Implementation of Large Scale Green Projects by Applying Innovative Technologies Using Floating Offshore Facilities

Institute of Energy for South East Europe

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Offshore Production Platforms – Their New Role in Green Projects

1. **Exploitation of Drinkable Water along with Electricity Generation.**

2. **Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.**

3. **Production of Green Electrofuels.**

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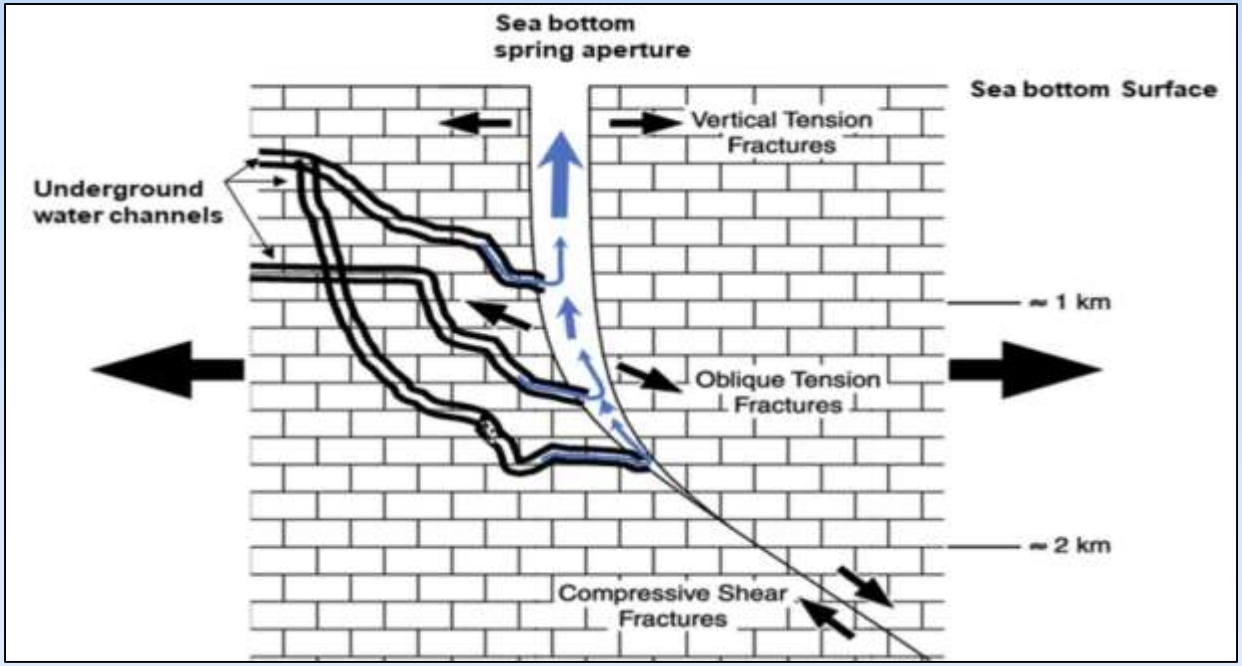
Exploitation of Drinkable Water along with Electricity Generation

-This Method focuses on the Drinkable Water production from Subsea Meteoric Water Springs.

-The aperture -at the sea bottom- could be explained either as a structural event, as the one shown below, or as an erosional one leading to karstic phenomena.

-The Method utilizes the high levels of pressure difference in order to “co-generate” electricity.



Exploitation of Drinkable Water along with Electricity Generation

The projection of subsea bottom water spring at the surface of the sea.

Column of potable meteoric water, rising up from the subsea spring

Exploitation of Drinkable Water along with Electricity Generation

An imaginary -nearshore- view of a platform installation, for environmental friendly drinkable water production.

Exploitation of Drinkable Water along with Electricity Generation

Feasibility Study – Relevant production rates

Water Production m3					
Q (m3/s)	Minute	Hour	Day	Month	Year
15.00	720	43,200	1,036,800	31,104,000	373,248,000
10.00	480	28,800	691,200	20,736,000	248,832,000
5.00	240	14,400	345,600	10,368,000	124,416,000
3.00	144	8,640	207,360	6,220,800	74,649,600
1.00	48	2,880	69,120	2,073,600	24,883,200
0.50	24	1,440	34,560	1,036,800	12,441,600
0.02	1	58	1,382	41,472	497,664

Efficiency of the Water Plant: 80%

Exploitation of Drinkable Water along with Electricity Generation

Publication of this Scientific Article, was announced and accepted on the “World Oil” Journal, issue Nov. 2023, a Top American Magazine of the International Petroleum Industry.

WO
WATER MANAGEMENT

Offshore potable water production from subsea karstic aquifers

The main scope of this article describes the possible and secure production method of large quantities of fresh/potable water from subsea bottom springs, can be achieved by separating this meteoric (in origin) ground water from the saline seawater.

DR. MARIOS PATSOULES and DR. GEORGE KARLATIRAS

Possible and secure production of large quantities of fresh/potable water from subsea bottom springs can be achieved by separating this meteoric (in origin) ground water from the saline seawater. The separation will take place in simple devices by using offshore installations and production technologies already developed in the offshore oil and gas industry.

It is an environmentally friendly and efficient new technique that can be easily implemented, since in near-shore operations there is nothing involved that would damage the sea environment and the living ecosystem. This method has never been applied before, and it is clearly innovative.

In many places around the world, large quantities of meteoric (initially potable) water are directed through rivers to oceans or various geological formations, changing its chemical properties as a result, making it inappropriate for covering necessary human primary (i.e. drinking or irrigation) requirements. This demand is growing bigger, especially when combined with climate effects and overpopulation. In this specific case, exploitation of the water carried out by underground channels (subsurface aquifers)—located far from any human activity and therefore avoiding getting close to any pollutant source—leads to sea bottom springs. This source of offshore potable ground water will be accessible by using petroleum technologies to securely promote its utilization.

Furthermore, by expanding this project's application, huge quantities of fresh water can be saved and produced worldwide, instead of ending up in the sea and the oceans.

BACKGROUND

The continuous, uninterrupted flow and "endless" duration of the project is due more to the complicated karst system—created by the erosion of cavities in the inner structure of the mountain—and less to complicated geological formation tectonics, thus contributing to the "installation of an ideal hydraulic system," through which huge amounts of water are led through "drains" to the bottom of the sea.

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Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

What does this innovative technology actually offer:

- Great Investment opportunities
- It uses innovative technologies, clean energy production
- High efficiency Energy production
- High availability power production unit
- Huge reserves in Greece
- ZERO environmental impact
- High capabilities/options for cogeneration covering different types of needs for the Societies (very advantageous for the Islands, i.e., produce hot water, heating/cooling, water desalination, district heating domestic and/or other processes, support of grid stability, electric vehicles fast charging, etc.)

Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

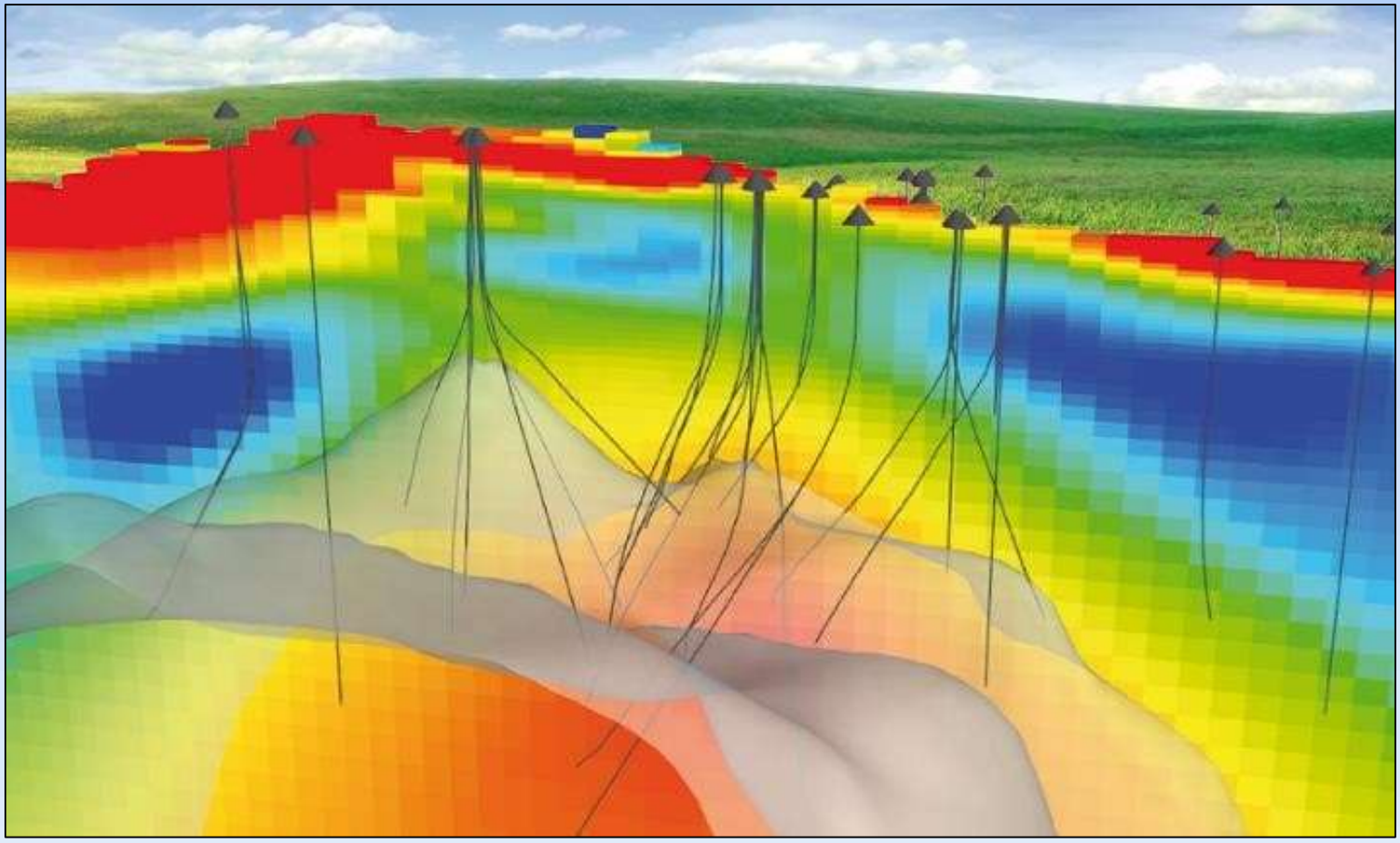
Volcanic Arc of Santorini:

Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

Landscape of Nisyros Caldera:

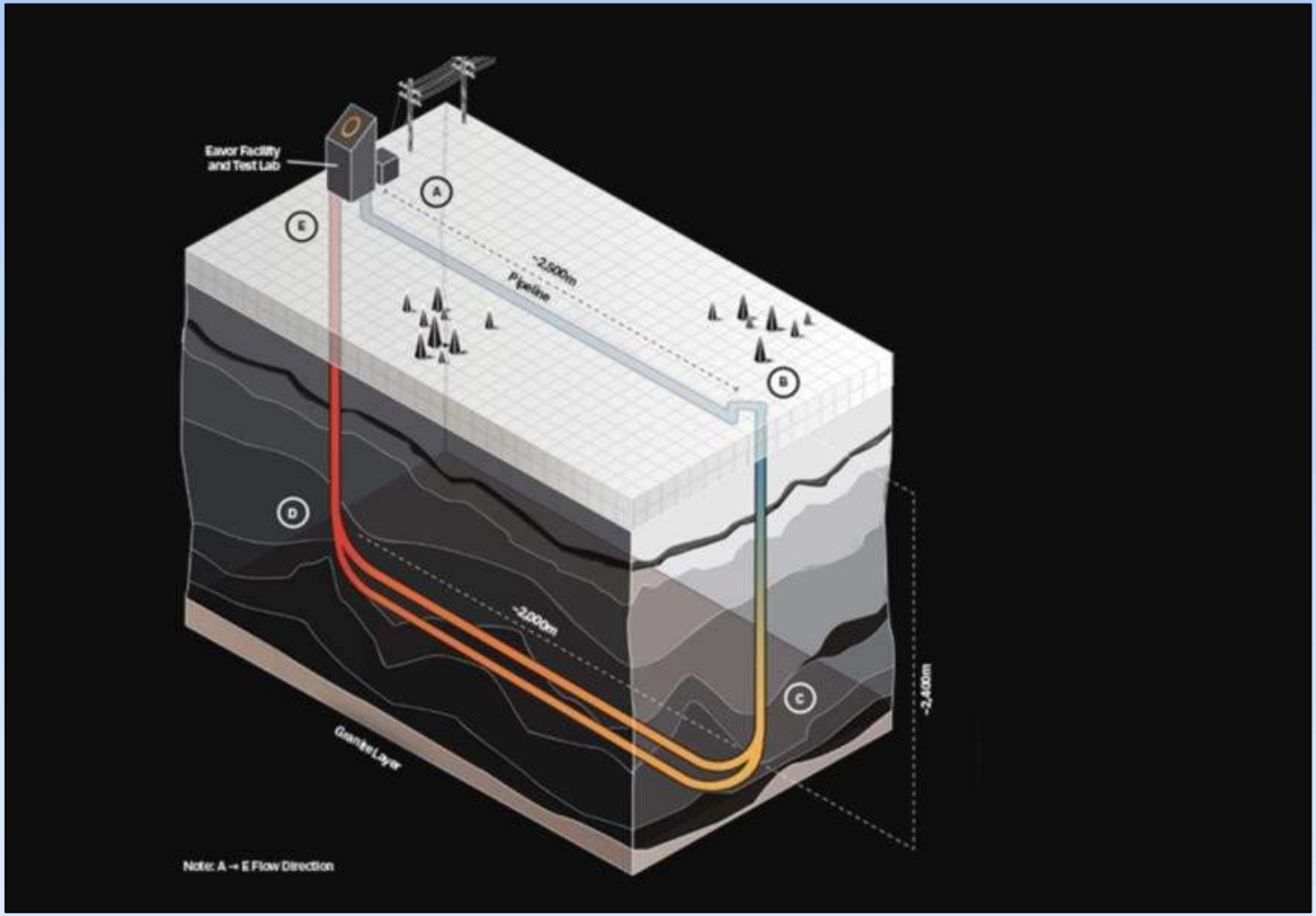
Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

A typical seismographic section of the Subsurface to be Drilled for the Development of neighboring structures for Geothermal Energy Production and Battery purposes use.



Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

Closed loop of heat exchange for high enthalpy geothermal energy production (technology widely used in oil & gas industry).



Utilizing of Geothermal Energy for the Production of Electricity, Heating and Cooling.

Feasibility Study – Power Production Unit 25MWe.

Power Production:	25MWe
CAPEX:	59 m.€
Availability:	90% (7884 h/y)
OPEX:	2.9 m.€
Earnings (EBITDA):	21.2 m.€
IRR:	19%
NPV:	65.3 m.€
Payback period:	5 years

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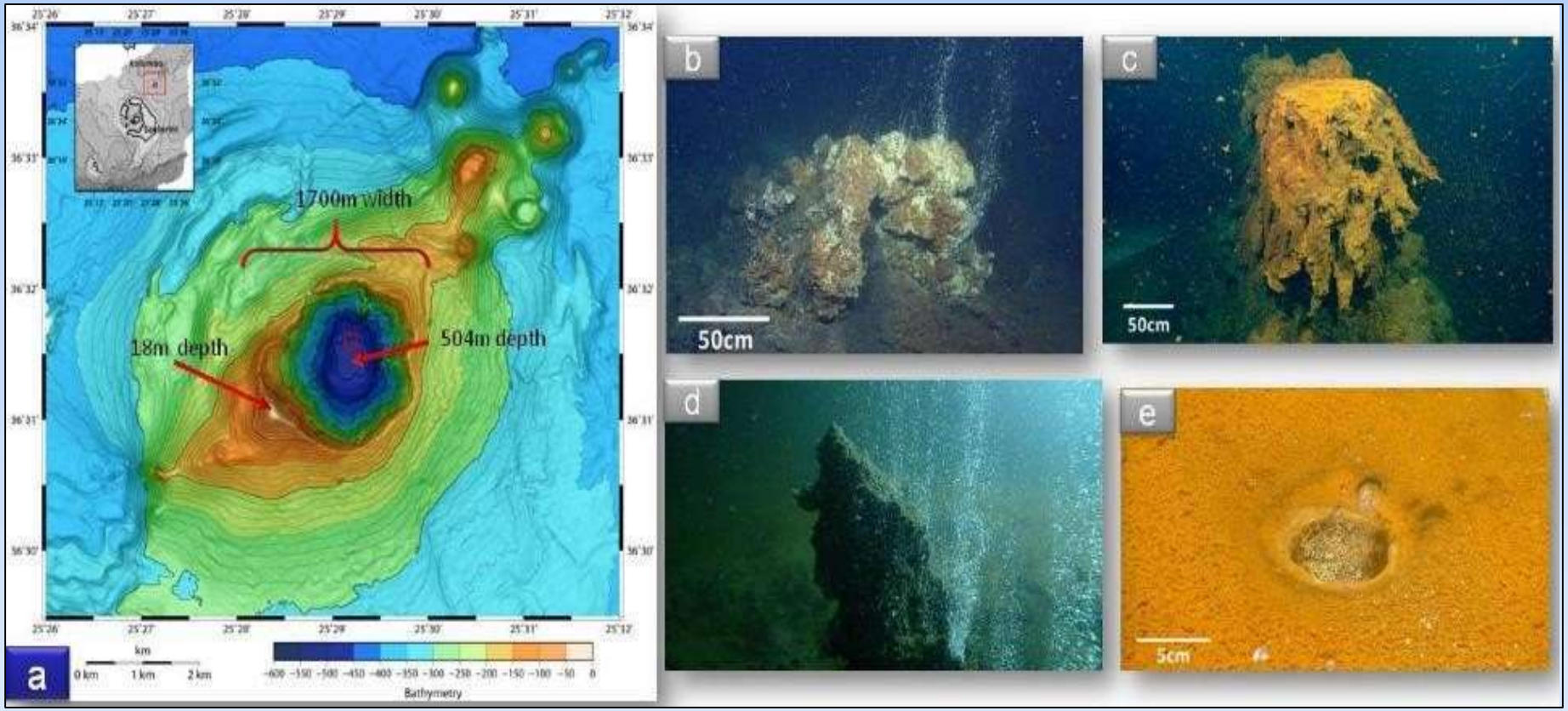
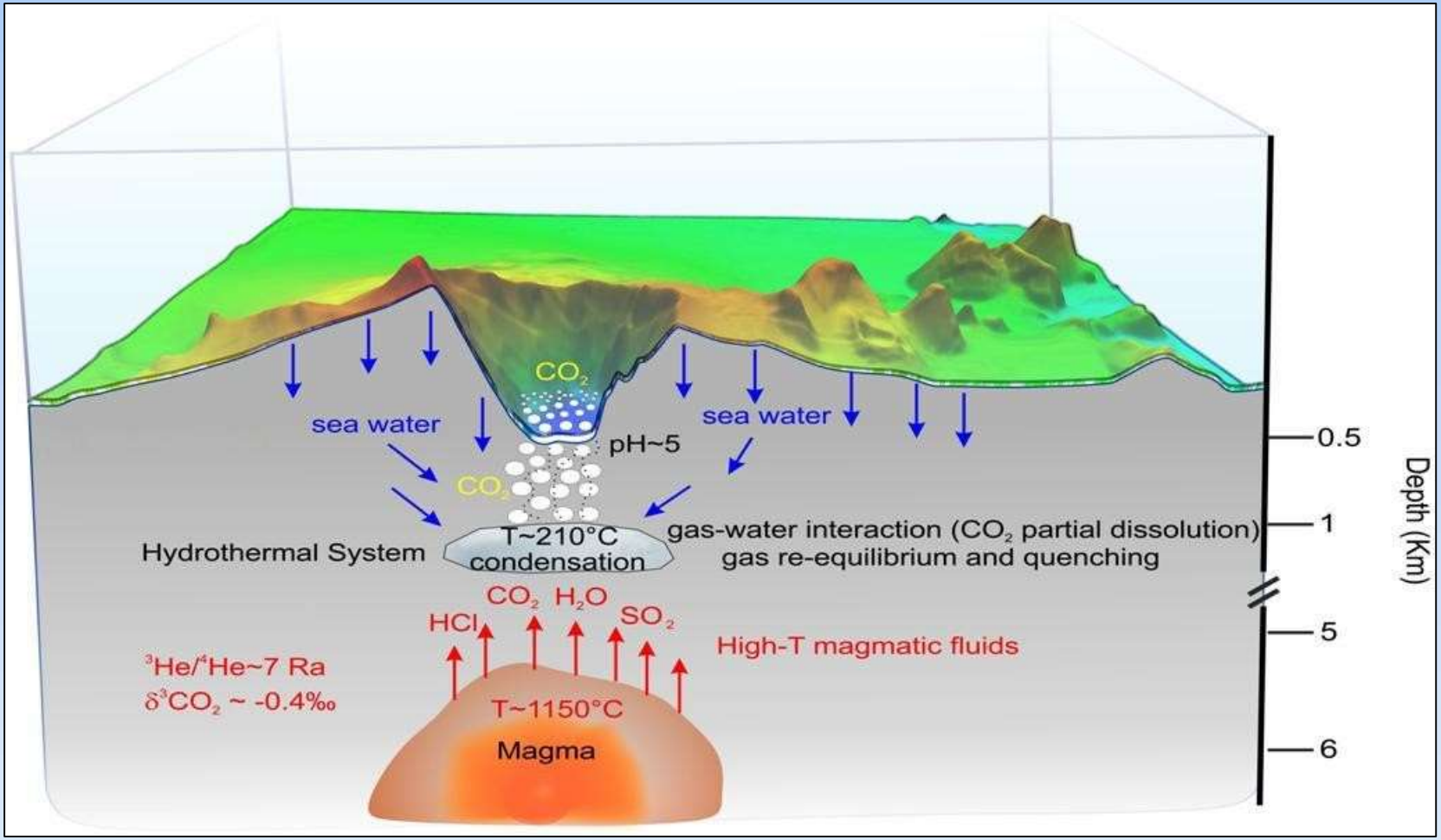
Production of Green Electrofuels

Utilizing the HPHT CO2 from the Sea Bottom Chimneys in order to react in a special chemical process with the H2 to produce Electrofuels.



Production of Green Electrofuels

Schematic process of the CO2 formation.



Production of Green Electrofuels

Αντιδρώντα		E_e (MW)= 0,668	E_th (MW)= 10,311	Προϊόντα	
H2 (tn/h)=	1,00	---------->		Gasoline(tn/h)=	1,564
CO2 (tn/h)=	7,28	---------->		purge (tn/h)=	0,655
		---------->		Light H/C (tn/h)=	0,299
		---------->		water (tn/h)=	5,758
		---------->		E_th (MW)=	19,239

Production of Green Electrofuels

A typical overview of a Project of this type includes:

1. Creation and installation of an offshore platform which will be used exclusively for the production of green energy (green hydrocarbons).
2. Drilling in an undersea area with CO_2 stack.
3. Abduction of CO_2 and creation of the first path to create distilled water, by using the heat carried out by the CO_2 chimney (220 C^o).
4. Electrolysis of distilled water to generate H_2 by using the heat of CO_2 for electricity production (creation of a second route for electricity production).
4. Channeling of CO2 and H2 for the production of electric fuels (creditable green fuels) based on the **Fischer–Tropsch** process in order to produce green hydrocarbon mixture (CnH2n+2).

The North Sea Ekofisk Complex

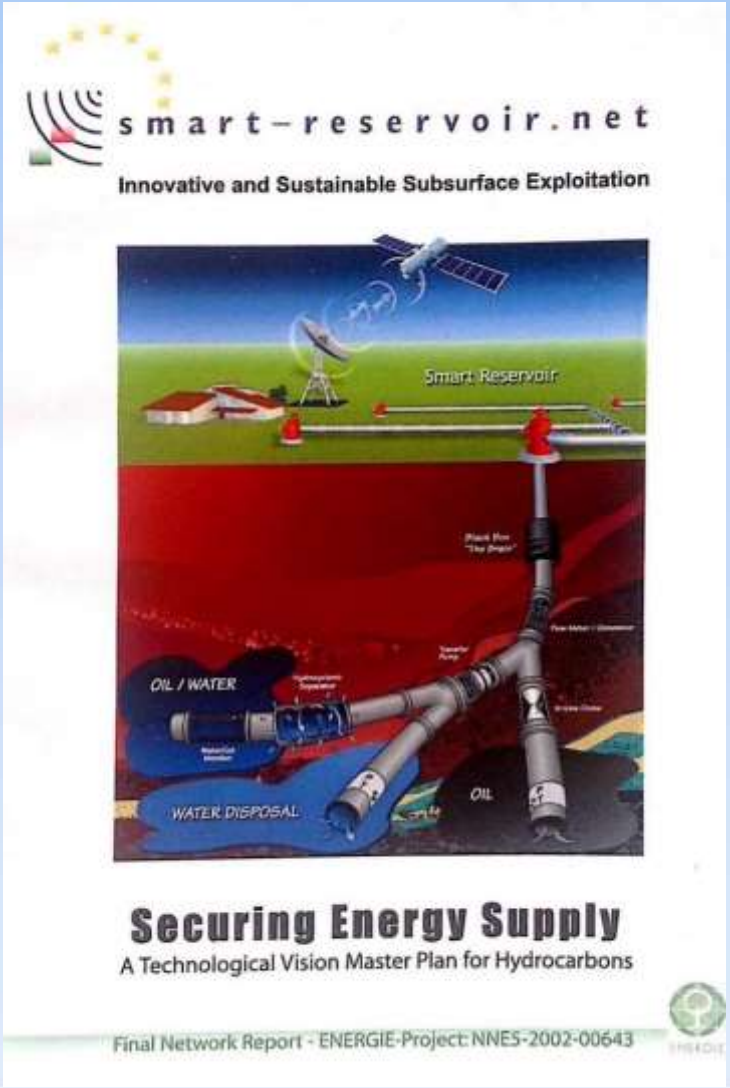
For the Safety of Workers And the Environment

As Last but not Least:

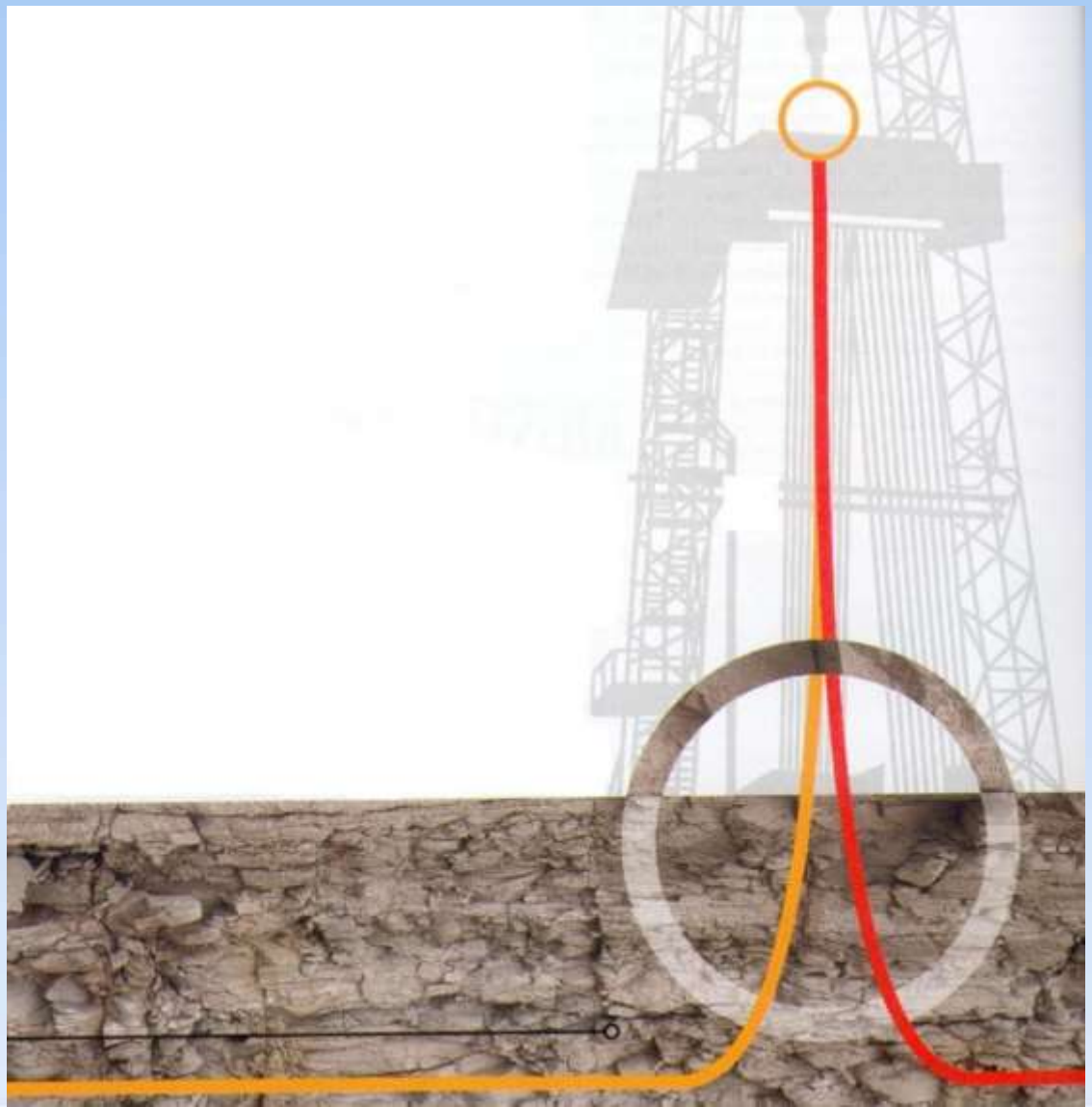
To kindly inform you that: I had the honor of representing Greece at the Technical Panel in Brussels where we structured the Directive 2013/30 EU, Stricting the regulations in force until then and adding others in order to over-protect both the marine environment and workers on the Oil Rigs in quite harsh conditions. This Directive was harmonized in the Legislation of all the EU Member States. And…

What has been observed over the years, is the fact that these accidents have been reduced to a minimum, with modern protection of the environment from oil spills.

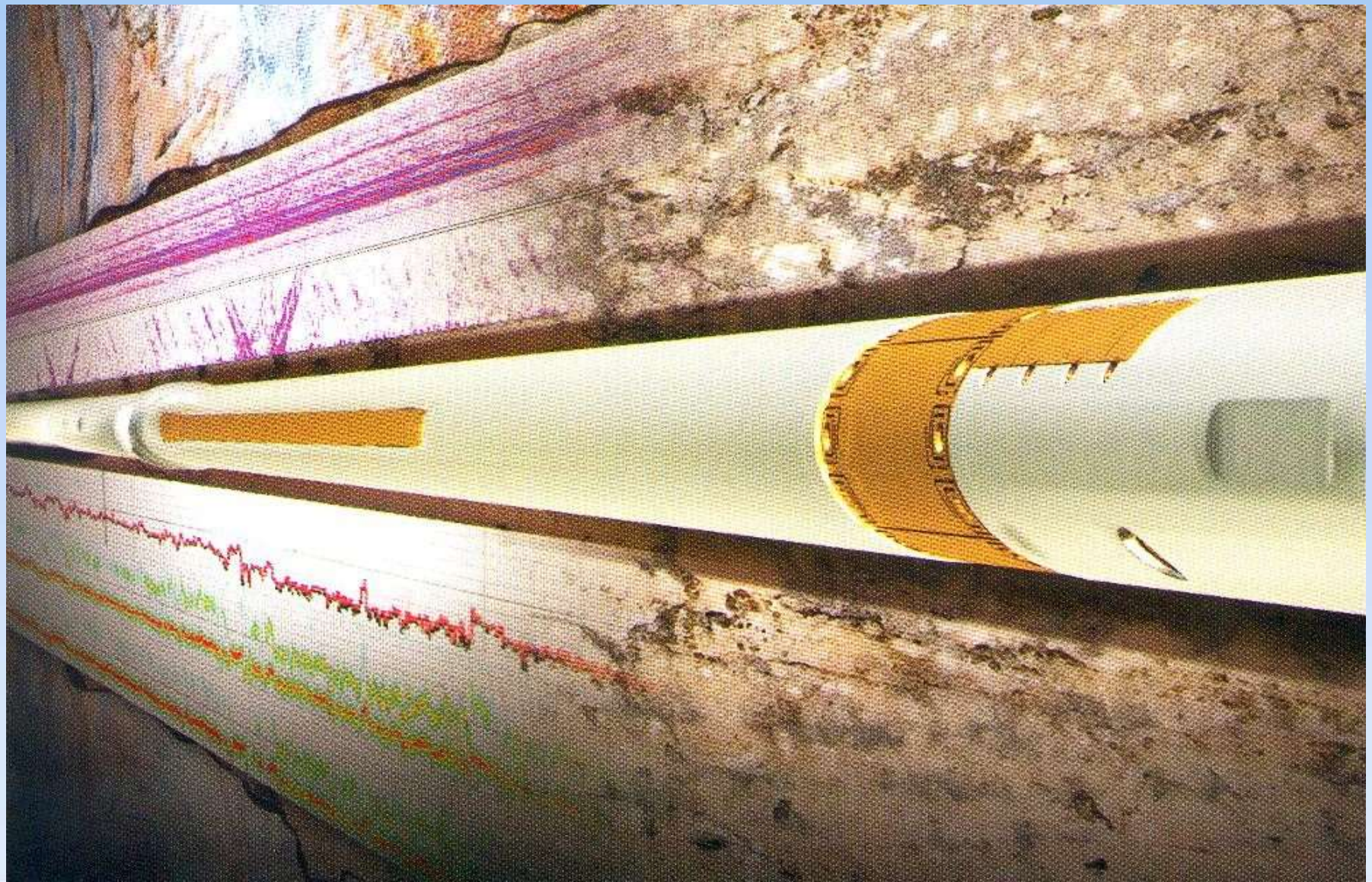
E.U. ENERGY PROJECT: NNES 2002-00643 with 120 participating European Oil Companies & Scientific Bodies



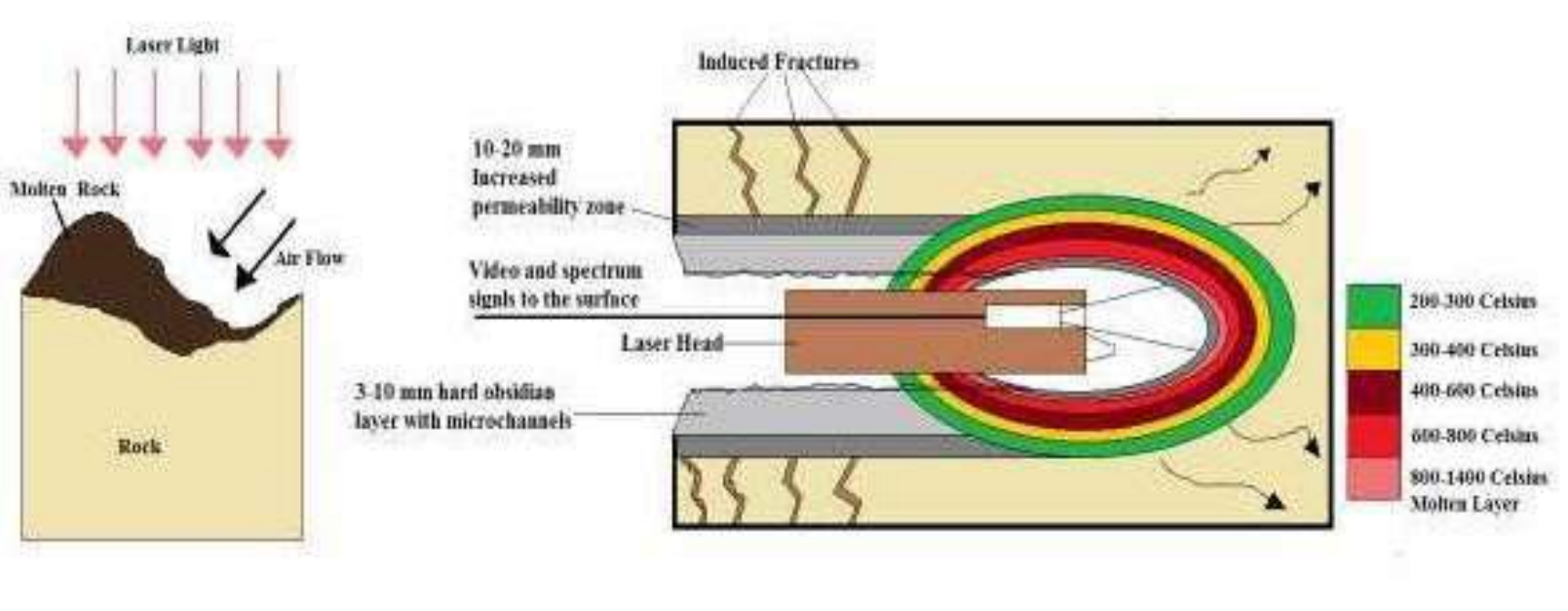
Directional drilling



Horizontal drilling opportunities



Laser drilling technique for even easier drilling



Major types of bits used for geothermal drilling