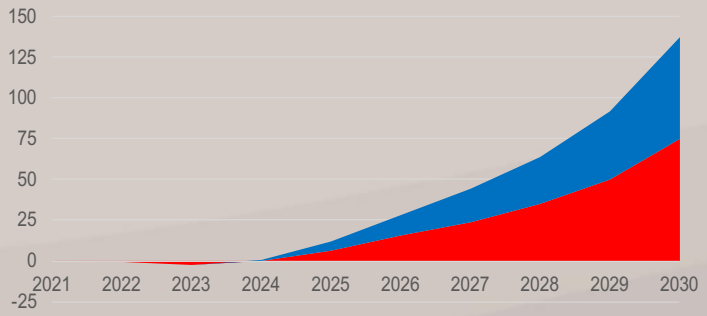
Canopus Drilling Solutions Geothermal

Unlocking Geothermal
with Disruptive Drilling Technology

Enabling Geothermal Anywhere

Huge resource

Canopus solution



Market and investment opportunity

Team

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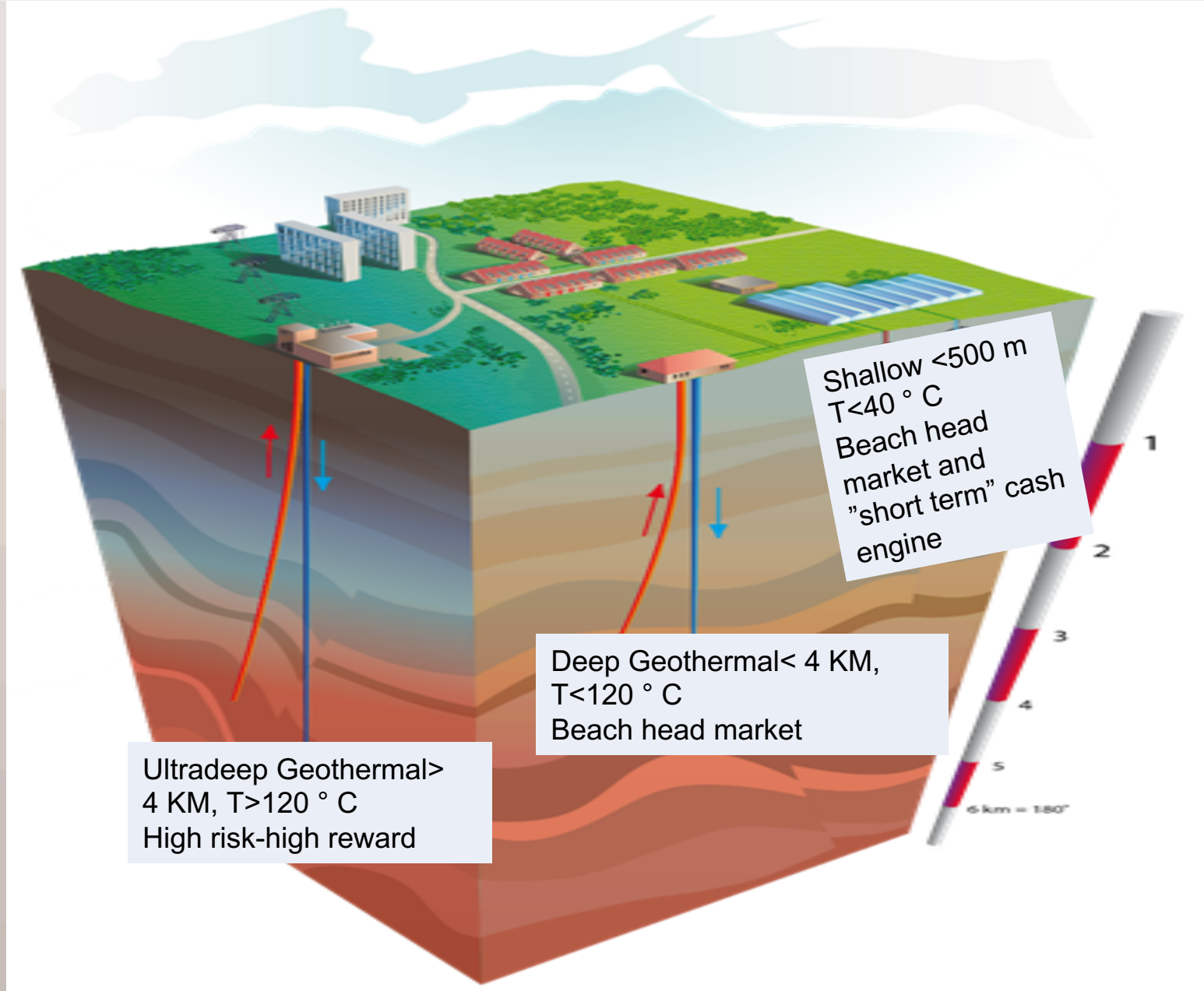
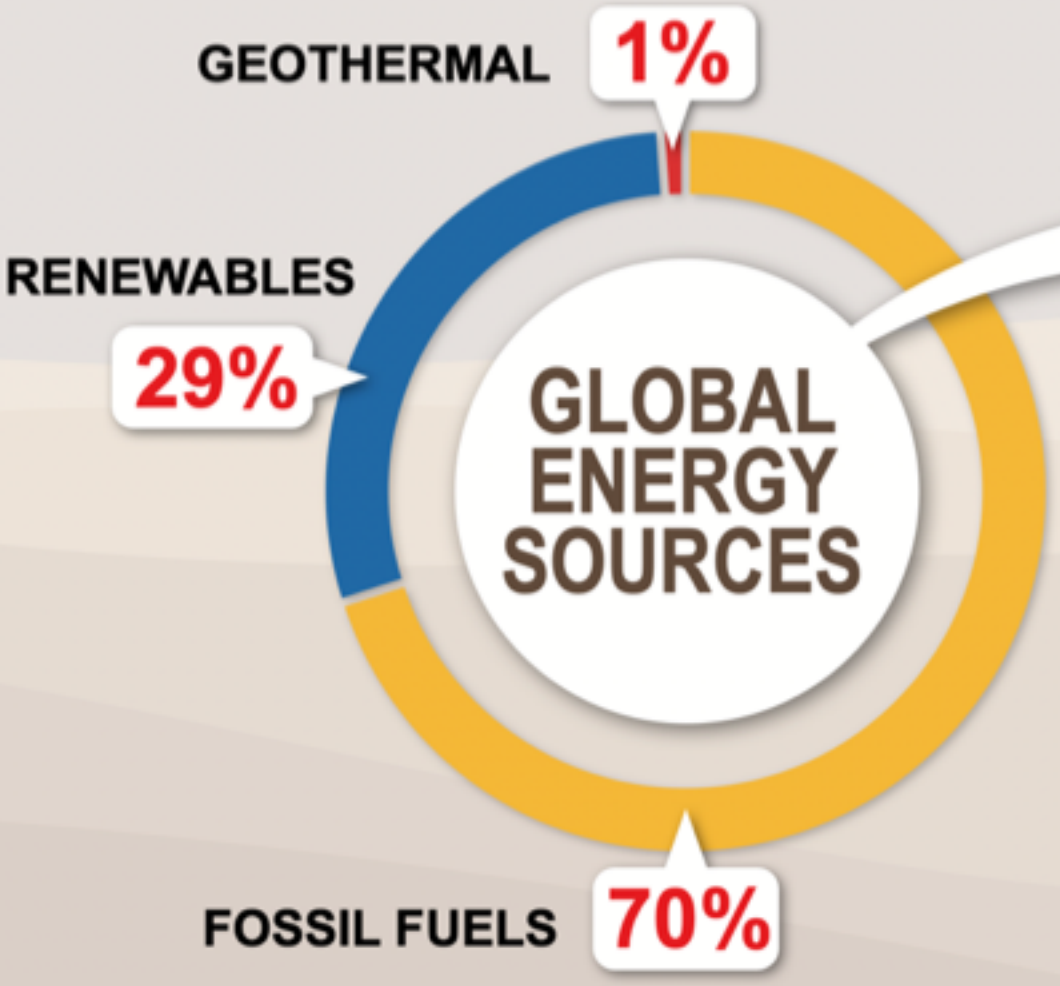
Branding

Geothermal Energy

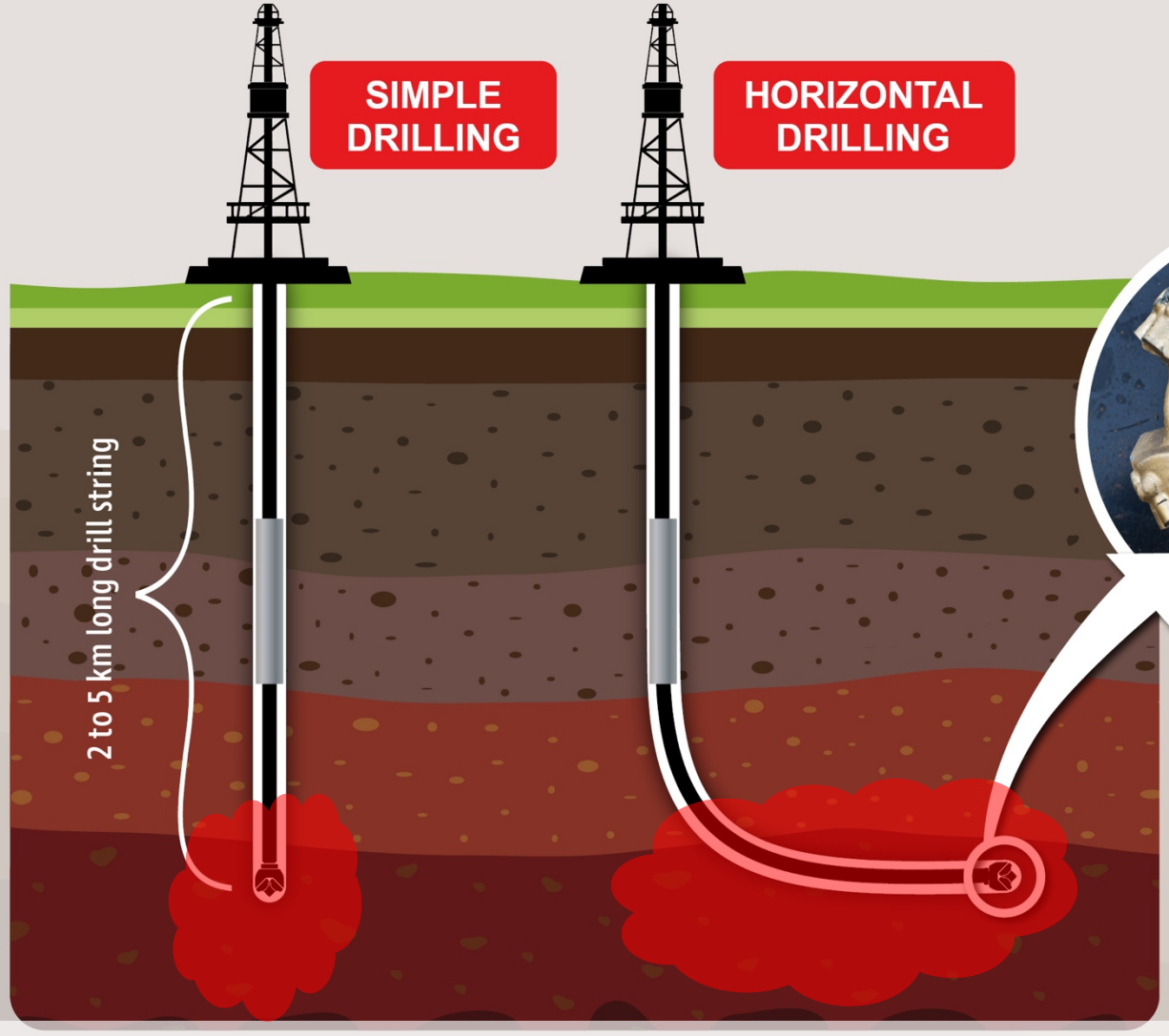


Geothermal huge potential, underutilized



	resource size	always available?	sustainable?	worldwide?	no carbon or waste?
COAL	++	+	-	+	--
OIL/GAS	+	+	-	+-	--
SOLAR (PV)	+	-	+	-	+
GEOTHERMAL	+++	+	+	++	+
NUCLEAR	-	+	-	-	-
WIND	+-	-	+	-	+
HYDRO/TIDAL	-	+	+	--	+-

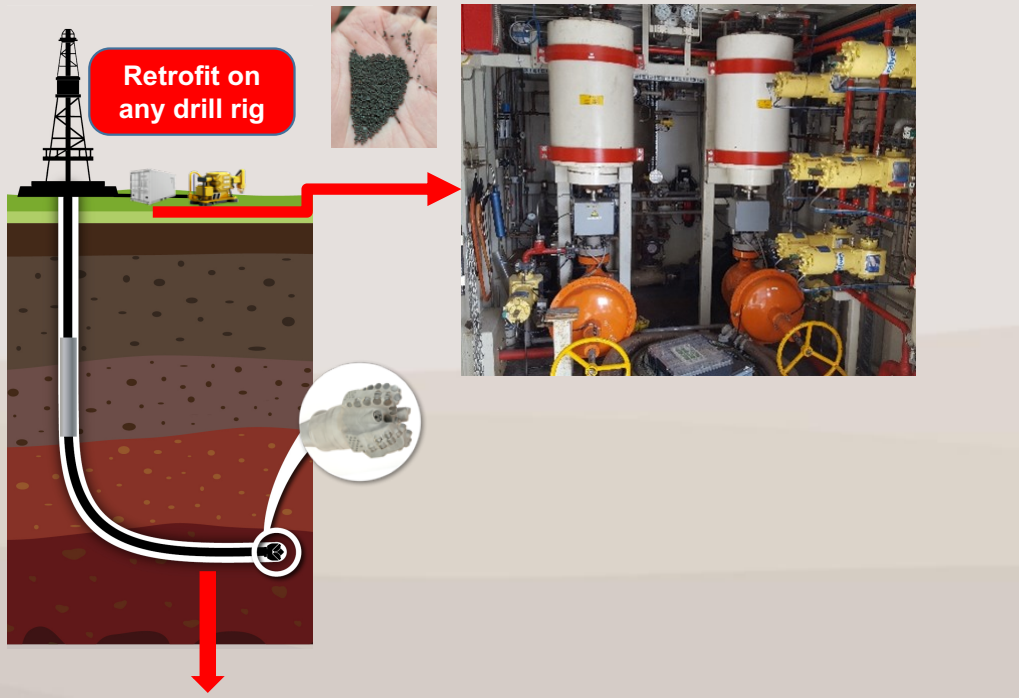
Why is drilling expensive?
Large forces, thin drill string, hard to steer

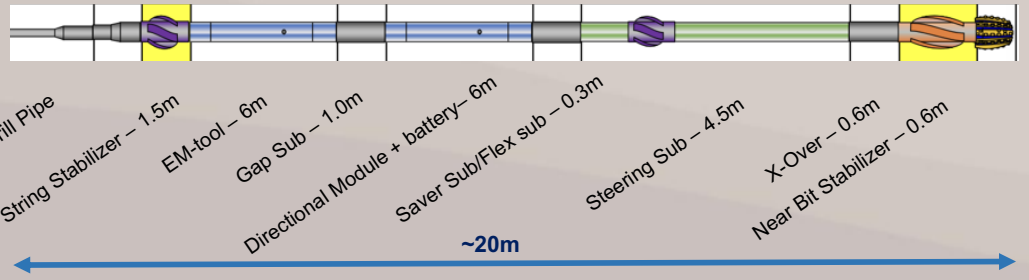


- Large forces & strong vibrations
- One bit per rock type
- Horizontal drilling is much harder than vertical drilling

Operators want to drill cheap vertical and horizontal wells to unlock Geothermal

Canopus Directional Steel Shot Drilling



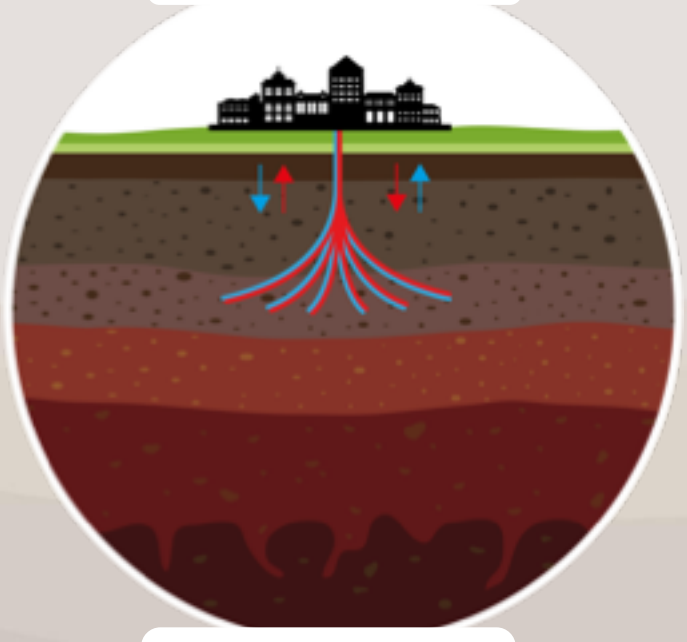


- **Components**: steel shot, injection unit, steering robot and modified PDC bit
- Steel shot particles of <1.1 mm diameter at ~ 1% concentration in drilling fluid
- PDC (conventional) and Steel shot combined
- Steering robot controls the direction of the hole bottom erosion
- Canopus patented
- **Faster: High Rate of Penetration**
- **Steers better: Short radius**

Steel shot drilling with steering: cost effective vertical and horizontal wells

Applications of Directional Steel Shot Drilling

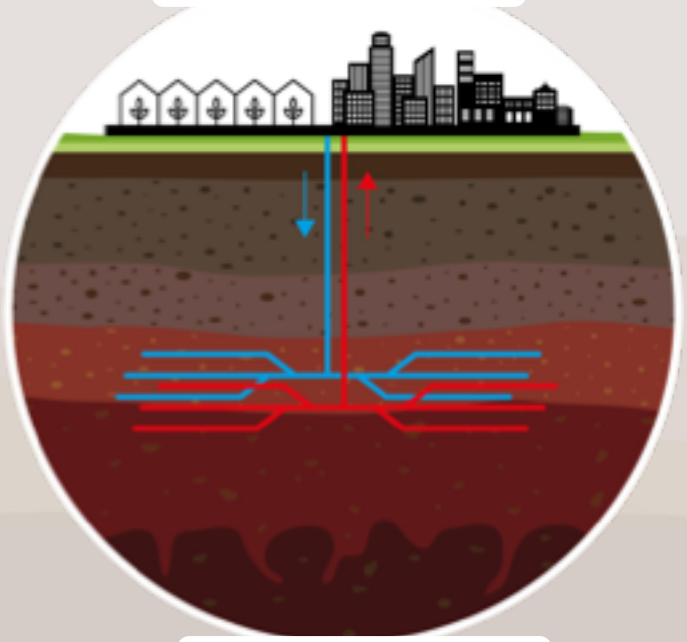
Shallow <500 M



Curved Wells from Surface

Smaller footprint and cheaper than vertical wells

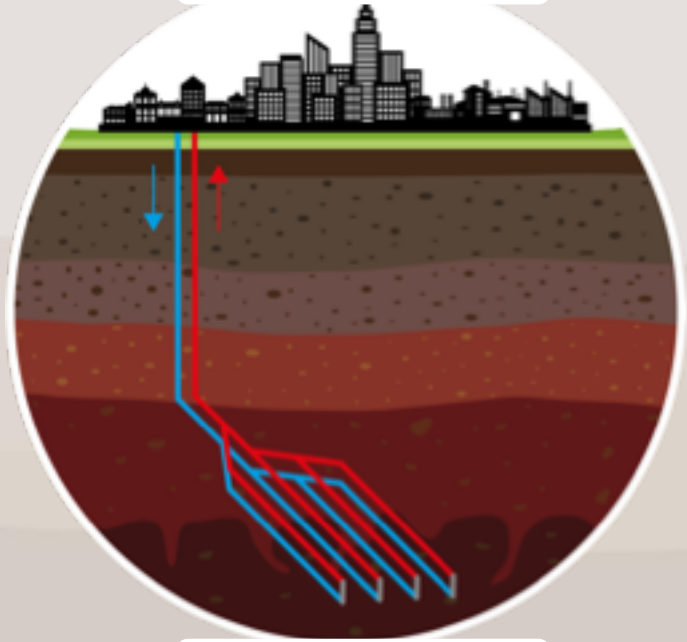
Deep



Multilaterals

increased heat production of up to a factor three and an increased chance to access good reservoirs and faults

Ultra Deep > 4 KM



Multilaterals

larger depths and drilling further into very hot reservoirs

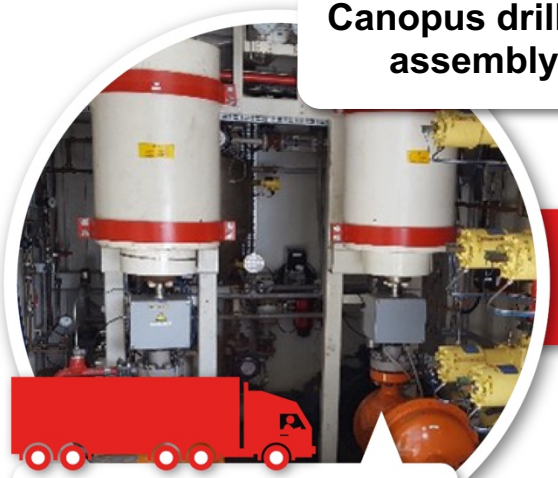
Canopus to rent out multilateral drilling systems to geothermal operators

Canopus Drilling Solutions Geothermal

Canopus drilling technology service to the customer

Common business model for drilling services

Canopus drilling assembly



Canopus surface system for adding steel shot to the drilling liquid

field engineers for operating the Canopus hardware

Healthy margins!

drill pipes

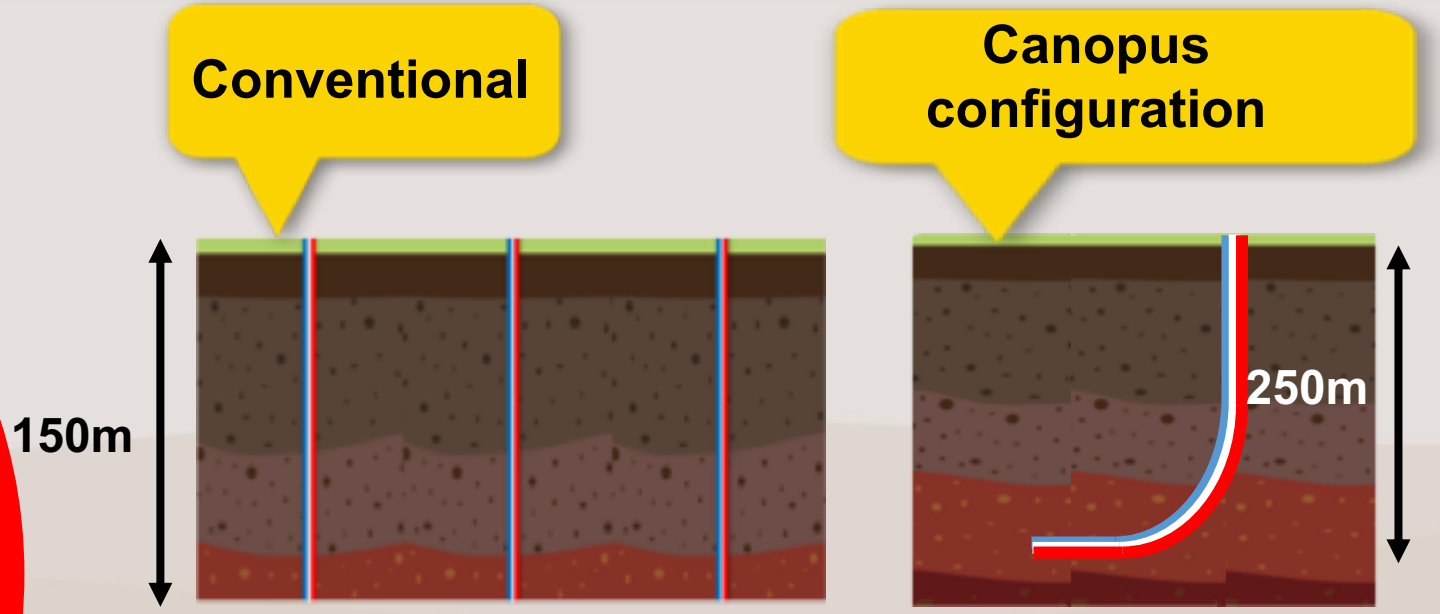
crew

pump

rig system hired by the geothermal operator

The market in 2030: Shallow Geothermal (Geothermal Heat Pumps)

11.5 bln USD
Geothermal Heat Pump
Market**



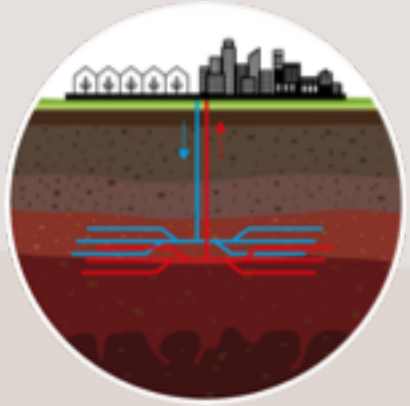
Canopus technology with curved shallow wells saves space and costs

**Source: Allied research

The market in 2030 Deep Geothermal

19 bln USD Deep Geothermal drilling**

Deep Geothermal key trend:
Drilling for more reservoir contact



	COST	RISK (ON PRODUCTIVITY & OPERATIONS)	PROVEN	ROCK	LOCATION
Neutral / Positive / Negative					
CANOPUS TECHNOLOGY	LOW	HIGH CHANCE HITTING GOOD RESERVOIR	FIELD READY IN 2022	ALL	MEDIUM
CONVENTIONAL DRILLING	HIGH	MEDIUM CHANCE HITTING GOOD RESERVOIR	COMMODITY	SPECIAL BIT FOR EVERY ROCK TYPE	LARGE
JET DRILLING CO'S: RADIALDS, V2H INT	LOW	VERY HIGH: UNSTEERED	MINIMAL USE, NO DIRECTIONAL CONTROL	ONLY SOFT AND PERMEABLE	MEDIUM
HYDRAULIC FRACKING: SEGA, HAL, SLB (USA)	VERY HIGH	INDUCED SEISMICITY UNCONTROLLED FRAC DIRECTION	COMMODITY	FOLLOWING STRESS	VERY LARGE

Canopus technology stands out

**Source: IEA

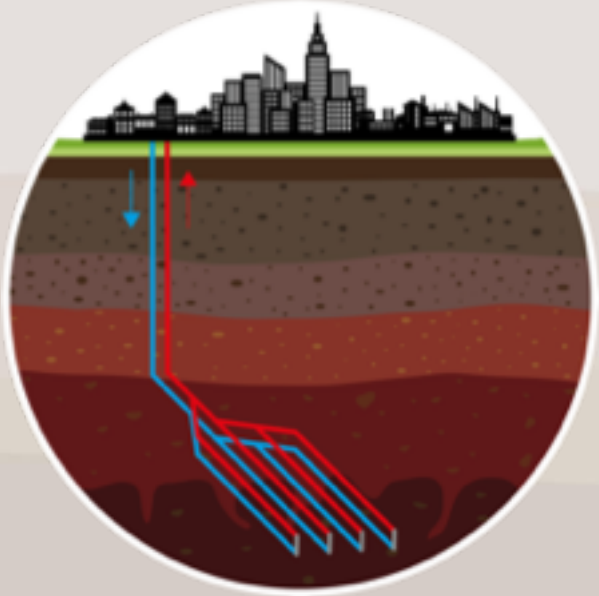
The market in 2040: Ultradeep

3,340 Bln USD
Electricity Generation
Market*

Ultradeep Geothermal key trends:

Eavor leads the way

Several initiatives to unlock ultradeep



Canopus technology stands out to drill multilaterals in terms of speed and steerability

*Source: Precedence Research

** Based on 15% market share of horizontal drilling scope

Canopus is field ready in 2024

TECHNOLOGY TIMELINE

DEVELOPMENT OF STEEL SHOT DRILLING BY SHELL AND GULF OIL

<2020

steel shot drilling in a mine

EARLY PHASE FUNDING € 265K

+

€ 1M DEMO AT TNO

WITH

ENGIE ebn ODFJELL DRILLING

2020-2021

steering in the lab

LAB

FIELD DEMO IN EUROPE

TNO ETH Grob Gemüseanbau Well Guidance SiL University of Calgary V-S-H

2022-2023

field proven base system

2022 Funding €2.6 mln Shift/Energiiq and Geothermica subsidy (€ 8 mln project)

Clear view on prospects and exit

TECHNOLOGY TIMELINE

PILOTING

FIELD HARDENING
5000 HRS OF
OPERATIONS

2024

market ready
2 units deployed

SIG

SiL
SERVICES INDUSTRIELS LAUSANNE

SCALE UP

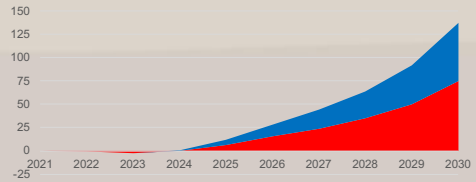
COMMERCIAL

2024+

9+
units

16 Staff

Call me



Geothermal is a huge resource
Canopus has a unique solution
(rooted in many years of R & D in Shell o.a.)

2022-2023
€ 8 mln field pilot project
€ 2.6 mln EU and Equity Funding
(Shift and Energiiq)
Healthy margins
Healthy prospect funnel
Interest from exit party

Looking for 2.5-5 mln to scale up in 2024/2025
For new units and personnel

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Backup

Ultradeep Geothermal: The next frontier

THE BUSINESS TIMES

BT businesstimes.com.sg

Tuesday, January 11, 2022

GARAGE

Geothermal finds footing in energy market with Temasek-backed technology

Canada-based Eavor Technologies raises over C$100m from investors globally

By Nurin Sofia

Singapore

CANADA-BASED geothermal technology company, Eavor Technologies, has raised over C$100 million (about S$106 million) from investors globally, including Temasek, Vickers Venture Partners and the venture arms of oil majors BP and Chevron.

company, its advanced geothermal technology is a closed-loop system called the Eavor-Loop.

The Eavor-Loop consists of two vertical wells drilled 3 kilometers underground, connected by multiple horizontal wells. A fluid circulates within this loop to conduct heat, which can be used for direct heating, cooling and generating electricity.

According to data from the International Renewable Energy Agency (Irena), geothermal-attracted investments of 1 per cent annually from 2013 to 2018, whereas its solar and wind counterparts secured about 40 per cent and 30 per cent of investments respectively in the same period.

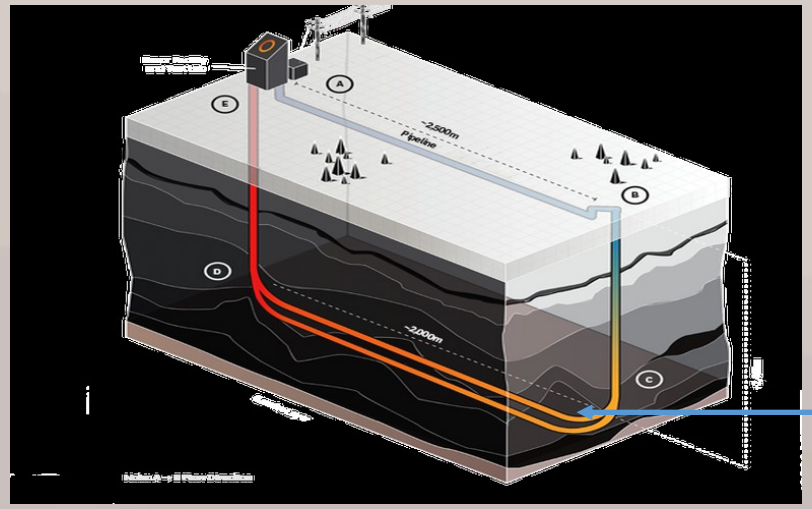
Solar and wind are attractive to investors as the plants are cheap to install and energy produced is priced competitively, in part due to

While Eavor has yet to install Eavor-Loop commercially, it has proved the validity of its concept in a C$10 million pilot project (above) in Alberta, Canada in 2019. PHOTO: EAVOR TECHNOLOGIES

"Canadian Eavor raises US$ 106 mln for ultradeep geothermal"

The Clean Air Task Force commissioned a non-profit geothermal organization, the Hot Rock Energy Research Organization, and an international clean energy consultancy, LucidCatalyst, to estimate the levelized cost of commercial-scale superhot rock electricity. They determined that it could eventually cost between $20 and $35 per megawatt hour, which is competitive with what energy from natural gas plants costs today.

CNBC: Super-hot rocks could provide limitless clean energy Oct 2022



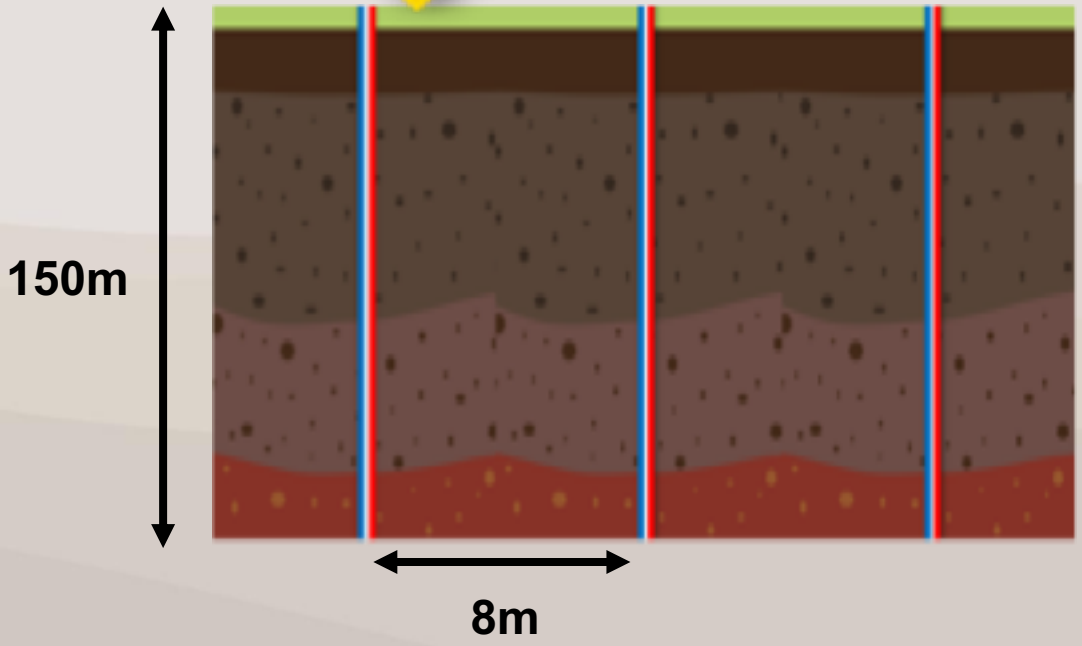
An Eavor loop

Canopus has an edge in ultradeep drilling when it takes off because of the advanced steering.
To reach ultradeep targets, Canopus will have to invest in more heat resistant electronics or better cooling of electronics

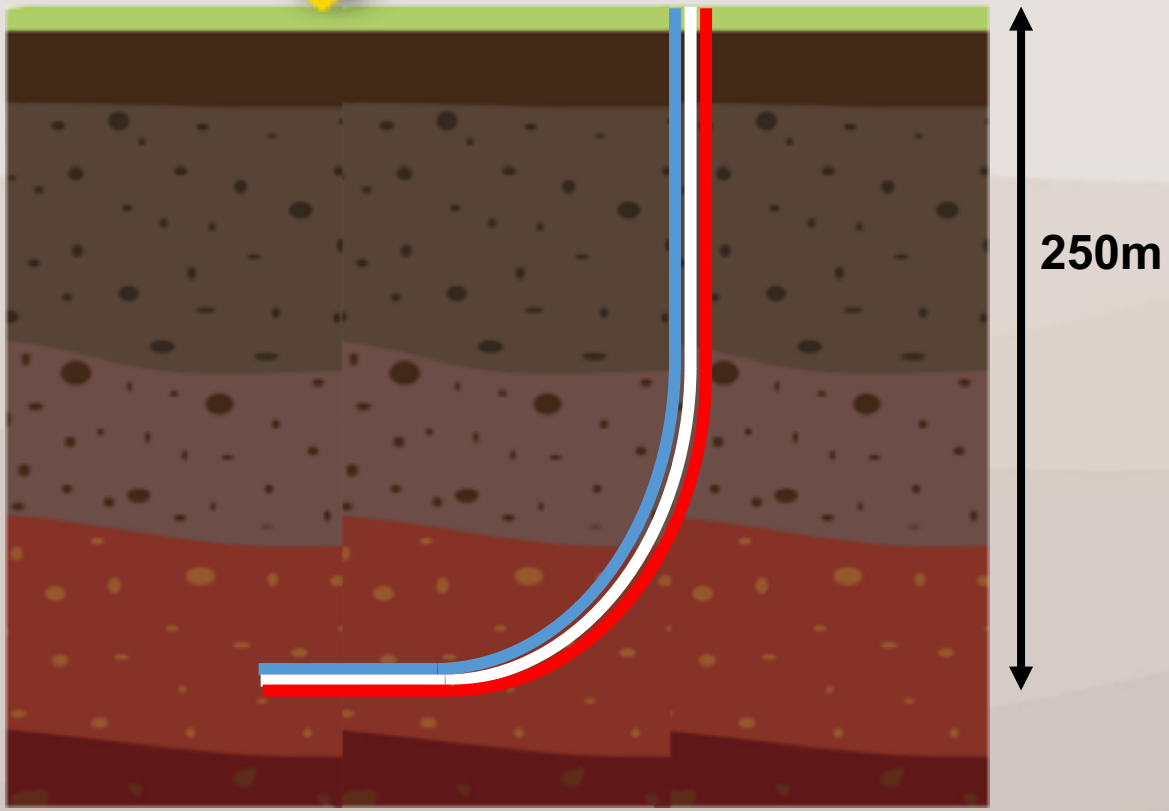
Drilling this horizontal section requires advanced steering

Canopus opportunity Shallow Geothermal

Conventional configuration: vertical unsteered BHE

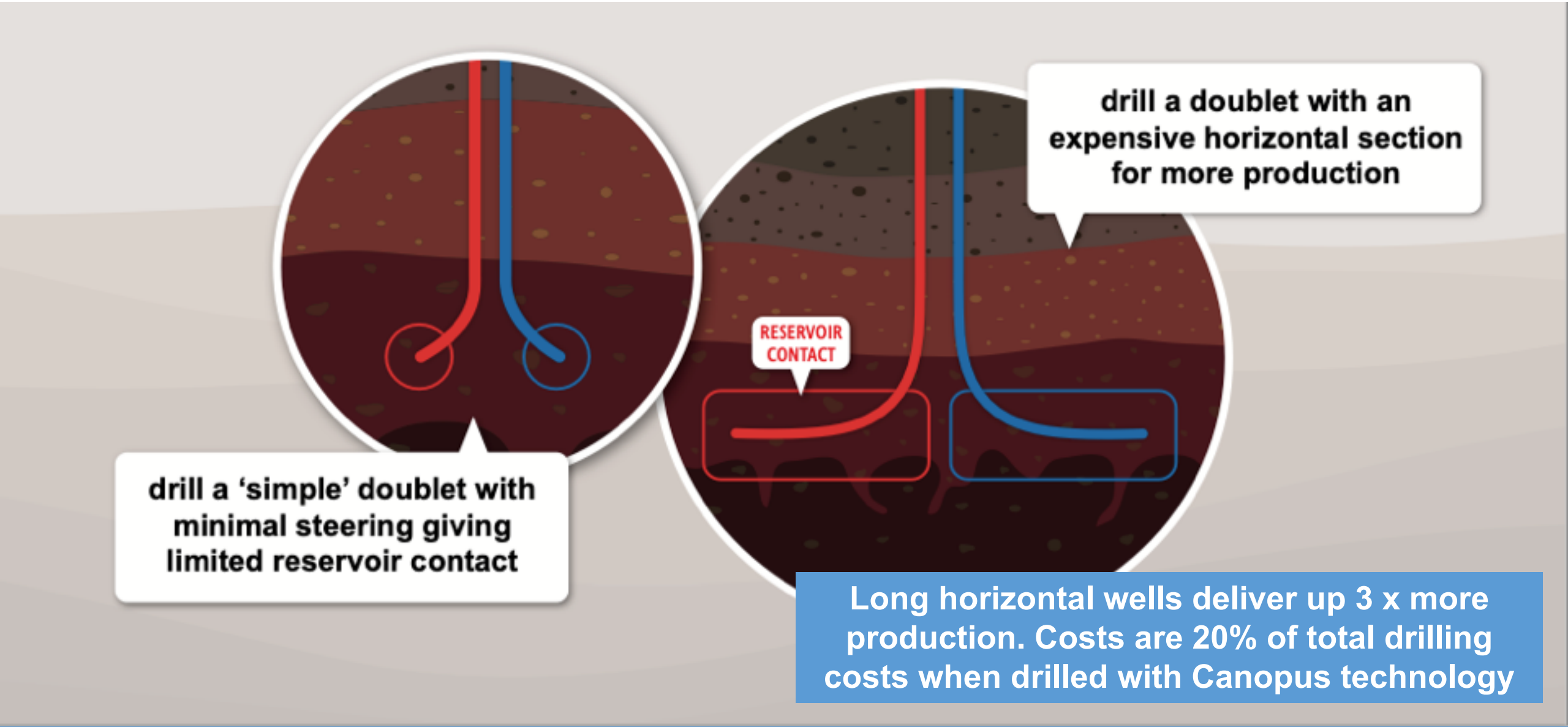


Canopus configuration: curved BHE with 450m total length



Three conventional BHE = 3 x 15 = 45 k€
have the same output as
A **single** Canopus curved BHE 37 k€
17% lower cost and **75% smaller footprint**

Canopus opportunity Deep Geothermal



Long horizontal wells deliver up 3 x more production. Costs are 20% of total drilling costs when drilled with Canopus technology

What Canopus offers: Unique Selling Points by market

Shallow

Curved & long BHE's
|
3 x Higher output per BHE
|
3 x Less BHE's
|
4 x Smaller area (m^2)
|
17% Better cost efficiency for the operator (customer)

Deep Geothermal

Doublets with long multilaterals
|
Up to 3 x Higher output per doublet
|
50% Better cost efficiency for the operator (customer)
&
3 x Higher chance accessing good reservoir

Ultra Deep Geothermal

Long multilaterals
|
Essential to make deep geothermal work
|
Opening up drilling 'Eavor-type' ultra deep closed-loop systems
|
Cost effective exploration