

“Deeplight”

Electro Pulsed Power Drilling Miles Ahead

27 February 2025

Royal  IHC

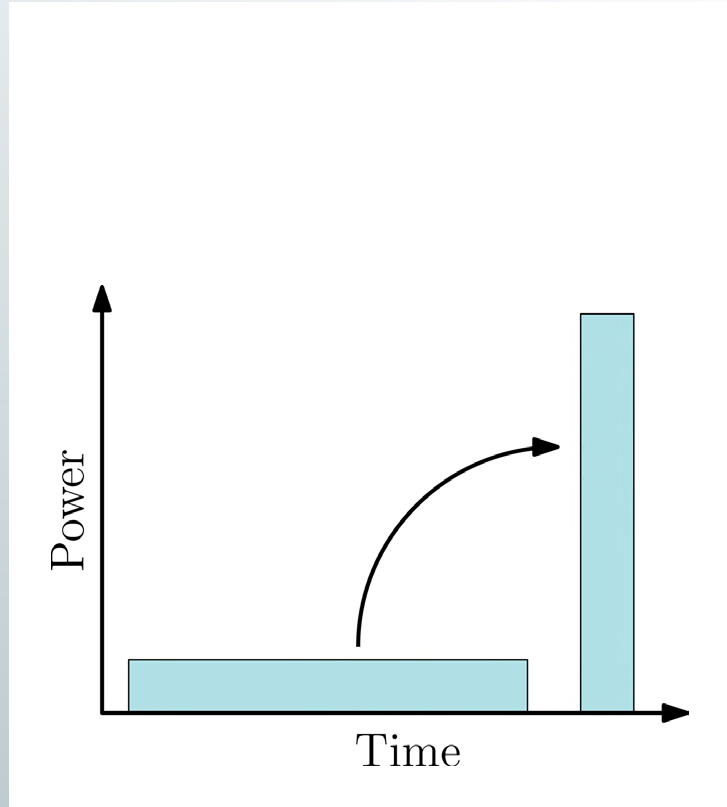


What is Electro Pulsed Power?



1 hour solar power,

1 second of solar power,



Compressed to $100 \mu\text{S}$

Compressed to $1 \mu\text{S}$



= 1 lightning strike

= 1 EPP Pulse



High speed movie

Time expansion:
1 : 1000

Test hard rock in water.



High speed movie

Time expansion:
1 : 1000

Basic Principle

- I. High voltage (100-500 kV) pulses.
- II. Electrons penetrate the rock.
- III. Forming of high pressure plasma channel.
- IV. Rock breaks from inside by tensile forces, which is much more efficient than conventional rock crushing.

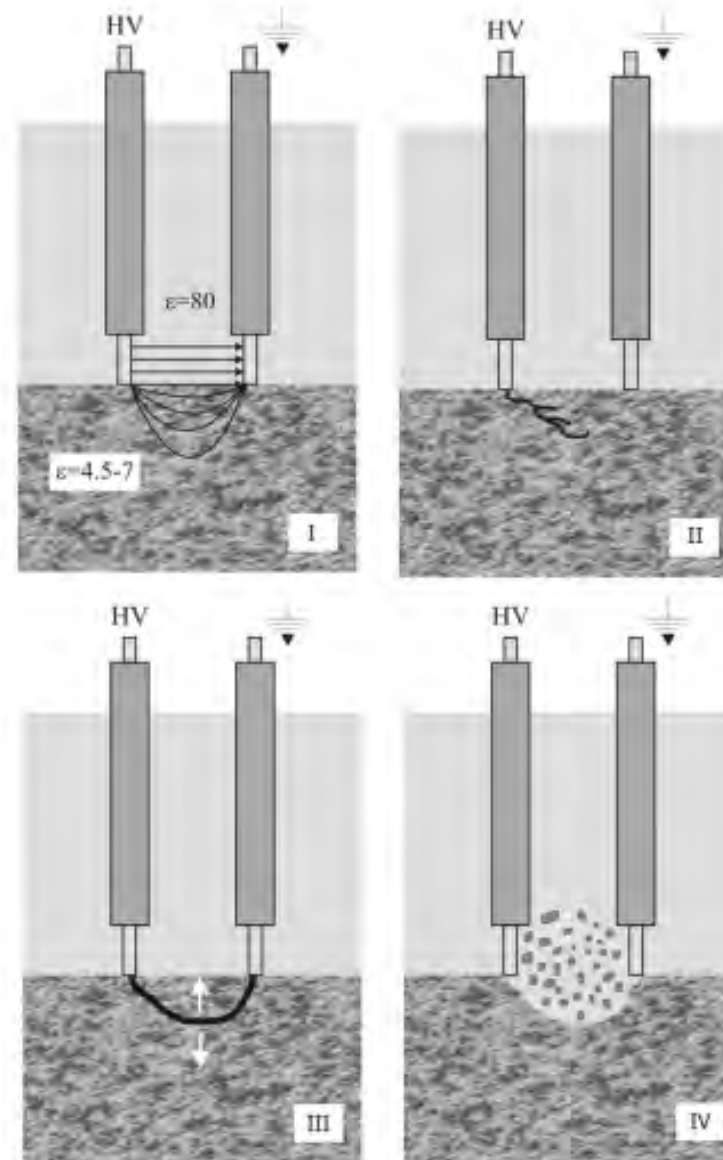
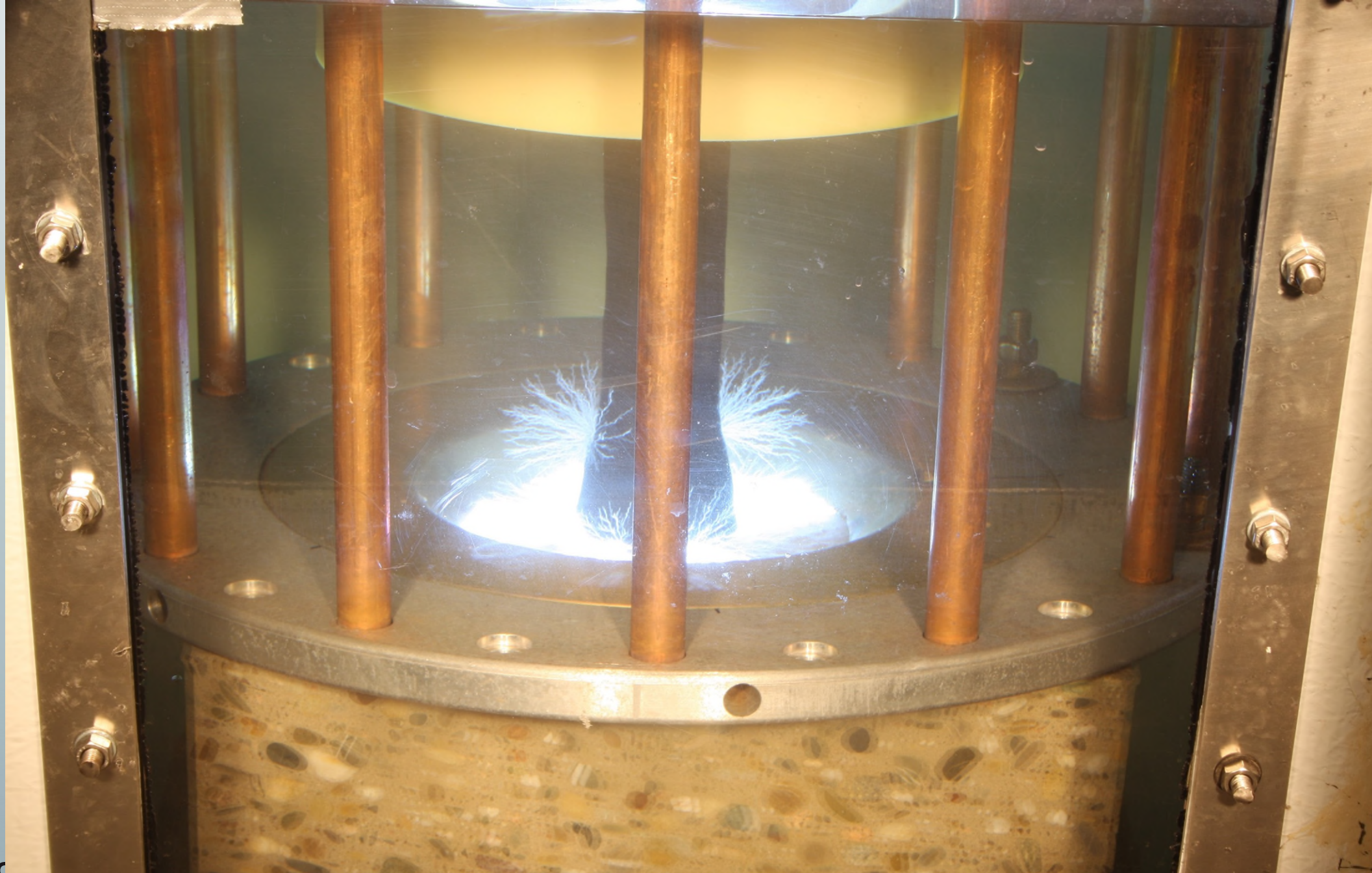


Fig. 1. Diagram showing selective breakdown of rock in water.



Test for research on Plasma Channel forming.



Rc

7

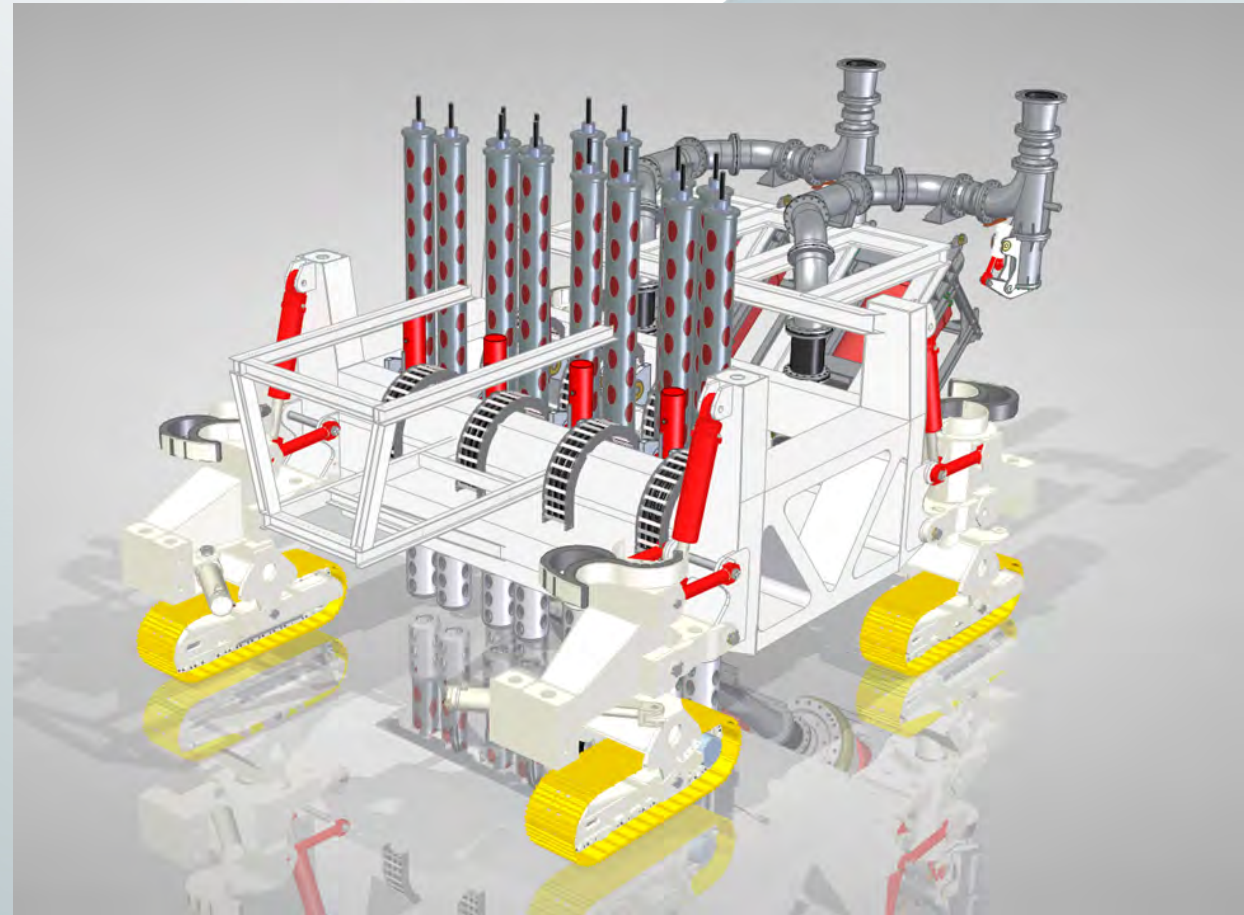
Test for research on Drilling applications.

IHC-PP application focus (all under-water):

1. Dredging of hard rock.
2. Excavation, blasting of boulders.
3. Mining (wet mining and deep-sea mining).
4. Ultra deep drilling for large geothermal wells.

Opportunities:

1. Piling, recycling of concrete, demolition, steel forming.



Deep-sea mining excavator.

IHC-PP application focus (all under-water):

1. Dredging of hard rock.
2. Excavation, blasting of boulders.
3. Mining (wet mining and deep-sea mining).
4. Ultra deep drilling for large geothermal wells.

Opportunities:

1. Piling, recycling of concrete, demolition, steel forming.

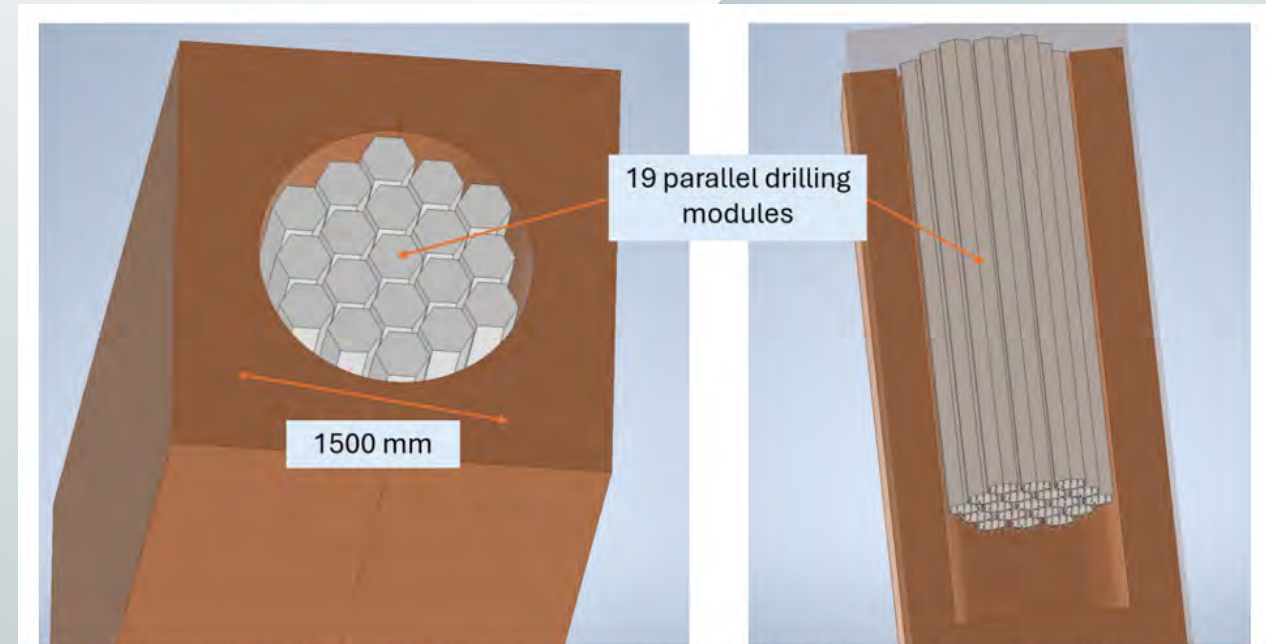
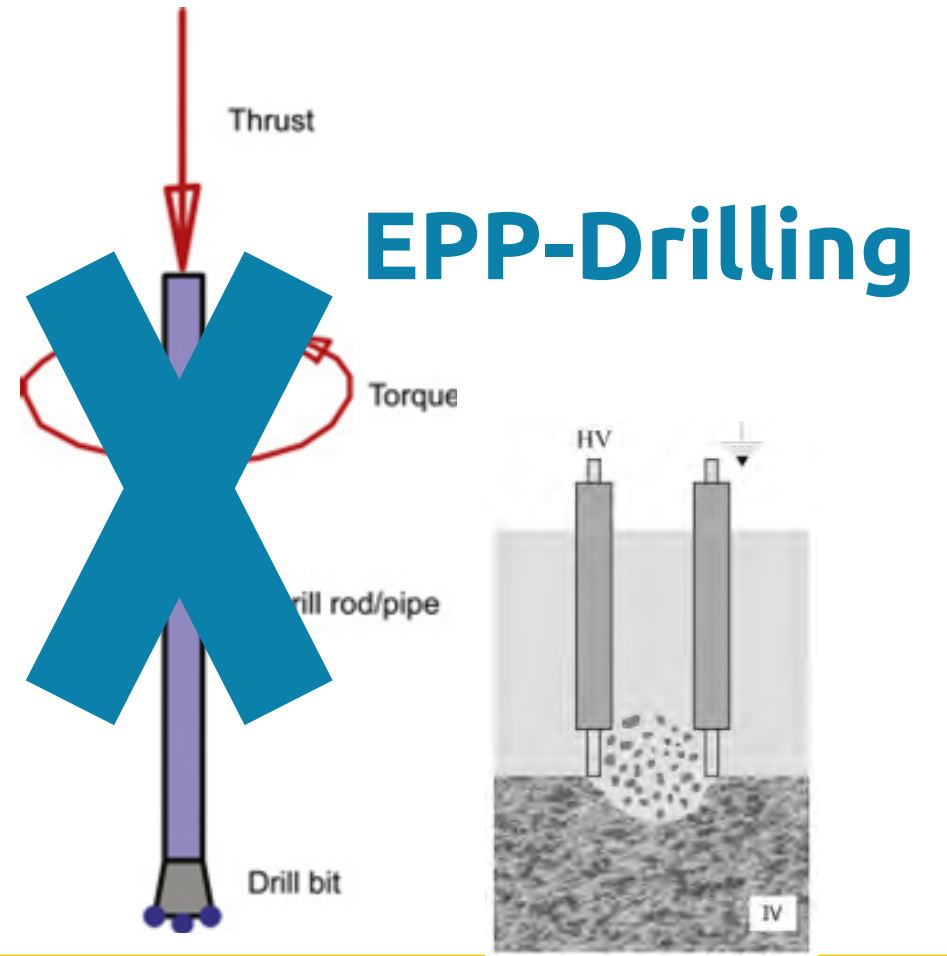
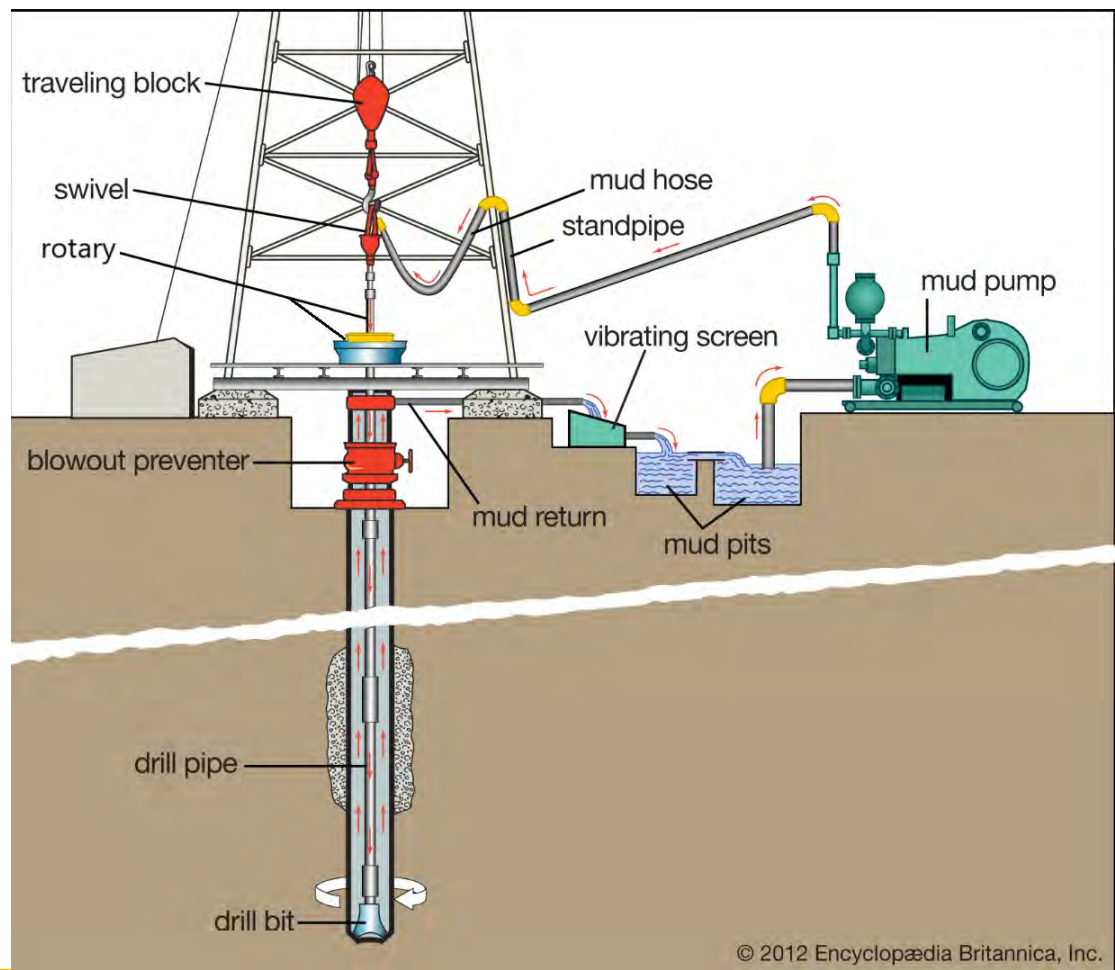


Figure 1: example of 19 parallel pulse drilling modules to drill a 1500mm hole. IHC will develop high-TRL spark-gap based drilling modules and TU/e will research and develop a solid-state pulse drilling module.

Concept for drilling of ultra deep shafts.

Conventional Drilling vs. EPP Drilling



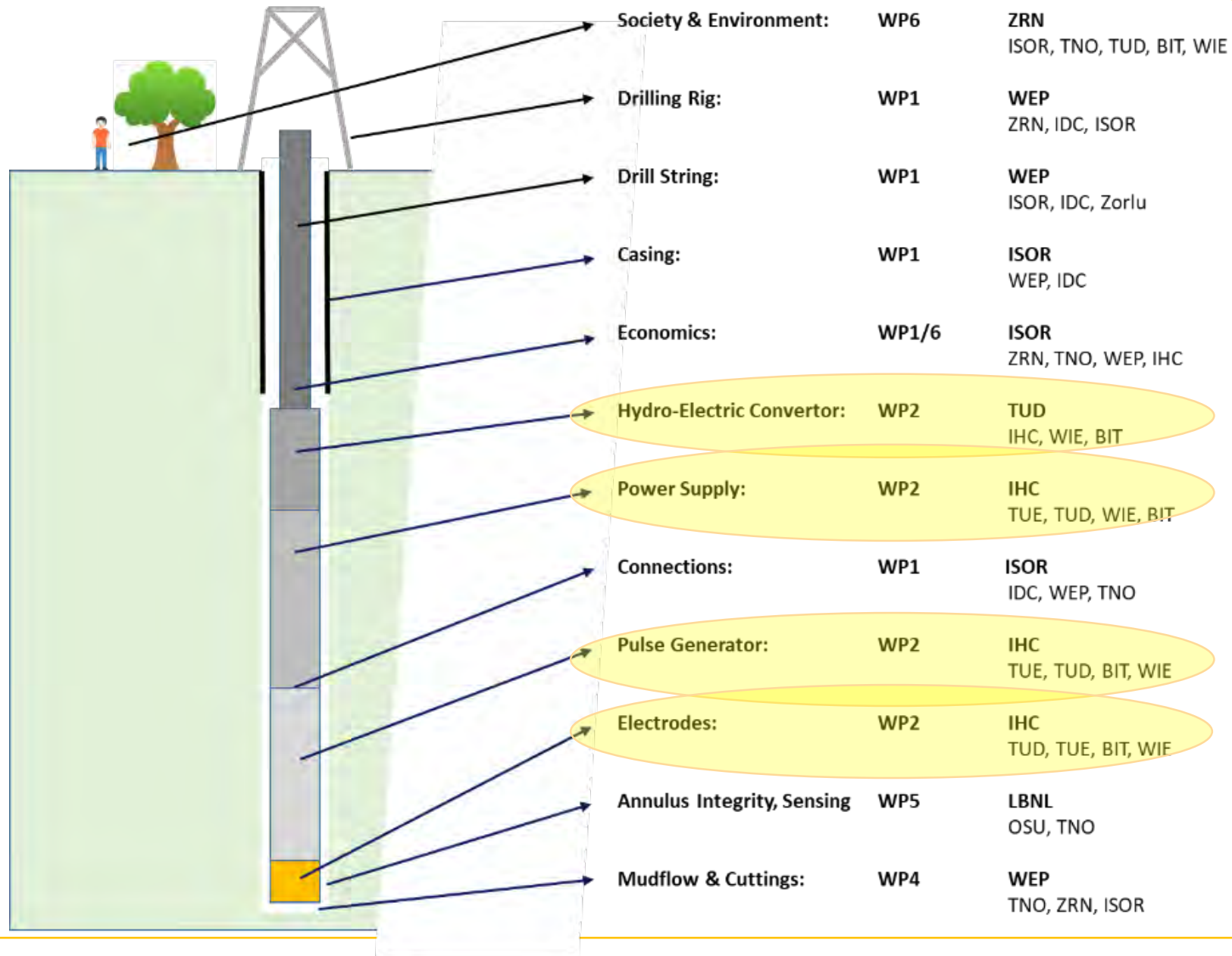
Novel concepts to construct cost effective geothermal wells with Electro Pulse Power Technology

Deep Light

International consortium to demonstrate feasibility of ultra deep drilling of geothermal wells.

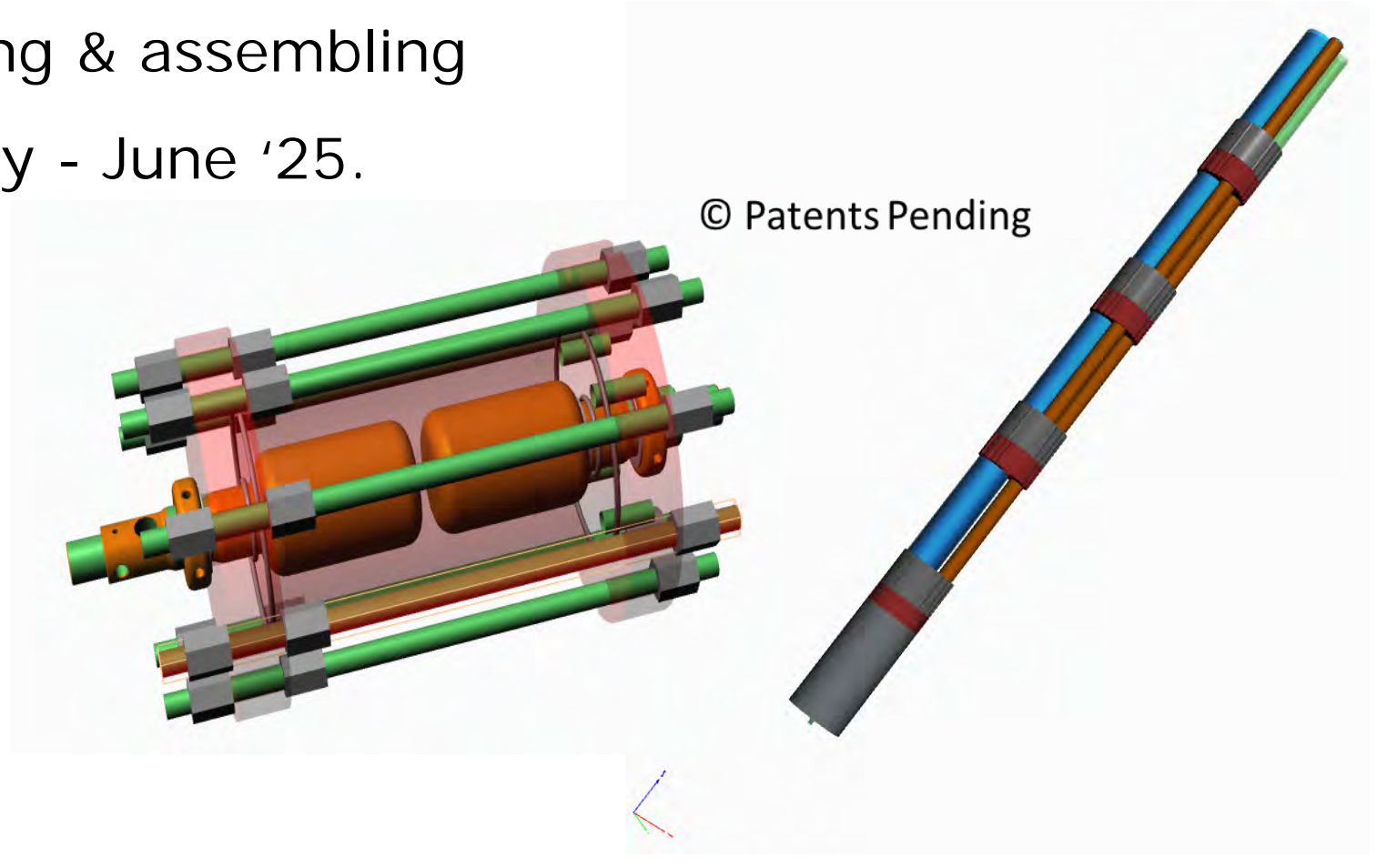
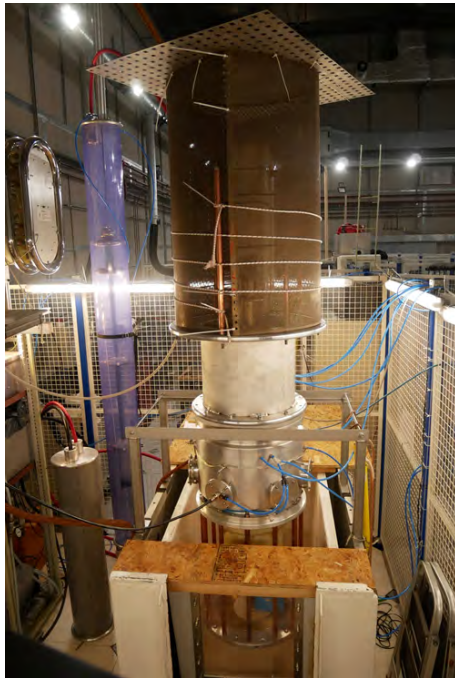
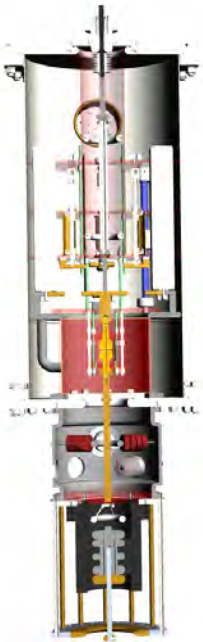
Overview of Work Packages in Deeplight Consortium

WP2 EPP Tool



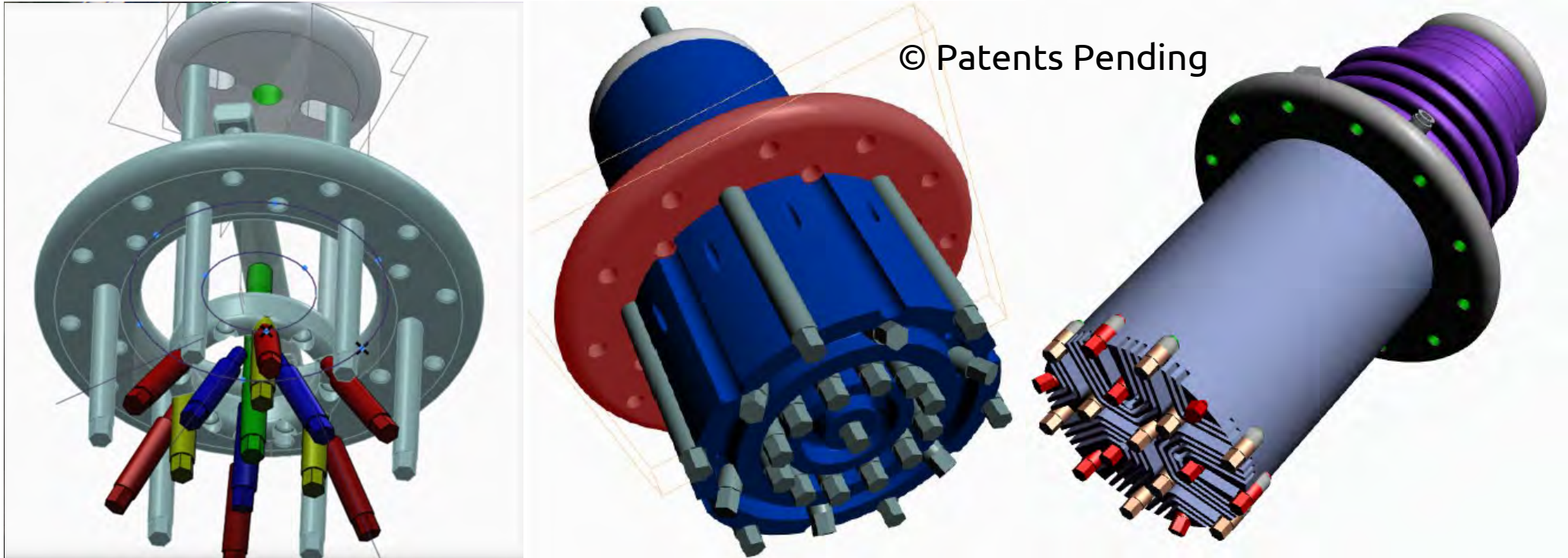
Pulse Generator, by IHC

- ✦ Status: Manufacturing & assembling
- ✦ Outlook: First test May - June '25.



Electrodes, by IHC+TUDr

- * Status: Ready for manufacturing
- * Outlook: First test May – June '25.



Housing design by, WEP & IHC

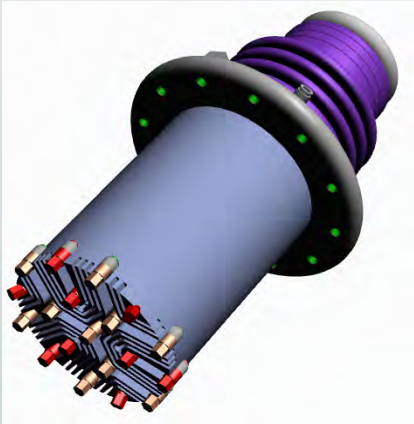


Pre-Prototype Test

- June 14th 2024



© Patent Pending



Experiments at TNO RCGS, May – June 2025

Drilling of rock sample at a depth of
~20-100m under continuous circulation
with the full BHA.



Roadmap > Electro Pulsed Power



Roadmap > Electro Pulsed Power

2017-2022

Research Phase

- Pre-feasibility Study
- Market research
- Explore opportunities
- Small scale tests
- Development steps

10km depth EPP drilling tool

- Prototype construction
- Field tests
- Optimization

2026-2028

2030-

Continuous Growth

New developments

- New markets
- New Products

2029