InnovaRig - an Instrument for a European Geothermal Drilling Program

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GeoForschungsZentrum Potsdam

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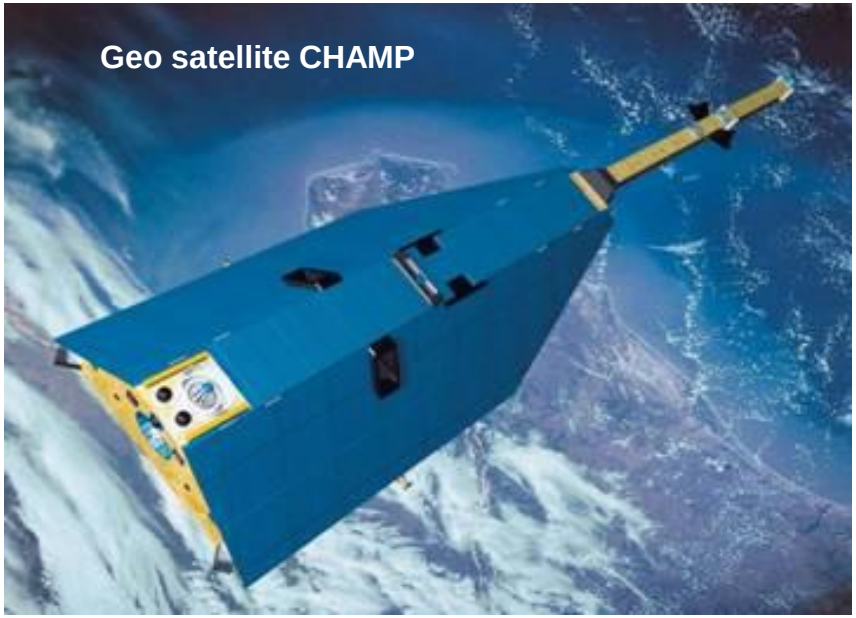
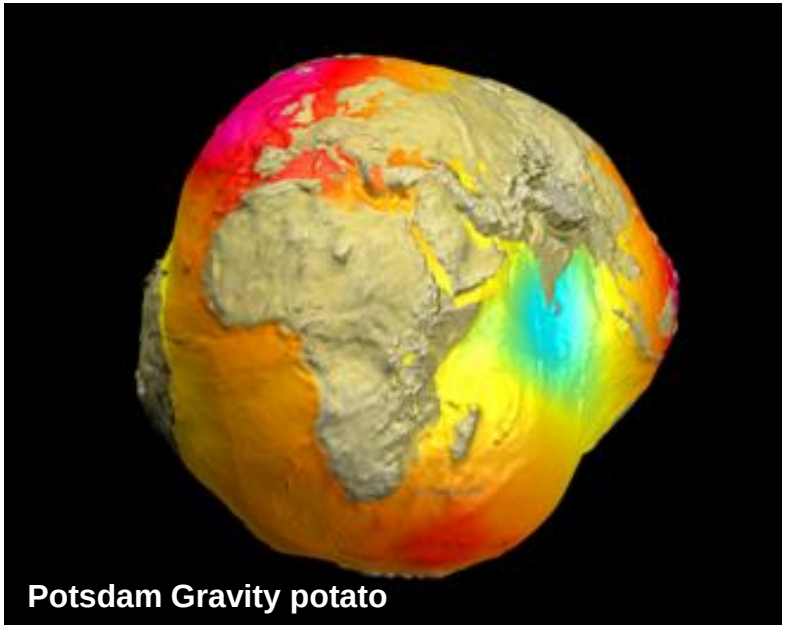
- Member of the Helmholtz Association of 15 national research centres
- Founded in 1992, the GFZ consolidates different geoscientific fields into a multidisciplinary network
- National research centre for earth sciences in Germany
- Forum for international communication and co-operation in geosciences
- One of the leading centres in Europe with respect to geothermal research

Research at GFZ

Broad spectrum of methods and techniques, such as

- satellite geodesy and remote sensing,
- geo-physical deep sounding,
- scientific drilling,





- experiments under in situ conditions,
- and modelling of geo-processes.

Major research fields "Earth and Environment" and "Energy" of the Helmholtz Association.

Technical Infrastructure

to fulfill the missions:

› Equipment Pools:
- geodetic,
- geophysical

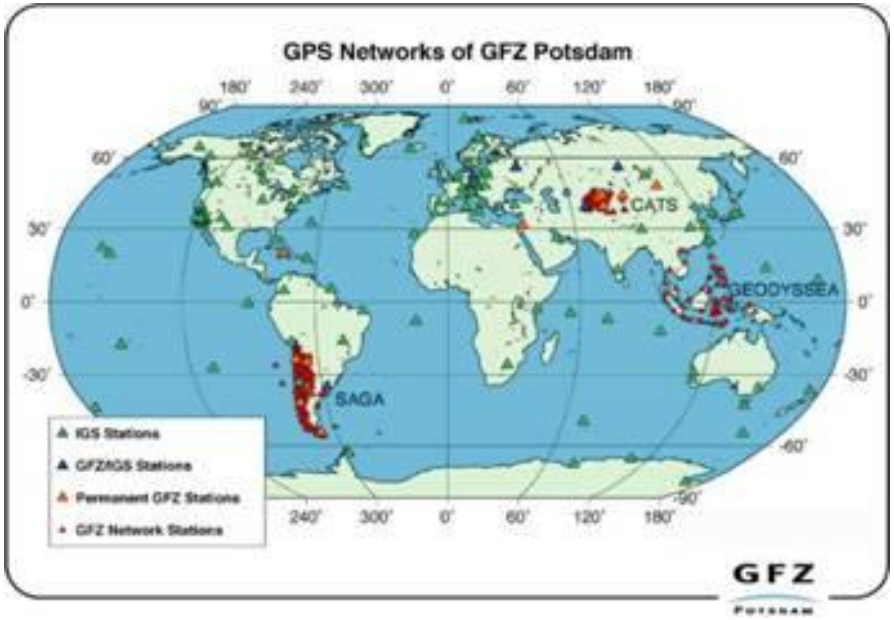
› Observatories:
- magnetic
- seismologic
- direct in depth

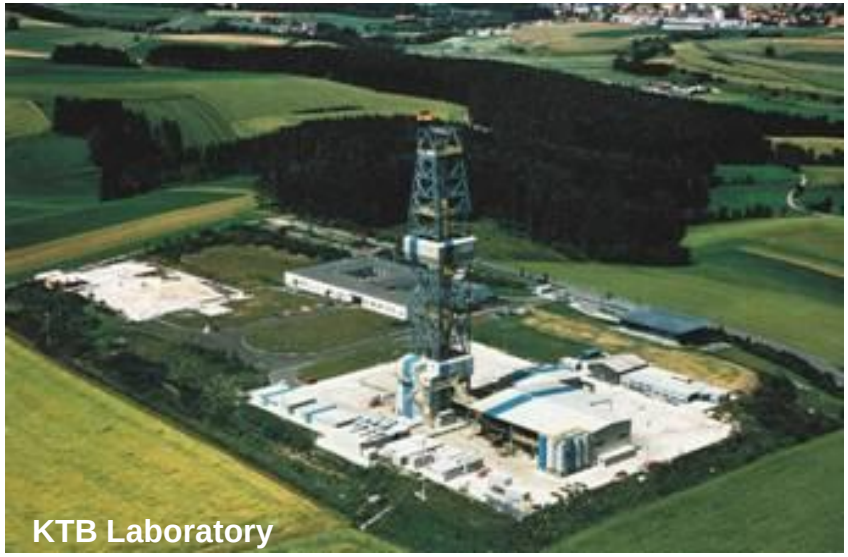
› Laboratories for material properties:
- chemical
- optical
- physical (in situ conditions)

› Library

› and now

InnovaRig – for scientific drilling



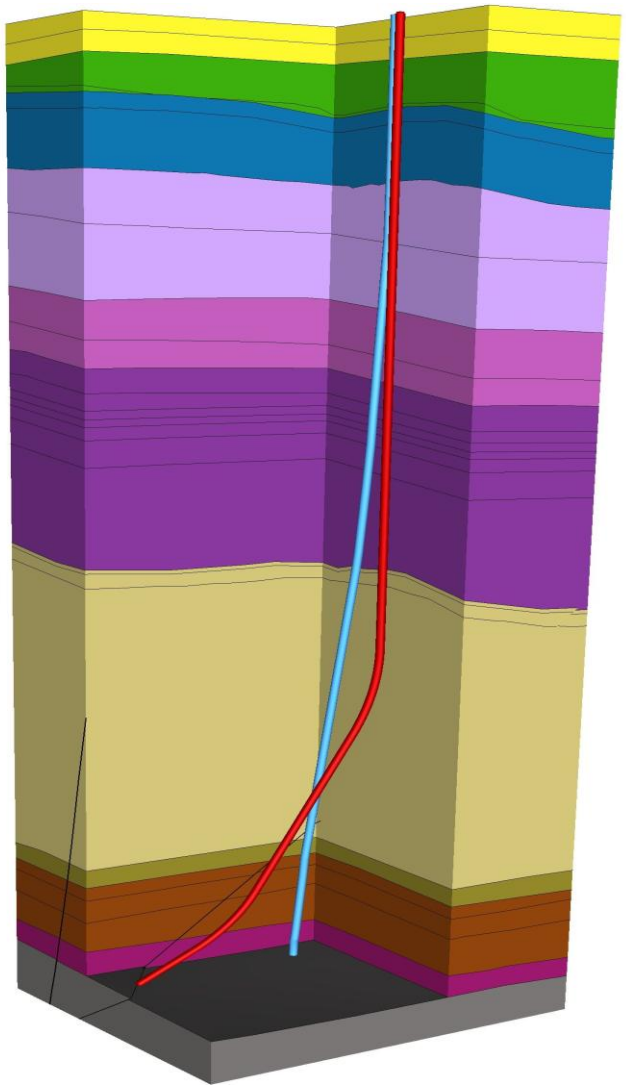

KTB Laboratory

CO_2 storage project (Ketzin, Germany)

www.co2sink.org

15 partners from
8 european nations

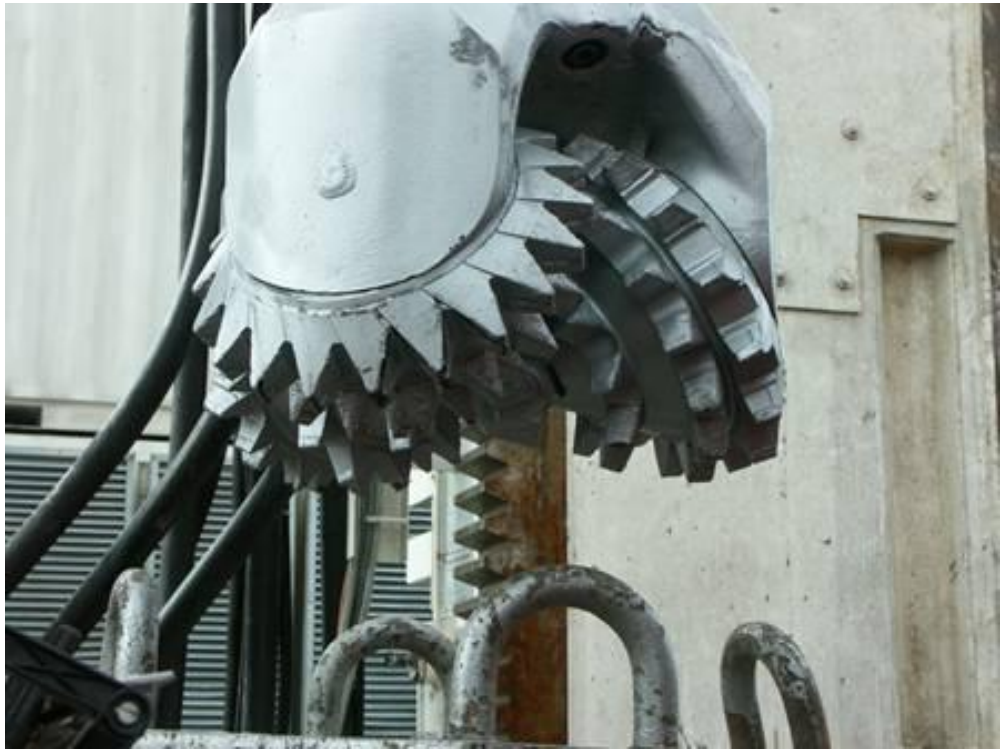
Completion of Groß Schönebeck



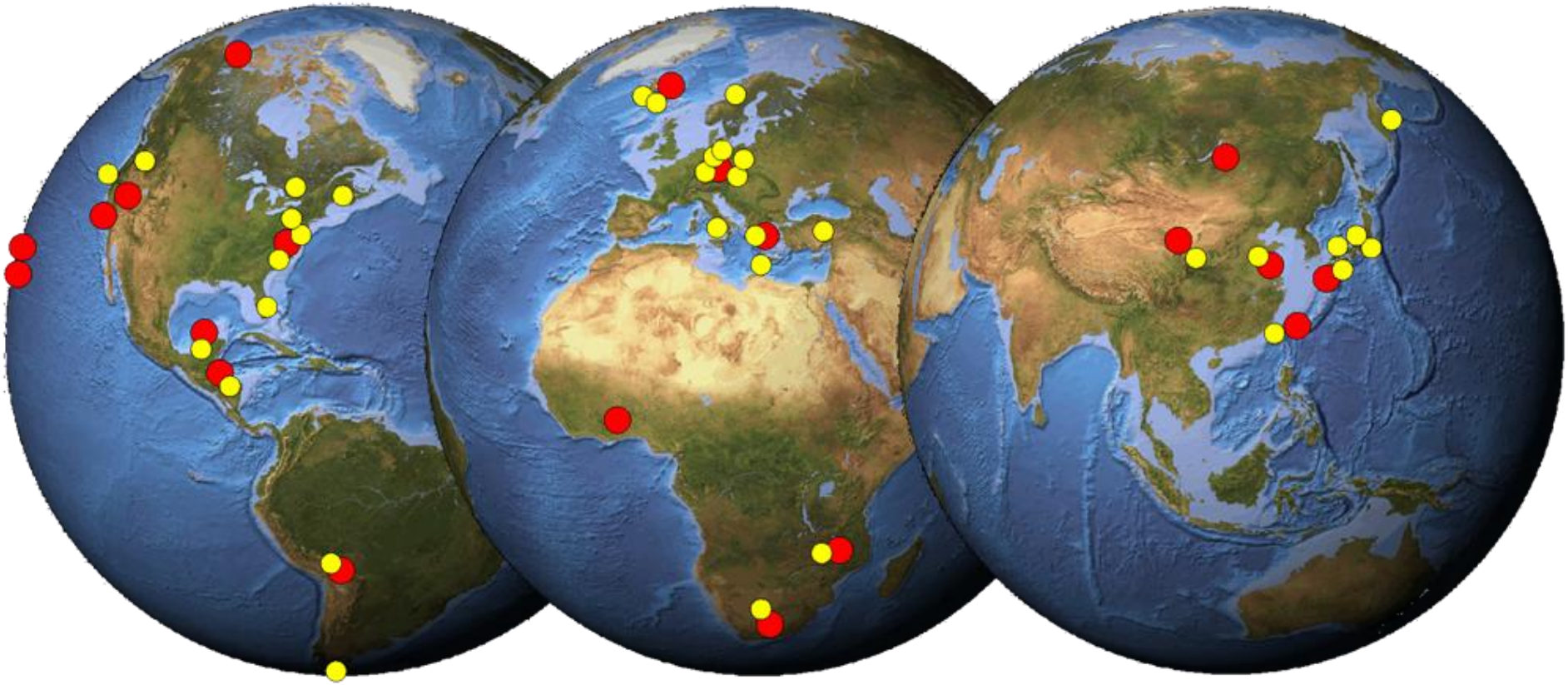
Directional drilling concept of the 2nd well

Drilling challenges (2006/2007)

- large diameter
- balanced drilling into the reservoir
- directional well

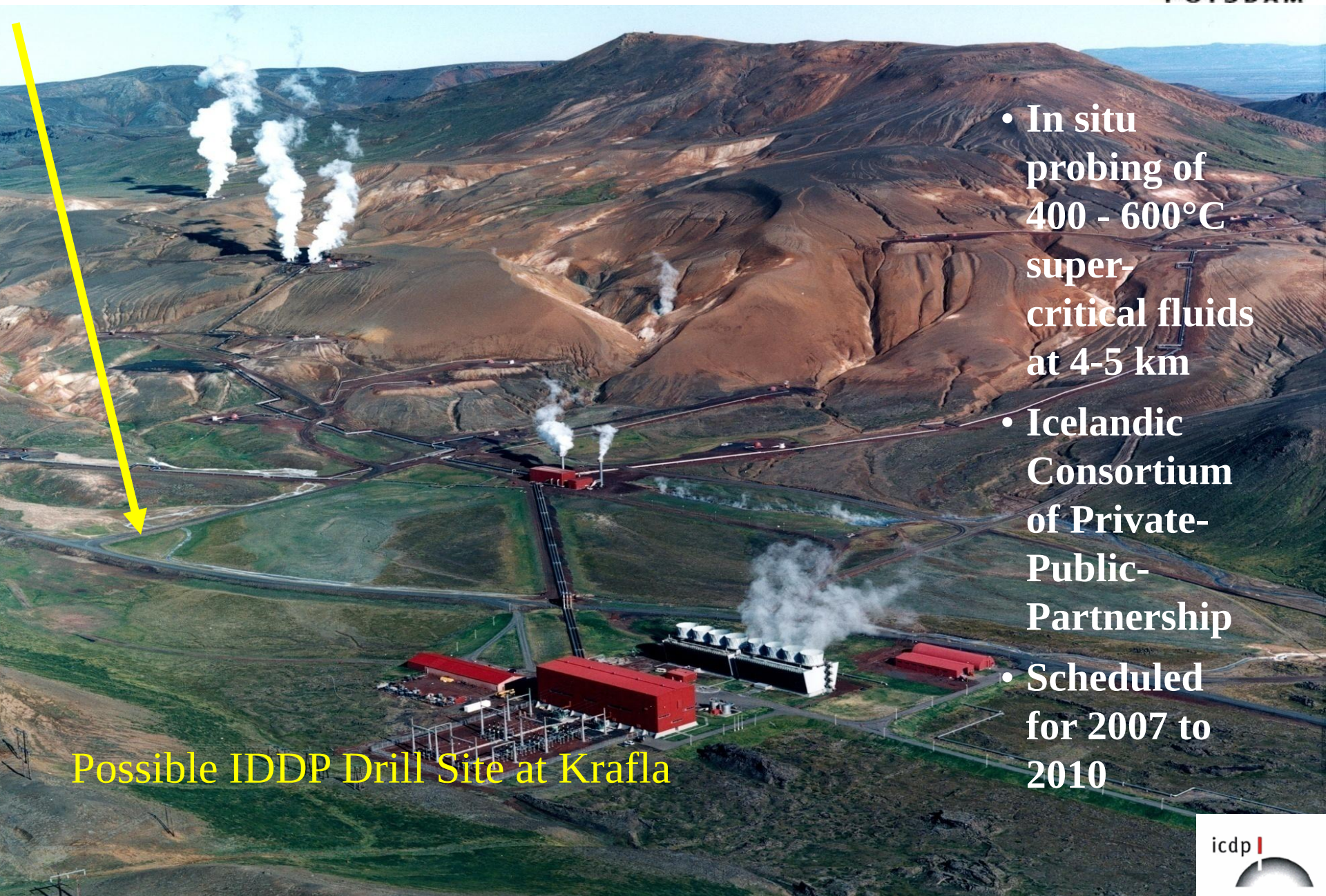


International Continental Scientific Drilling Program



20 projects, 40 workshops, ~ 1000 scientists involved

Iceland Deep Drilling Project

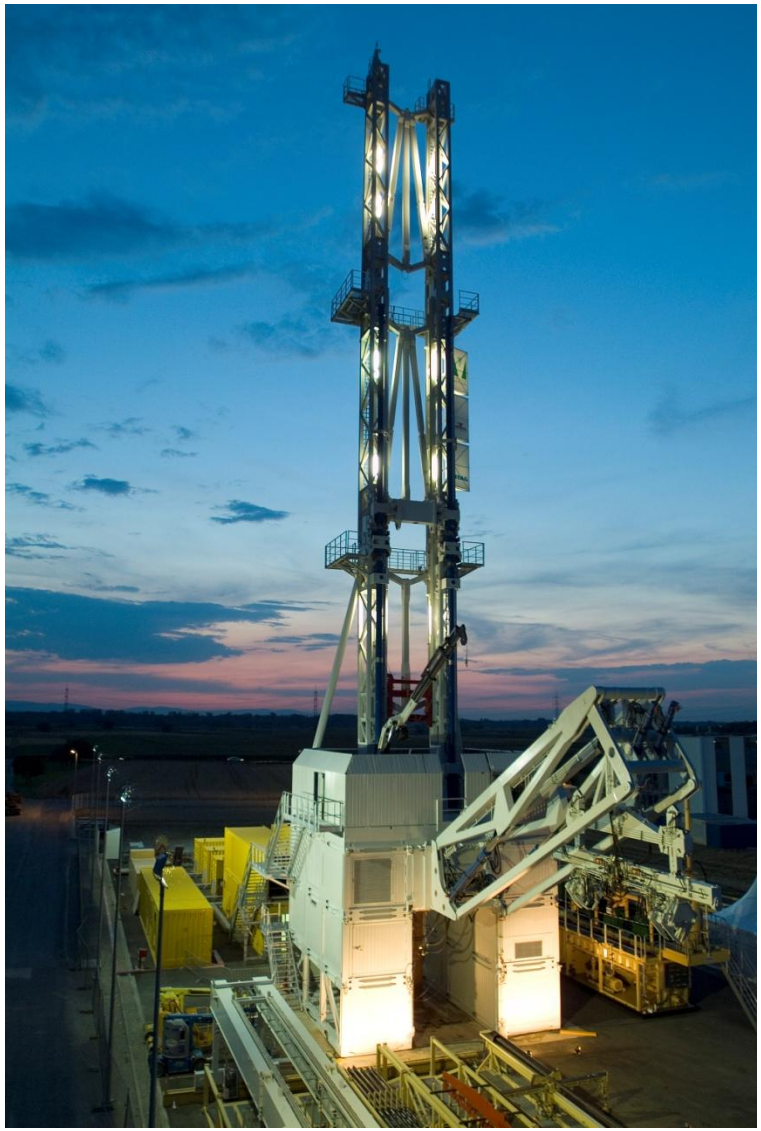


- In situ probing of 400 - 600°C super-critical fluids at 4-5 km
- Icelandic Consortium of Private-Public-Partnership
- Scheduled for 2007 to 2010

Possible IDDP Drill Site at Krafla

Scientific purposes of InnovaRig

- to have an opportunity for applying various drilling processes within the frame of usual industry safety standards,
- specific equipment for sample recovery (cores, cuttings, mud, gas),
- reliable installations to support various stimulation procedures (chemical, mechanical, and thermal),
- installations to make logging easier respectively to reduce its preparing time,
- support for comprehensive data acquisition from drilling, logging, testing, and monitoring,
- and additional technical options derived from special scientific requirements.

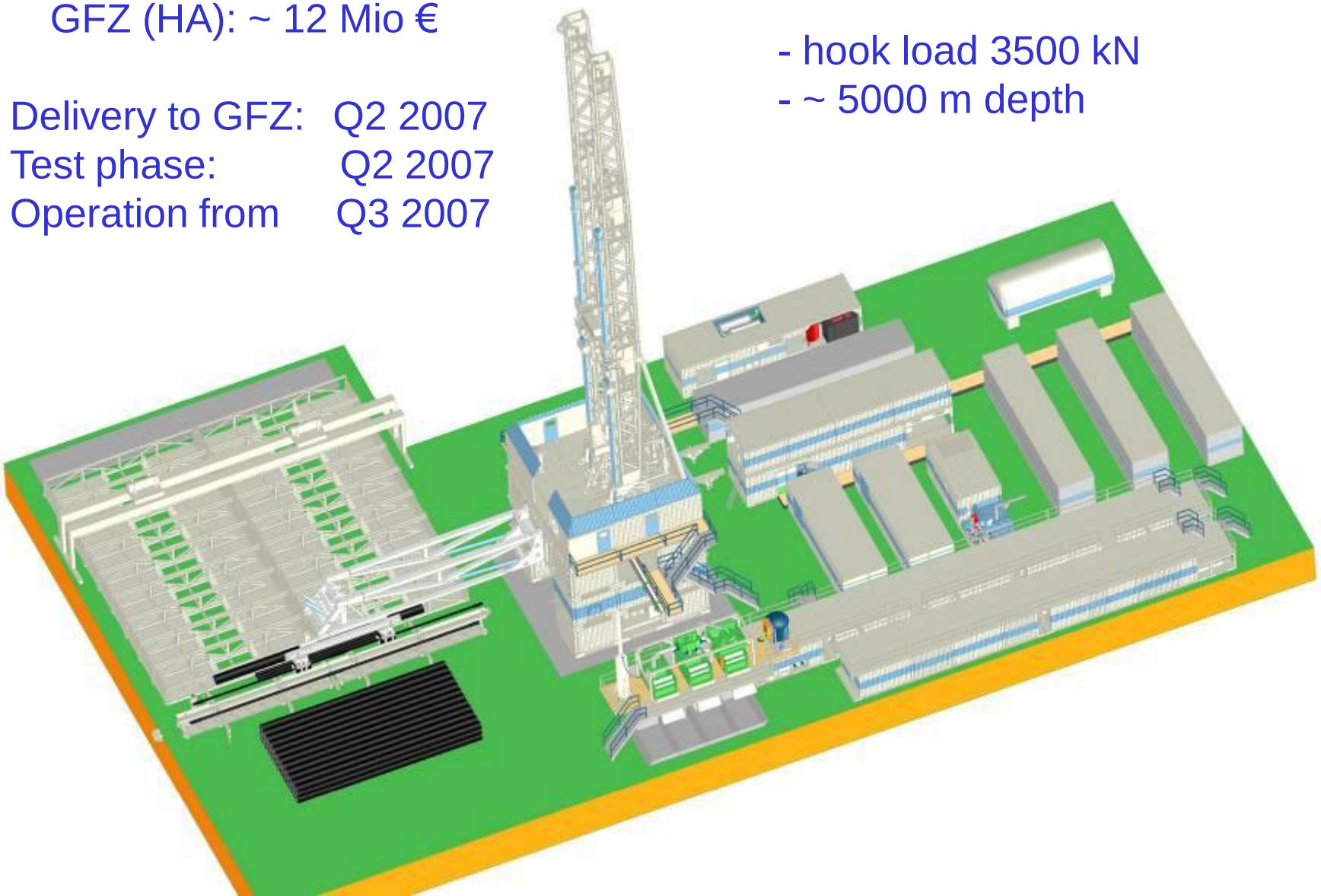


InnovaRig – instrument for scientific drilling

Total-Invest: ~ 17 Mio €
GFZ (HA): ~ 12 Mio €

Delivery to GFZ: Q2 2007
Test phase: Q2 2007
Operation from Q3 2007

- hook load 3500 kN
- ~ 5000 m depth



Dr.

Advantages of InnovaRig

- designed to address significant cost reduction in comparison to conventional rigs requiring less personal using a semi-automatic operation and minor mob-demob-time due to fully containerised construction.
- power supply from the electric grid or by generator.
- skid-system allowing for single setup to realize two borehole by hydraulically shifting the rig by 10 m.
- two top drives and a five kilometer wireline coring system.
- additional drill pipe and blowout preventer components are available.

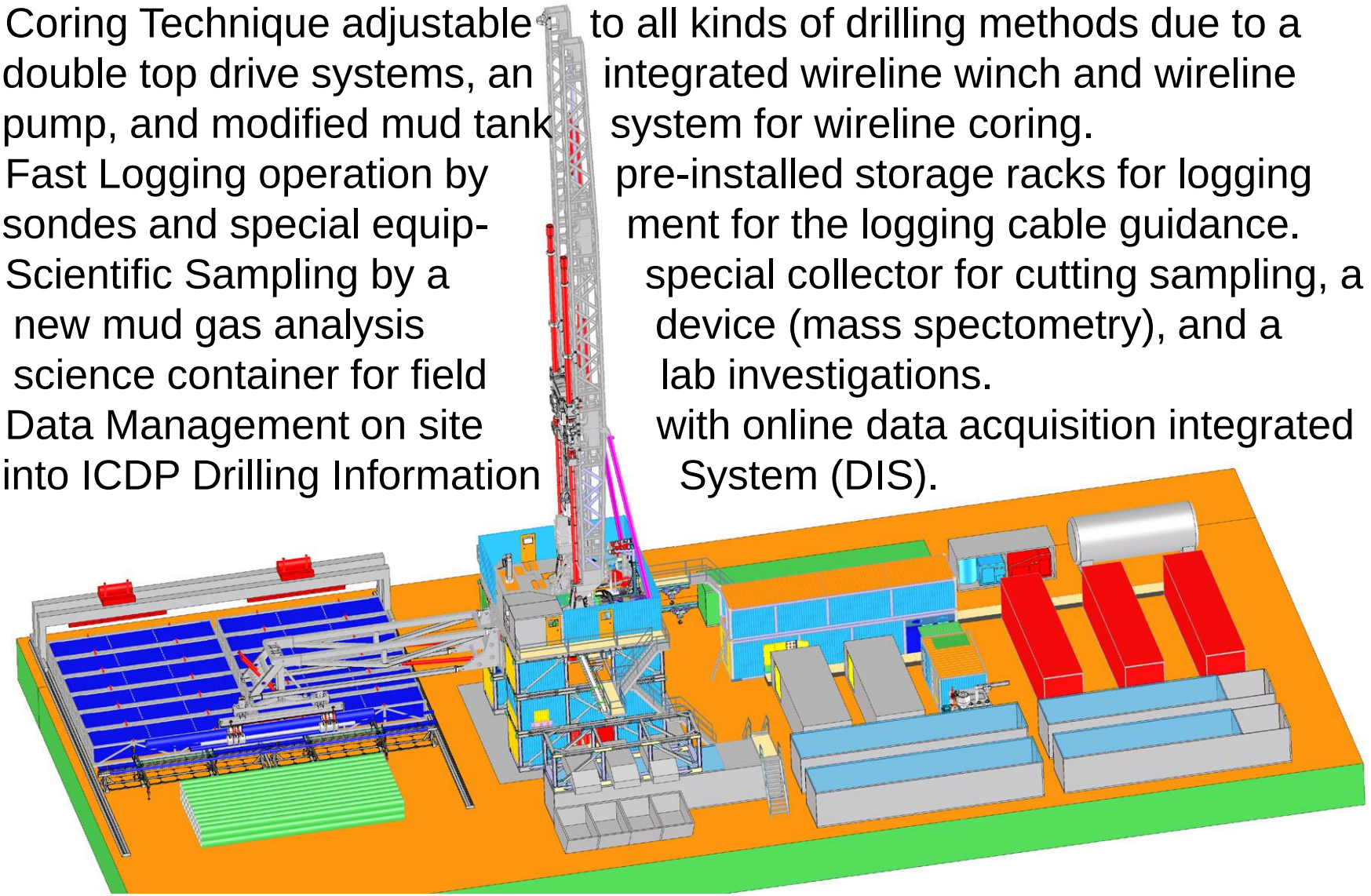
InnovaRig basics

- Mast and Hoist System with hydraulically driven double cylinder system and - 3500 kN hook load (~ 5000 m depth capacity).
- Pipe Handling System with semi-automatic hands-off-technology and combined pipe connector bridge, pipe handler and iron roughneck.

- Four Drilling Techniques integrated such as rotary drilling, standard spot coring, wireline coring and air drilling.
- Mud System, Pumps and Tanks adjustable to drilling procedure as well as massive hydraulic testing.

InnovaRig for science

- Coring Technique adjustable to all kinds of drilling methods due to a double top drive systems, an integrated wireline winch and wireline pump, and modified mud tank system for wireline coring.
- Fast Logging operation by pre-installed storage racks for logging sondes and special equip- ment for the logging cable guidance.
- Scientific Sampling by a special collector for cutting sampling, a new mud gas analysis device (mass spectometry), and a science container for field lab investigations.
- Data Management on site with online data acquisition integrated into ICDP Drilling Information System (DIS).



InnovaRig and geothermal projects

- innovative geothermal concepts or challenges to future geothermal drilling,
- especially the application of time consuming tests of new methods within the concept of enhanced geothermal systems saving additional capital costs for rig time,
- and providing experimental facilities for service companies to test new technologies outside of commercial drilling operations.