EGS Doublet

- Hotter Water Produced to Surface
- Colder Water Injected from Surface
- Hydraulically Induced Fracture
- Horizontal or Inclined Wells Drilled from the Earth’s Surface
Focus Areas for EGS Success

• Cheaper/Lower-Tech Rotary Drilling BHAs
  • Rely less on RSS or steerable mud motors
Tangent Drilling BHA Concept

- Bit Rotation ($\omega = 225$ rpm)
- Bit (8.5 in)
- Near-Bit Stabilizer (8.375 in) ($\omega = 165$ rpm)
- Mud Motor
- Pipe Rotation ($\omega = 60$ rpm)
- Adjustable Gauge Stabilizer (AGS) (7.8 to 8.5 in)
- String Stabilizer (8.375 in)
Focus Areas for EGS Success

• Cheaper/Lower-Tech Rotary Drilling BHAs
  • Rely less on RSS or steerable mud motors

• Fracture Geometry vs Injector/Producer Separation

• Overall Sense of Urgency
  • Learn fast by taking calculated risks.
  • Execute as if your life depended on it.
Fracture Geometry and Well Spacing

Linear Frac Fluid
Fracture Geometry and Well Spacing

Cross-Linked Frac Fluid
Focus Areas for EGS Success

- Cheaper/Lower-Tech Rotary Drilling BHAs
  - Rely less on RSS or steerable mud motors
- Fracture Geometry vs Injector/Producer Separation
- Fluid Distribution Control Systems
  - Autonomous
  - Self-regulating
  - Inner Completion vs Cemented in Place
Injection Fluid Distribution

Inner Completion Option

perforations or fracturing sleeve
drilled borehole
cased-hole packer
injection control valve
tubing
injected fluid
casing with annulus isolation from cement
Injection Fluid Distribution

Cemented in Place Option

combination fracturing sleeve & injection control valve

drilled borehole

casing with annulus isolation from cement

injected fluid
Focus Areas for EGS Success

• Cheaper/Lower-Tech Rotary Drilling BHAs
  • Rely less on RSS or steerable mud motors
• Fracture Geometry vs Injector/Producer Separation
• Fluid Distribution Control Systems
  • Autonomous
  • Self-regulating
  • Inner Completion vs Cemented in Place
• Overall Sense of Urgency
  • Learn fast by taking calculated risks.
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