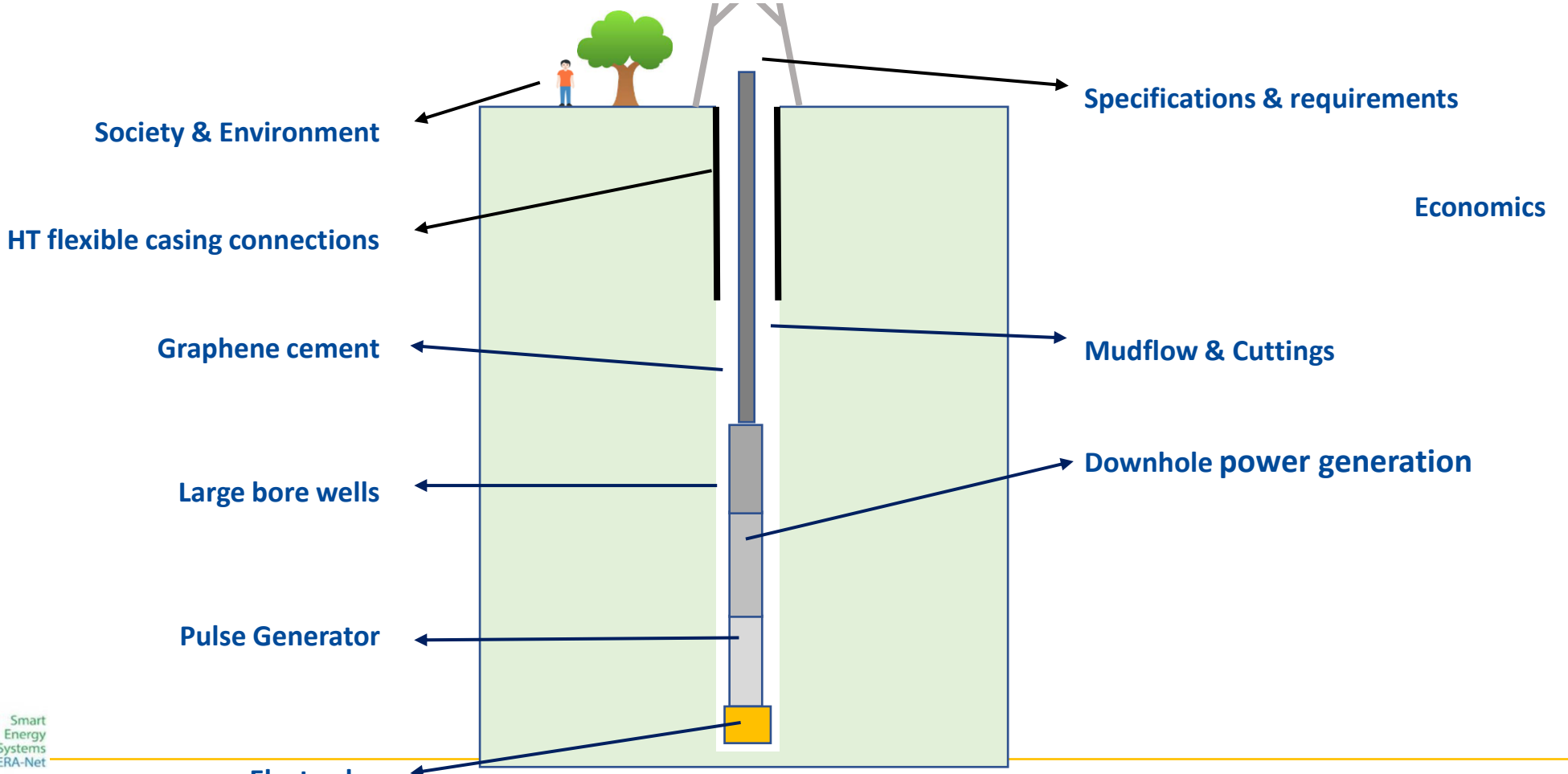


Voltage ↑
Pulse-rise time ↓
Reliability ↑





System development



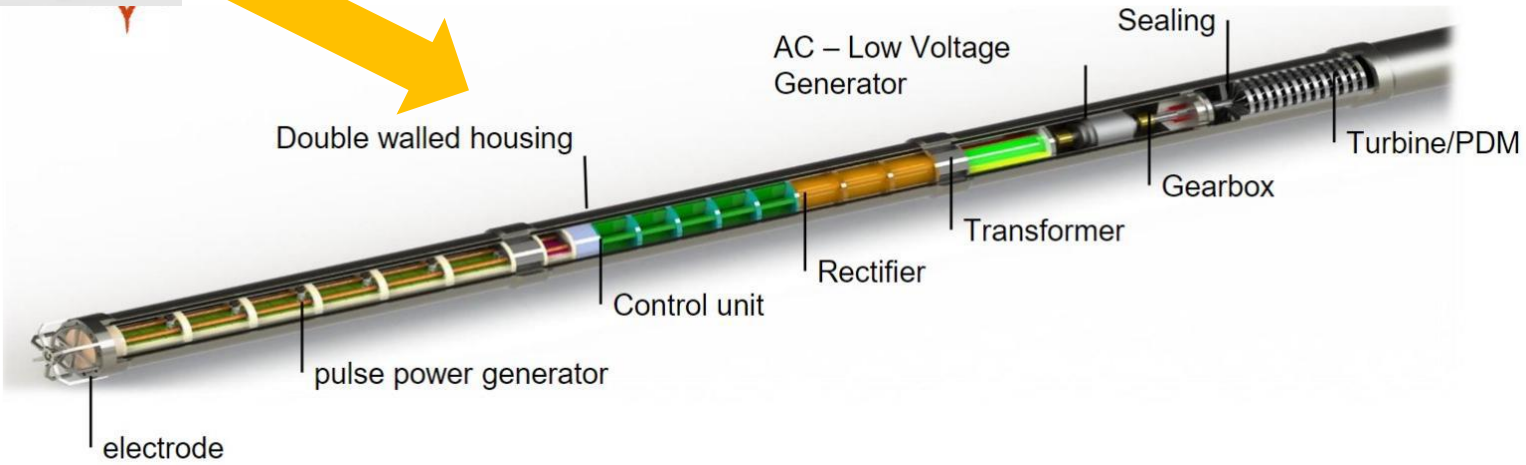
Defined Functionality

- 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

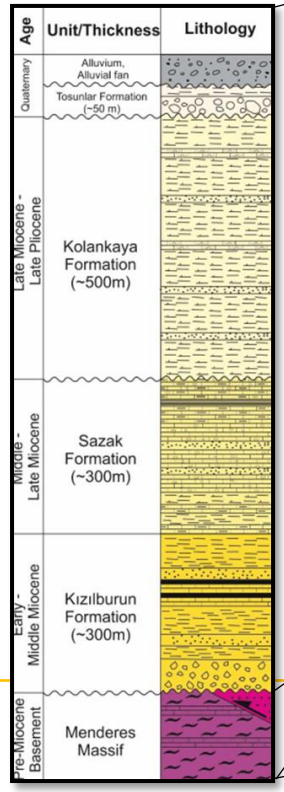
Bottom Hole Assembly

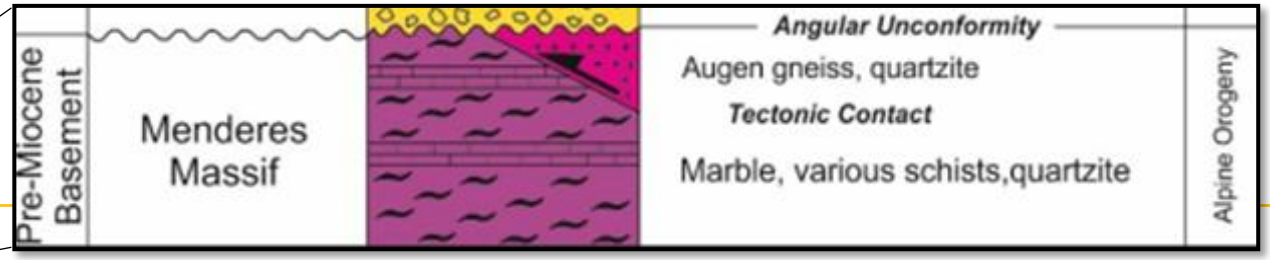
Positive Displacement Motor with PDC bit

Turbine + pulse generator + electrodes



Applications: hard rock drilling





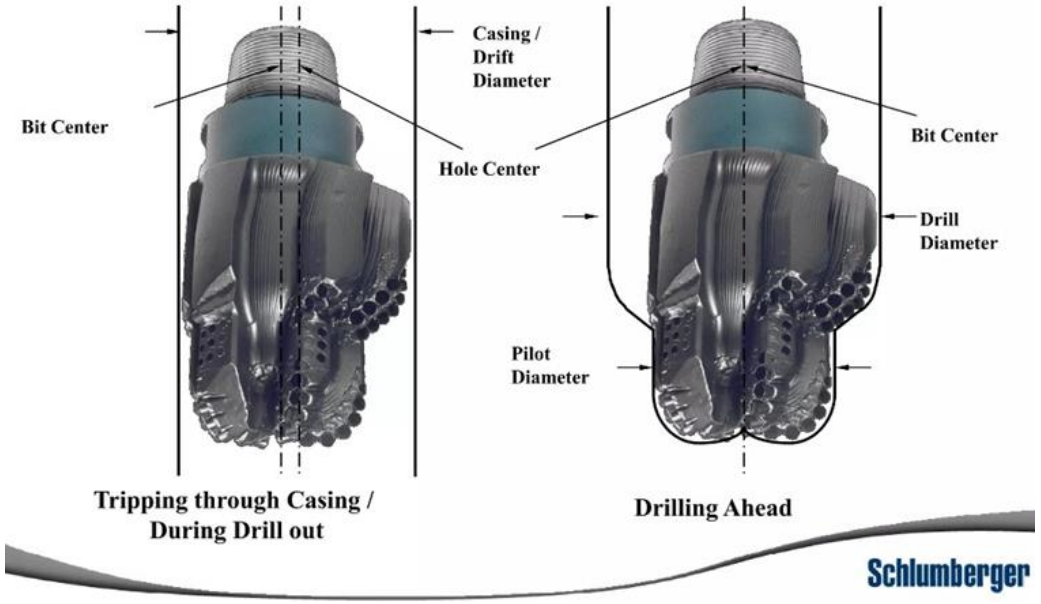
Complex & hard formations

- ROP: 1 - 6 m/hr
- Bit runs: ~5

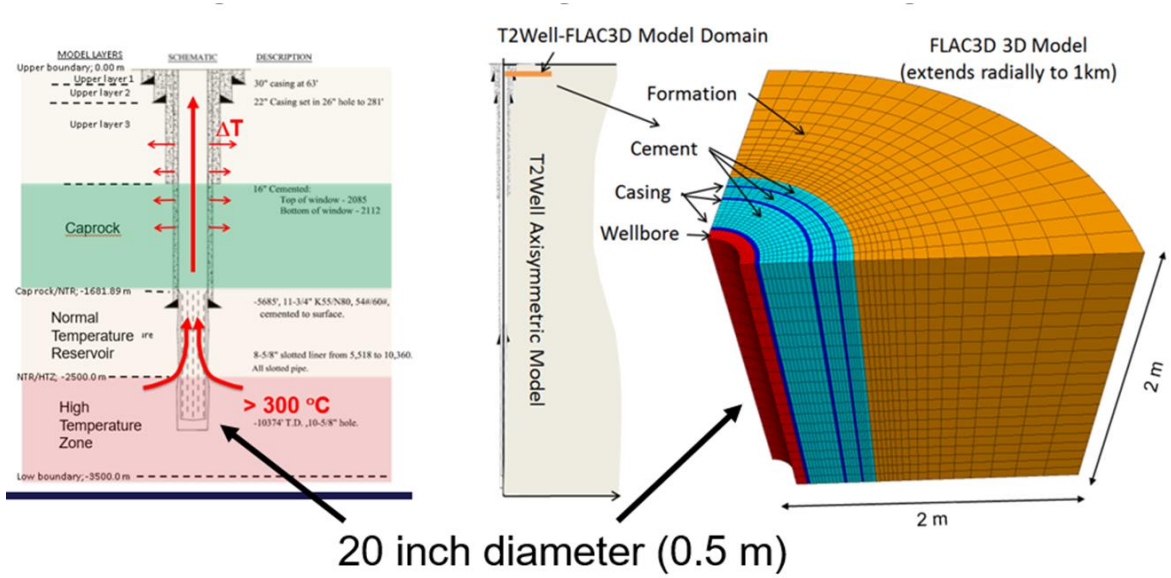
- ROP: >10 m/hr
- Bit runs: <5

Applications: hole enlargement

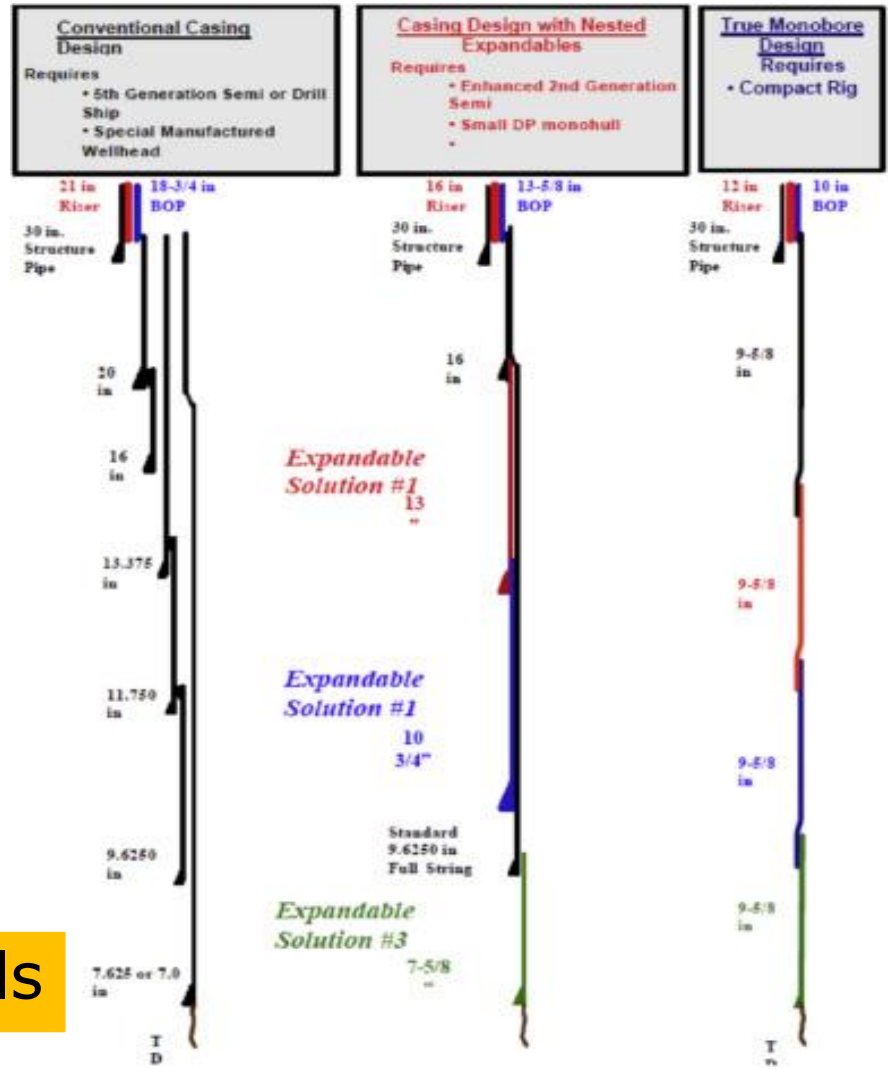
- Equipment less reliable due to high mechanical loads
- Low performance due to reduced operational limits
- Less effective because of 2 different cutting points



Applications – hole enlargement

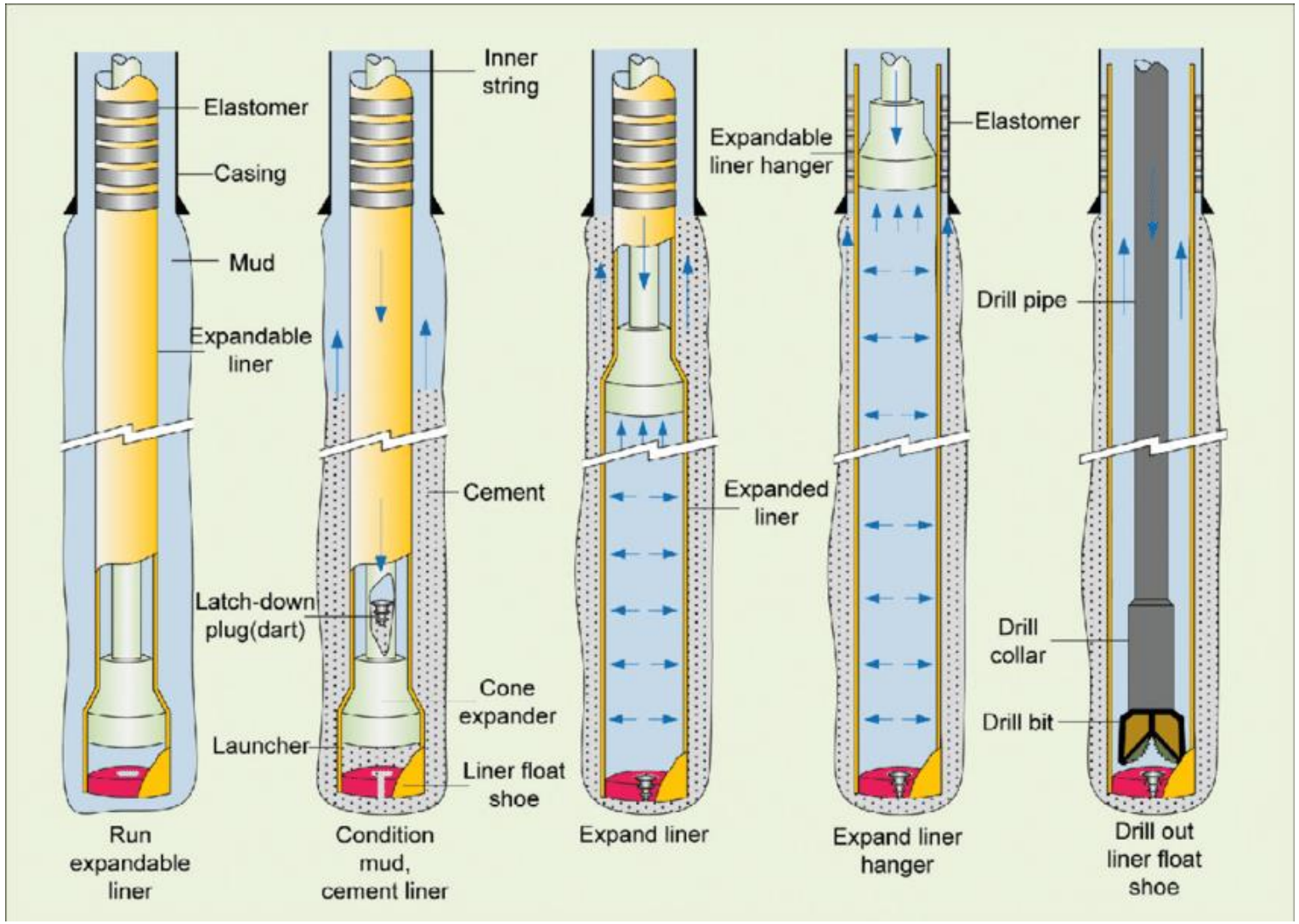


Very high-power wells



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

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Deep Light

Thank you for your attention

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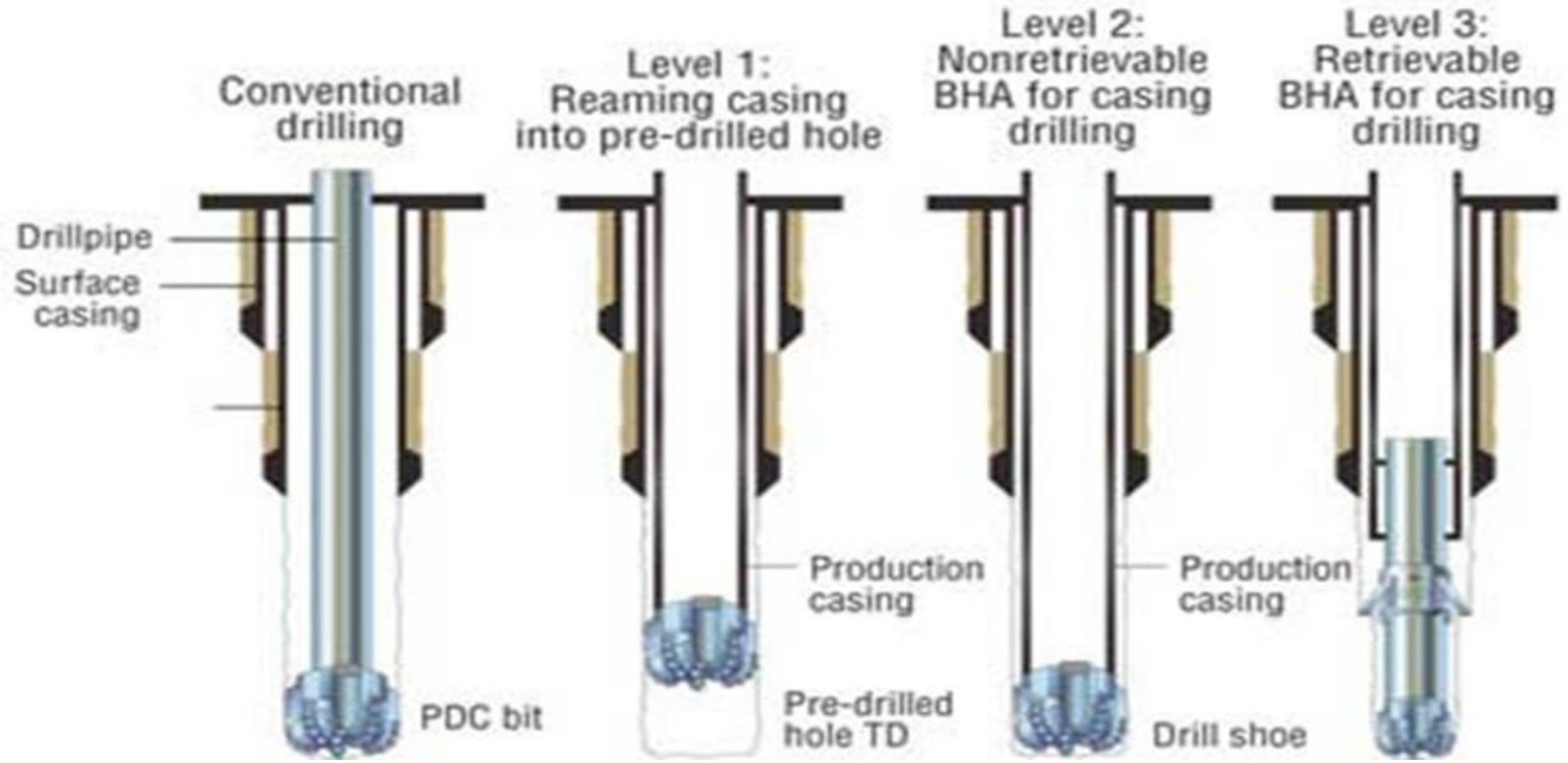
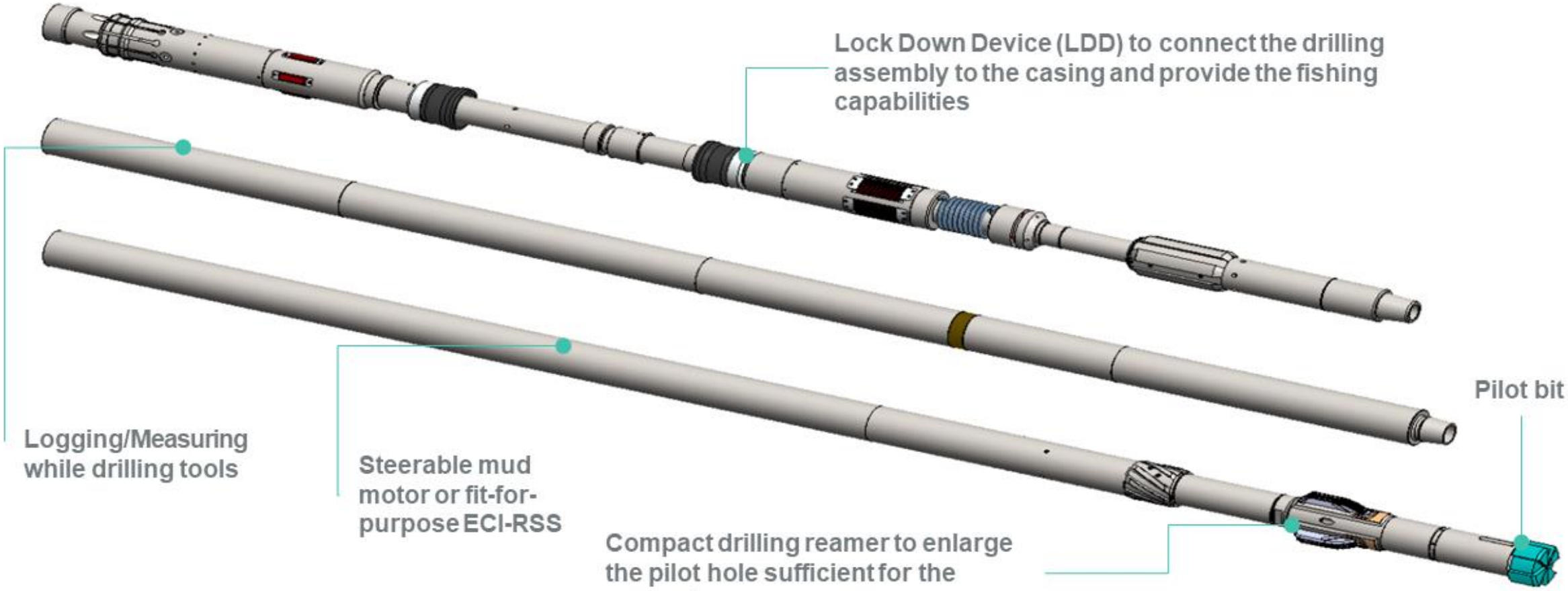
Casing while Drilling (Cwd)



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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