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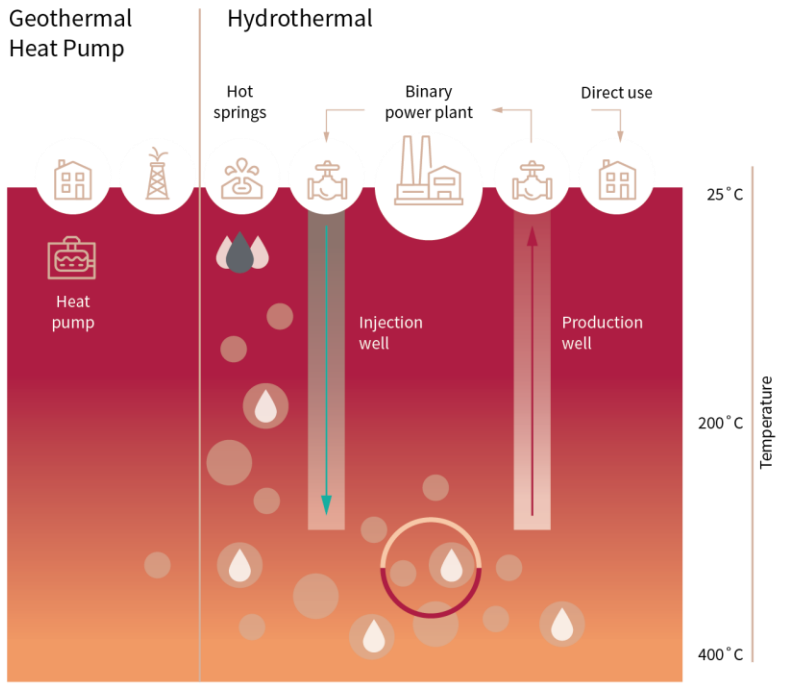
2023, Tony Pink

The Geothermal Ecosystem 2023

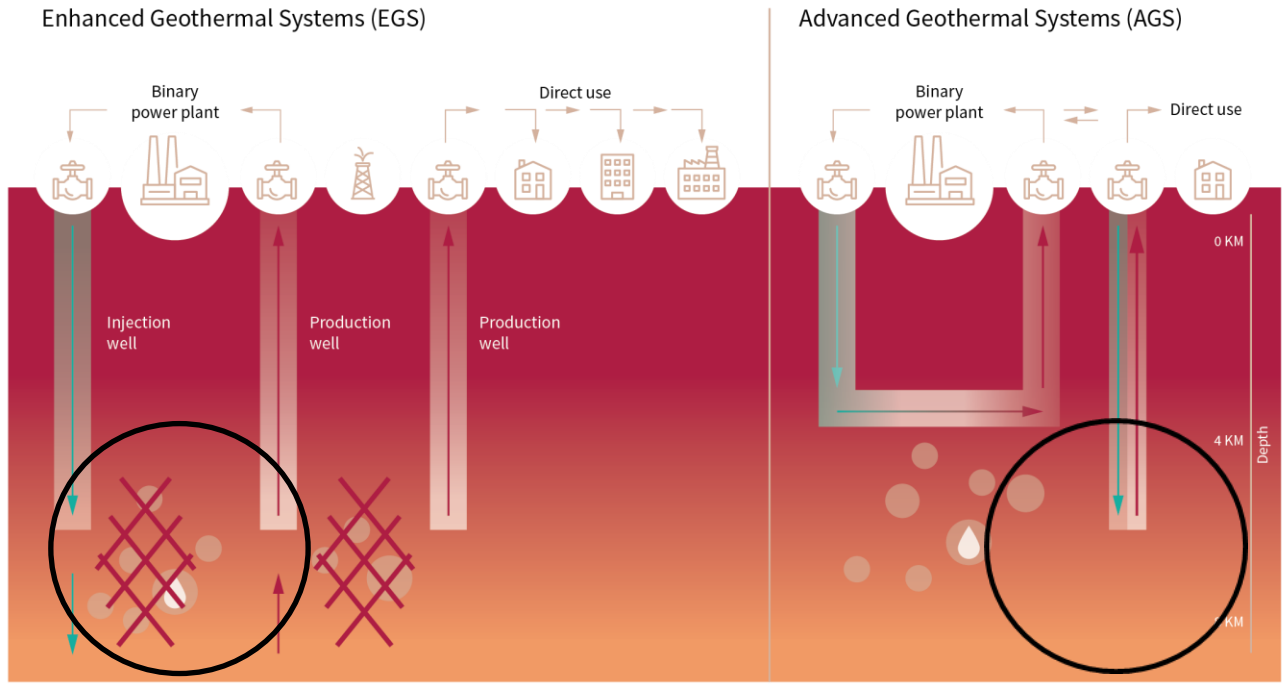
Conventional



✓ Sufficient Access to natural hot brine

Geographically limited to areas with natural underground reservoirs

Unconventional



✓ Access to hot rock but insufficient permeability of fluid saturation. Engineered reservoirs, injection fluid into the subsurface, or using closed-loop.

Less geographic restrictions allowing for geothermal in new geographies – ultimately geothermal anywhere

Installed Power of ~16 GW (ThinkGeoEnergy, 2022)

Conventional Power Potential of ~200 GW (S&P 2022)

Unlimited Potential of Geothermal Anywhere

Improving the Case for Geothermal

Diversifying revenue streams:

- Energy Sales
- Capacity Factor
- Investment Tax Credits (ITC)
- Others: Direct Lithium Extraction

Technology to improve economics:

- Lower drilling costs (30%-70% of cost)
- Lower risk profile
- Greater depths:
  - *improved generation*
  - *available everywhere*

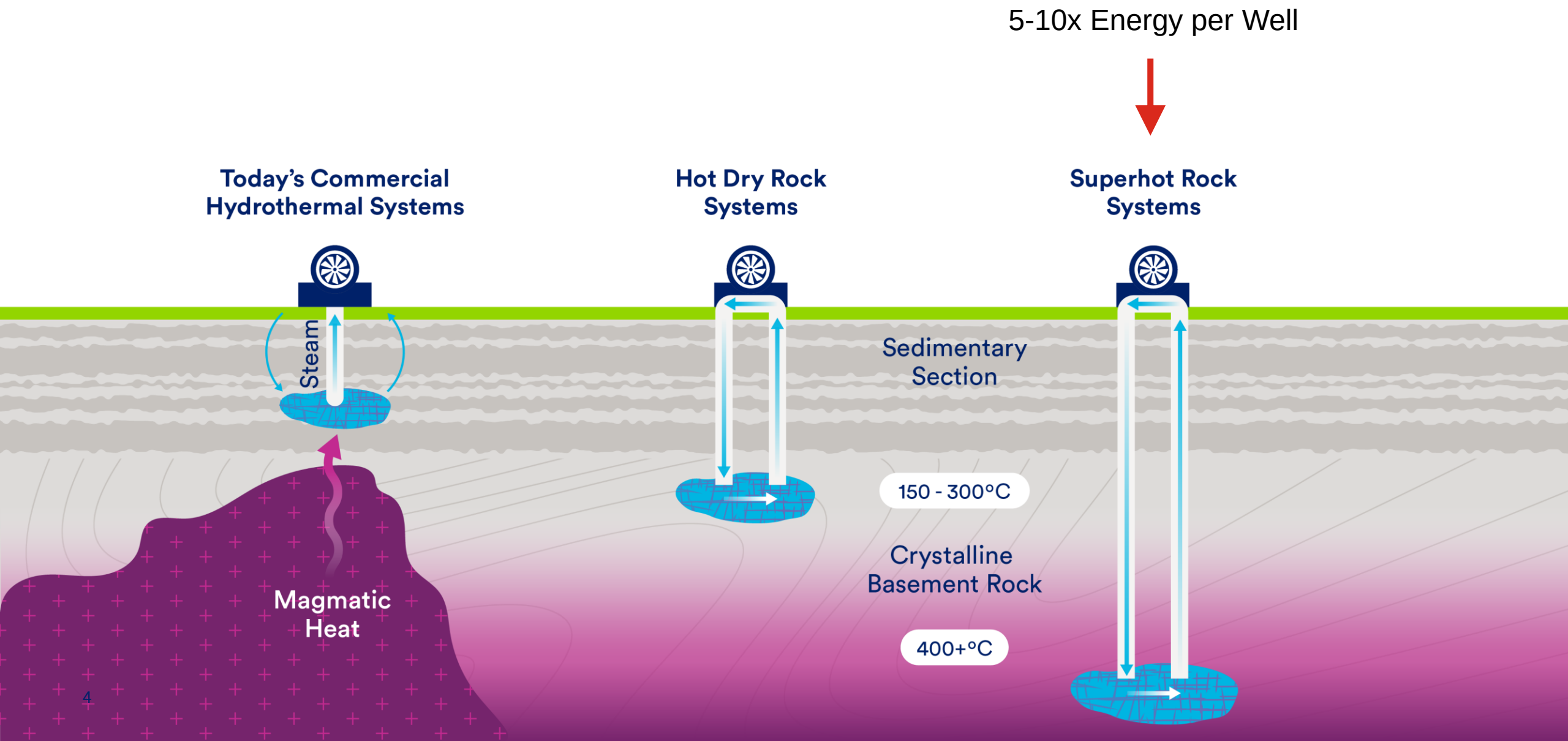
Project timelines:

- Improving regulatory framework (current permitting 12-24 months)
- Reducing permitting timelines

Where Geothermal Wins

- Baseload: Capacity Factor
- Better utilization of transmission infrastructure
- Ability to scale up: transferable skilled workforce

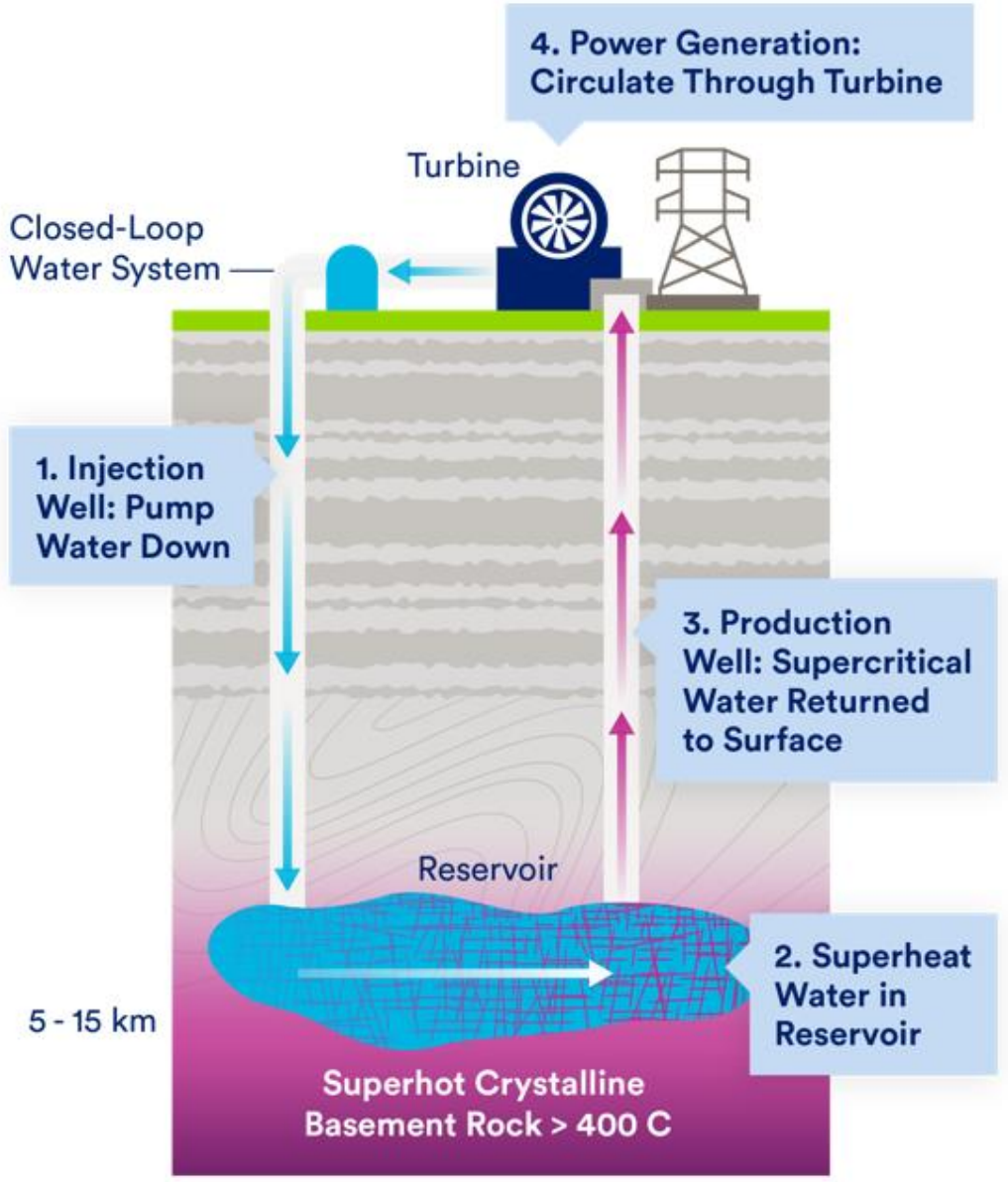
New Markets, Super Hot Rock



New Markets Super Hot Rock

Value Proposition

- Competitive power
- Zero greenhouse gases
- Endless no-cost Earth energy resource, accessible worldwide with super deep drilling innovation
- Dispatchable, meaning always on, baseload power
- Energy dense, high energy with a small surface footprint
- Pivots fossil power to geothermal across the globe.
- Generate hydrogen without carbon as a transportation fuel
- Potential to repower fossil power plants
- Significant engineering advancements required but does not depend on scientific breakthroughs



New Markets Super hot rock

Main Technical Challenges

- Low ROPs
- Drilling temperatures beyond electronic capability
- Completions design
- High Temperature Casing and Cement

New Markets, Super hot rock

Low ROP

Past – Roller Cone

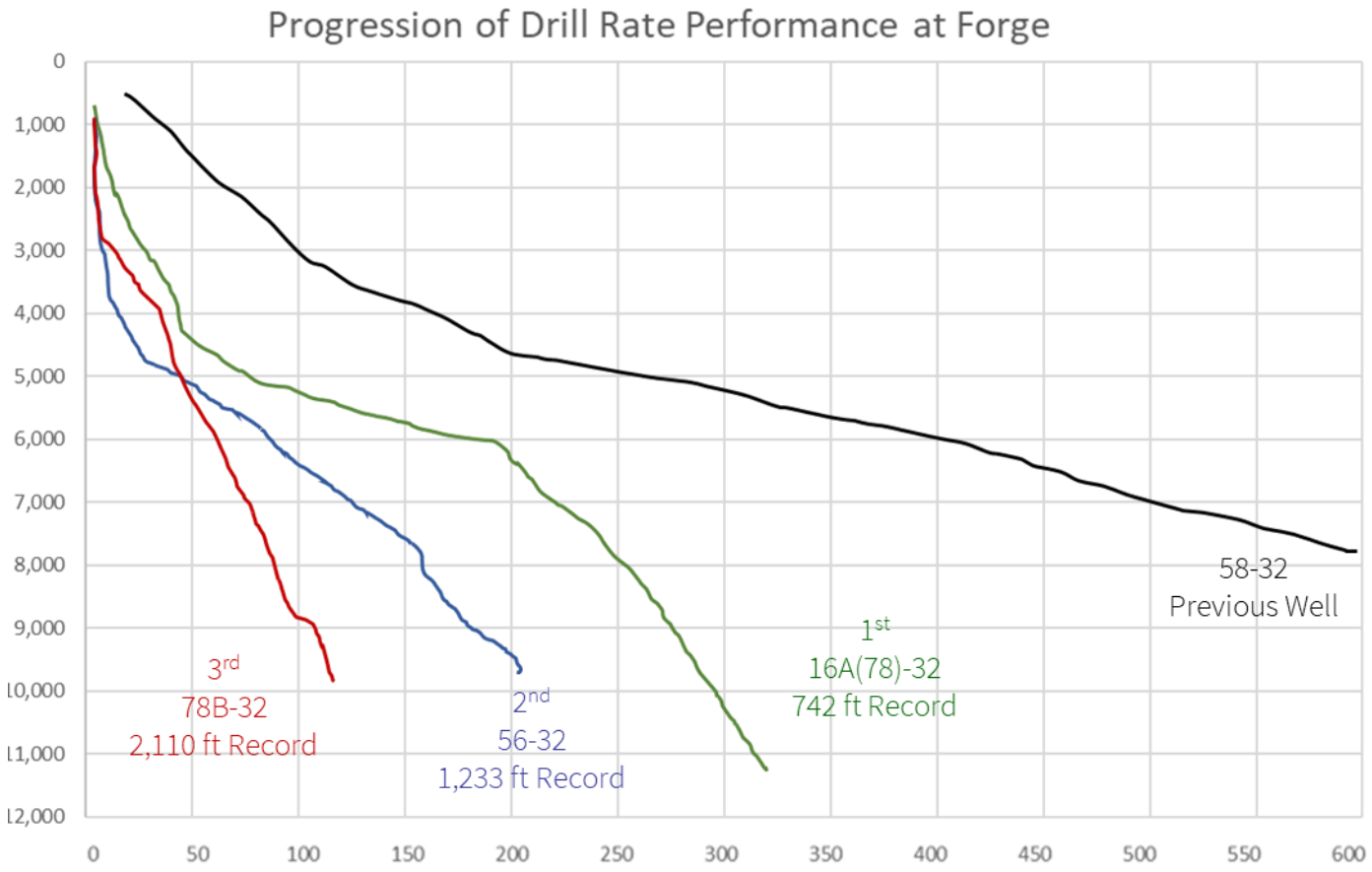
Present – Fixed Cutter

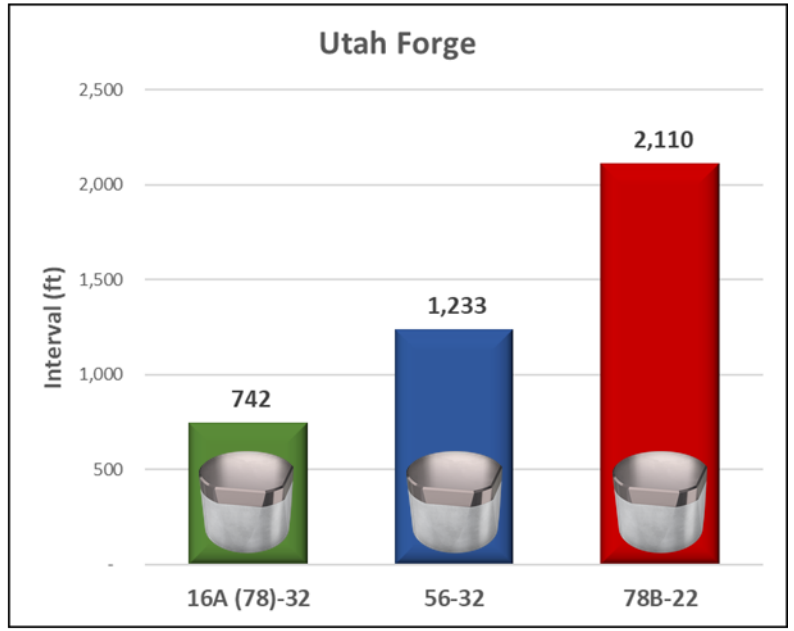
Future – Non-traditional

16

New Markets, Super hot hard rock

Proven Performance at Utah Forge

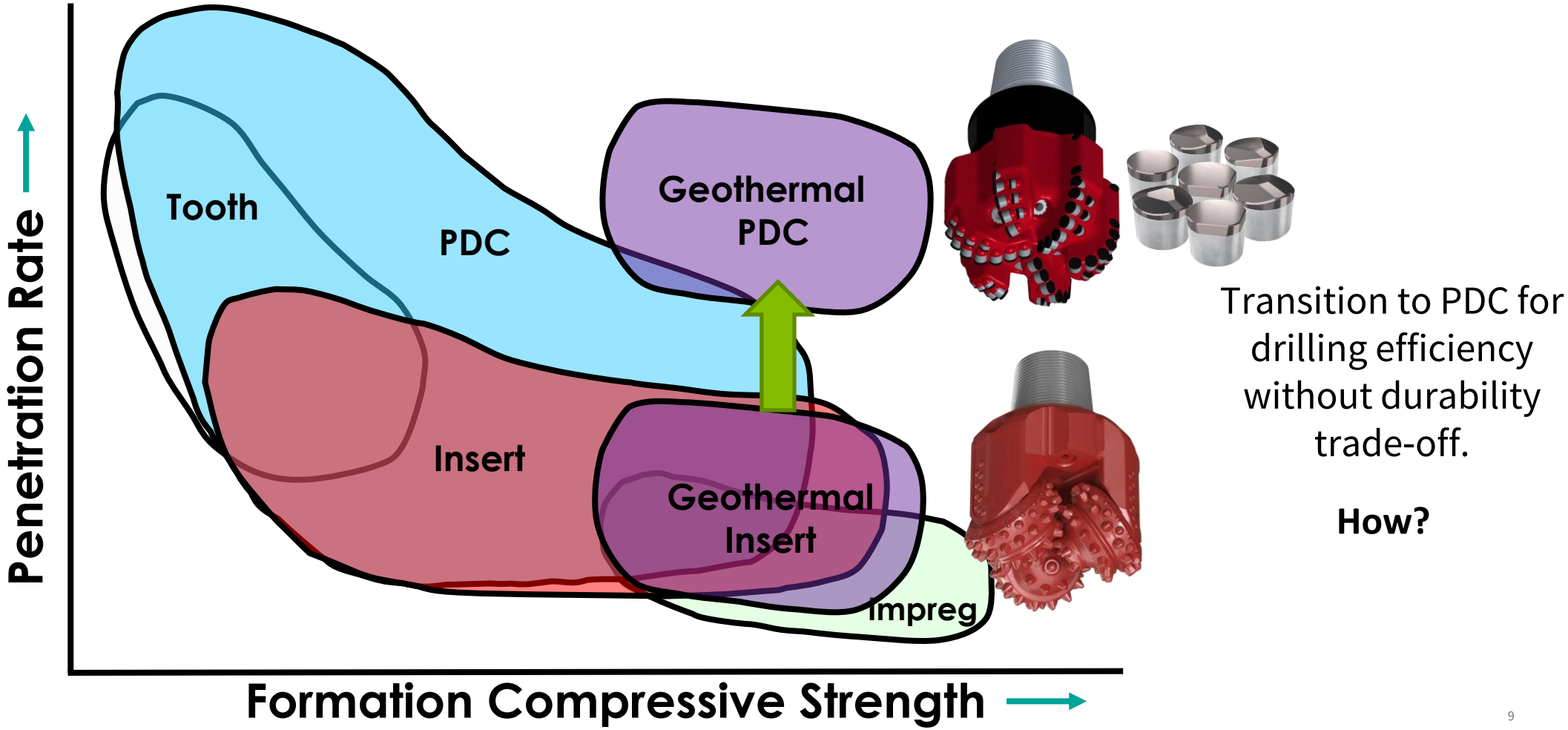




52.3 ft/hr 33.3 ft/hr 75.6 ft/hr

Drilling Technology - Present

Transition from Insert Bits to Advanced PDC



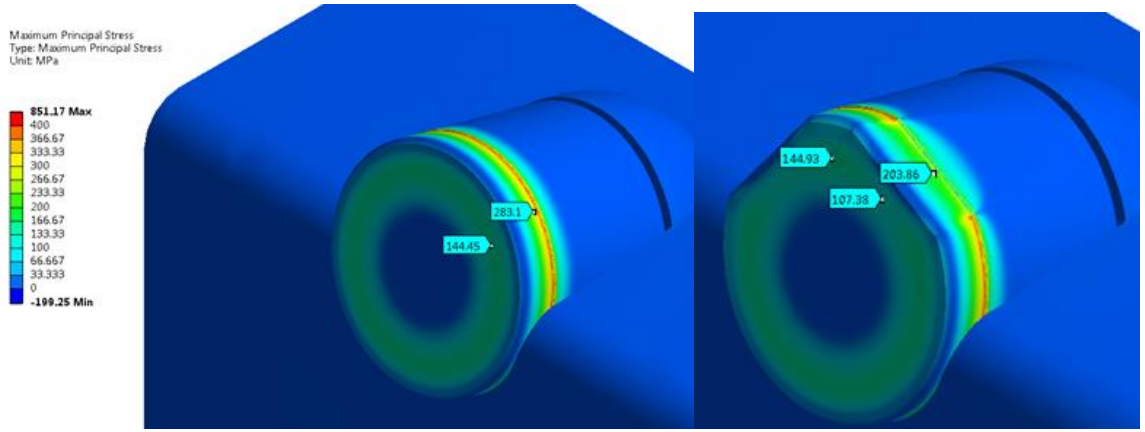
Transition to PDC for drilling efficiency without durability trade-off.

How?

Drilling Technology - Present

Transition from Insert Bits to Advanced PDC

- Stronger V-shaped cutter technology allows for higher WOB to be applied



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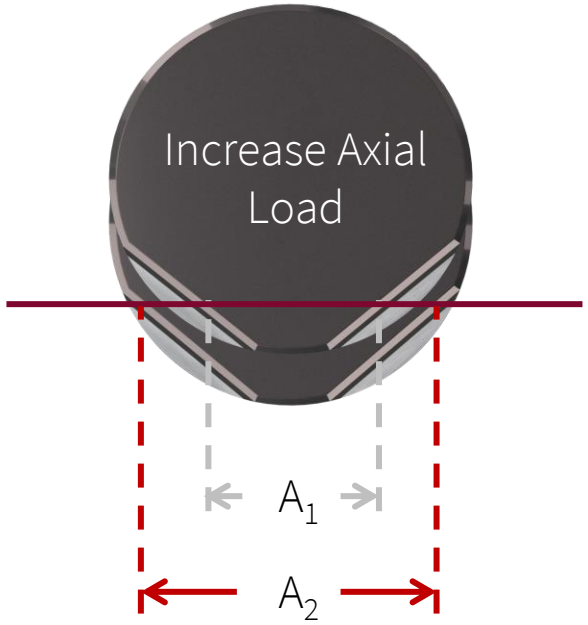
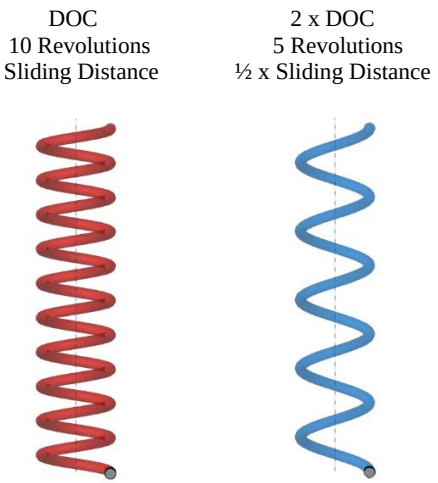


Increase WOB does not change force per area. Area changes to maintain force equal to rock strength. (SPE-210468-MS)



New Markets, Super hot hard rock

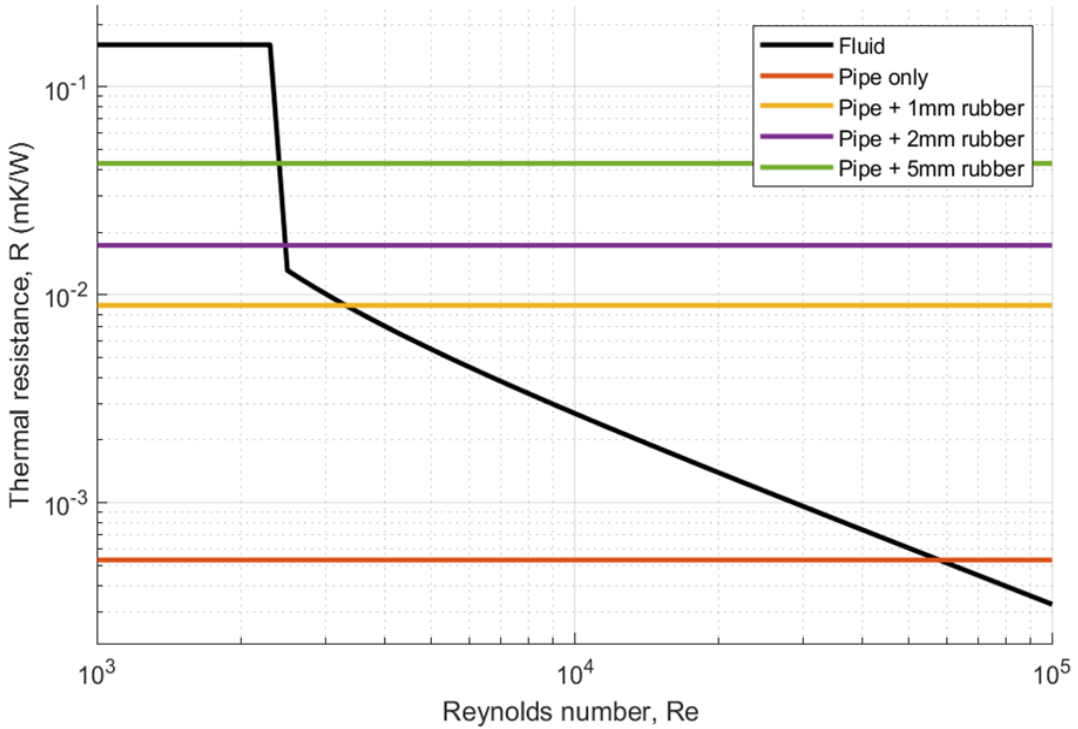
Future Drilling Technology, Particle Impact Drilling

- Collaboration between Particle Drilling & NOV
- Removes rock by blasting it away with hardened steel particles
- Lab & Field Testing are very promising
- 2 runs, 900ft at 48 ft/hr

New Markets, Super Hot Rock

Drilling temperatures beyond electronic capability,
Taking a System Approach

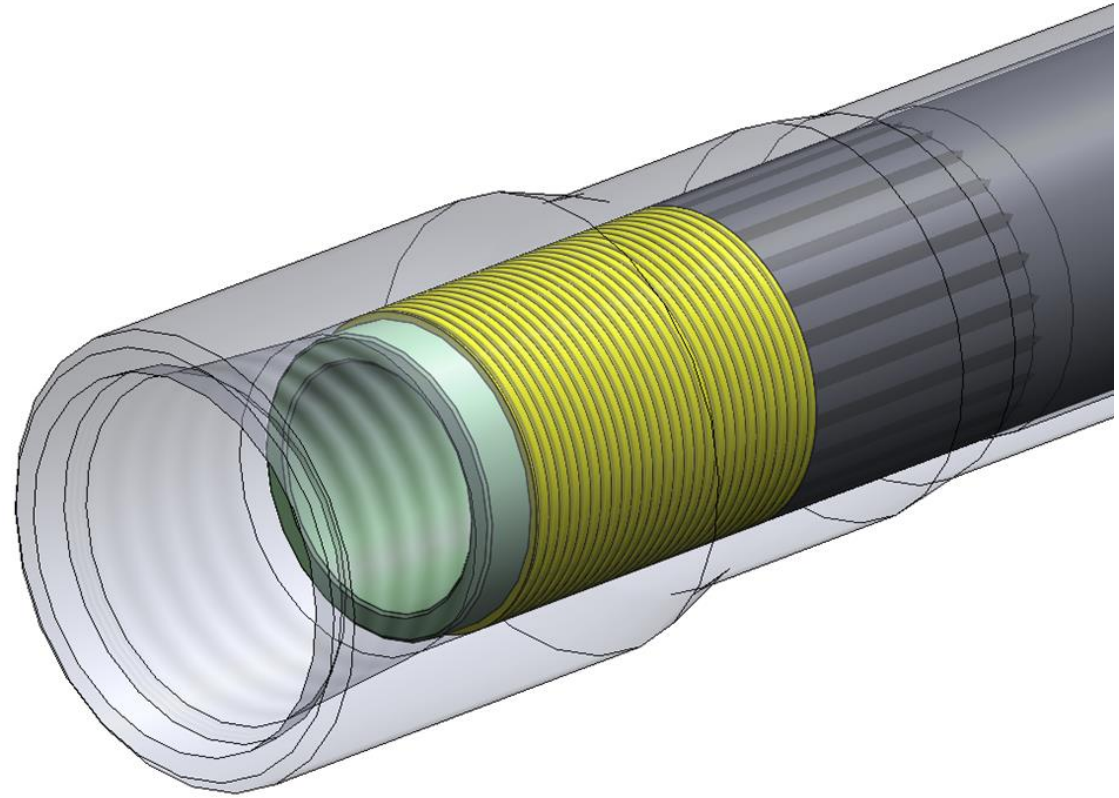
- **Coatings**
- Insulated drill pipe
- Mud coolers
- High flow rates
- Large diameter pipe
- Laminar flow
- Fast connections with automation
- Continuous circulation

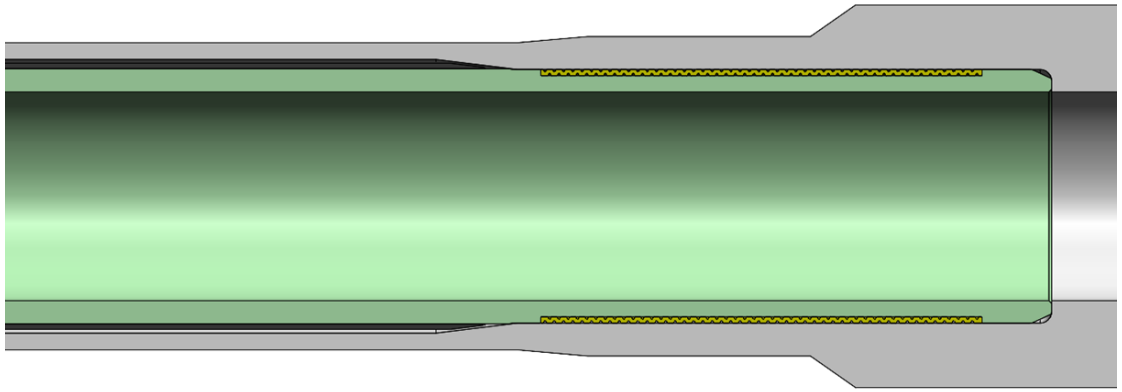


New Markets, Super Hot Rock

Drilling temperatures beyond electronic capability

- Insulated drill pipe
- Patent Filled in Jan 2023
- Eavor Workshop Feb 3rd
- 2-3 Coated Surfaces





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