Geothermal Drilling

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Geothermal drilling

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- **Drilling target**
  - Planning
  - Well design
  - Drilling program design
  - Tendering process
  - Contracting

Geothermal drilling

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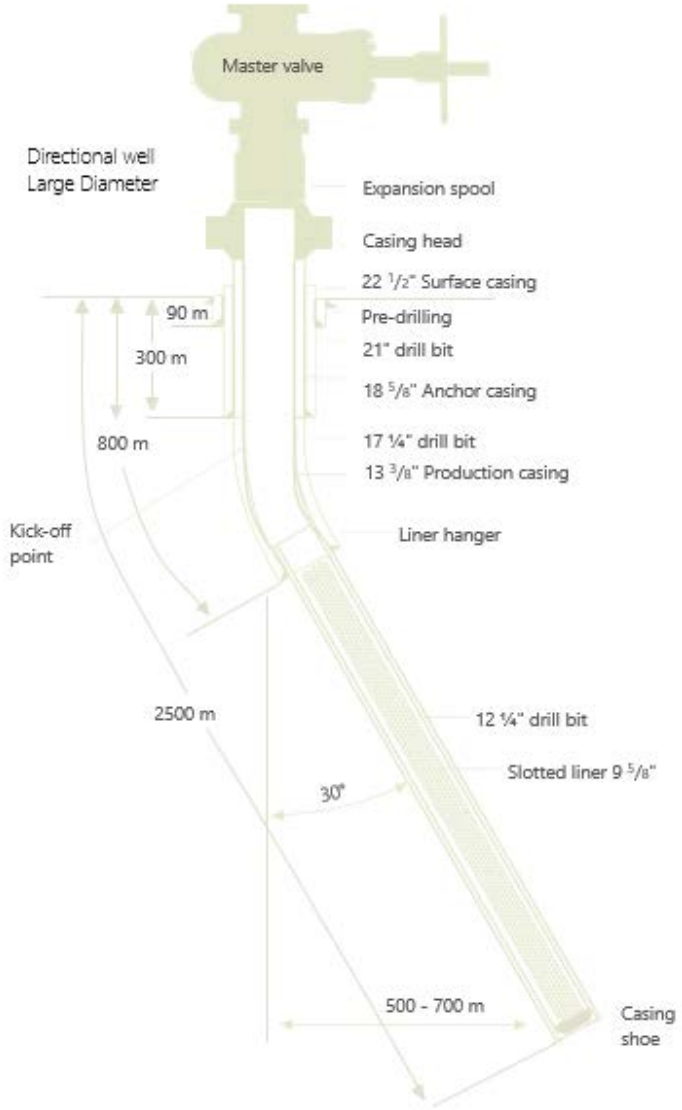
- **Planning**
  - Permitting
  - Equipment
  - Material

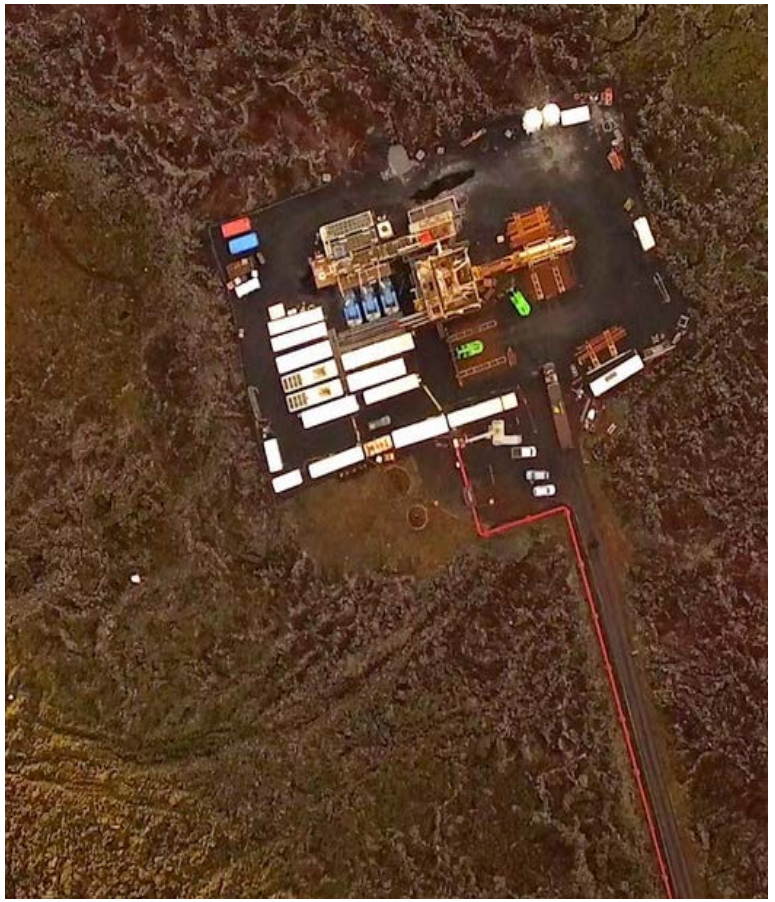
Typical well design

- **2500 meter directional drilled**
  - Large diameter well
  - Drilling 26“ top hole to ~100m
  - 21“ drilling for 18 5/8“ anchor casing ~300m
  - 17 ½“ drilling for production casing ~ 800m
  - 12 ¼“ drilling production section ~2500m
  - 9 5/8“ slotted liner



Contracts

- **Day rate contracts**
  - most common
- **Turnkey contracts**
  - used in smaller projects and water well drilling
- **Integrated meter rates contracts**
  - used in Iceland for geothermal drilling projects



Integrated contracts, structure

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- Mixing of meter rate, day rate and turnkey contracts.
- If everything is normal and the well is drilled as designed
  - The prize is more or less fixed.
  - The contractor is paid for each meter drilled.

Integrated contracts, structure

- The contractor and the developer splits the risk of damages in the hole up to a limit.
  - The responsibility is greater on the **contractor**.
  - The trust has to be **between** the parties.
  - Unexpected delays related to hard rock, bad performance or weather condition is on the **contractor**.
  - Hourly rate is paid for down hole problem due to difficult geological conditions by **developer**.

Integrated contracts, what is in it

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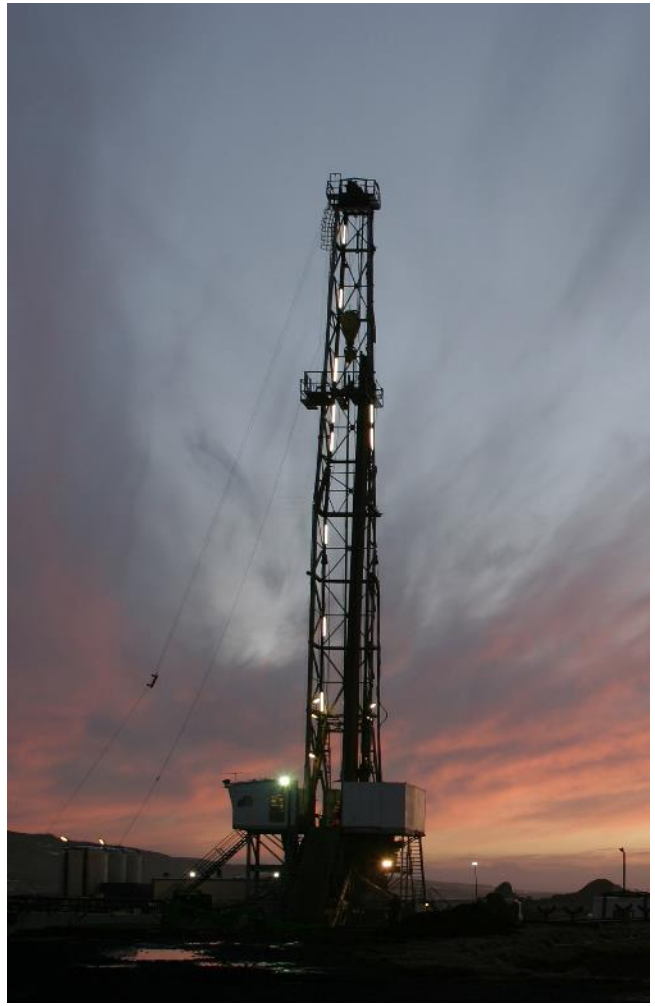
- The contractor is supplying **all drilling services**
  - casing running, cementing, dd service, etc.
- The contractor is supplying **all equipment's for drilling**
  - drill bits, stab, DC, DP, mud motors, jars …….
- The contractor is supplying **all drilling consumables**
  - drilling mud, cement, casing and casing accessories…



Win-Win

- The total cost decreases and the **contractor** has benefit of improvement of procedures and adopt new technologies.
- The **developer** can focus on what they do best.
- Drilling time is shorter since **everyone** has benefit of shorter drilling time.
- **Especially** developers that don't have necessary knowledge and infrastructure.

For whom is this a good choice

- Small developers.
- New developers coming into the marked.
- Operation in remote locations.
- For example, HS Orka projects in Iceland

Thank you