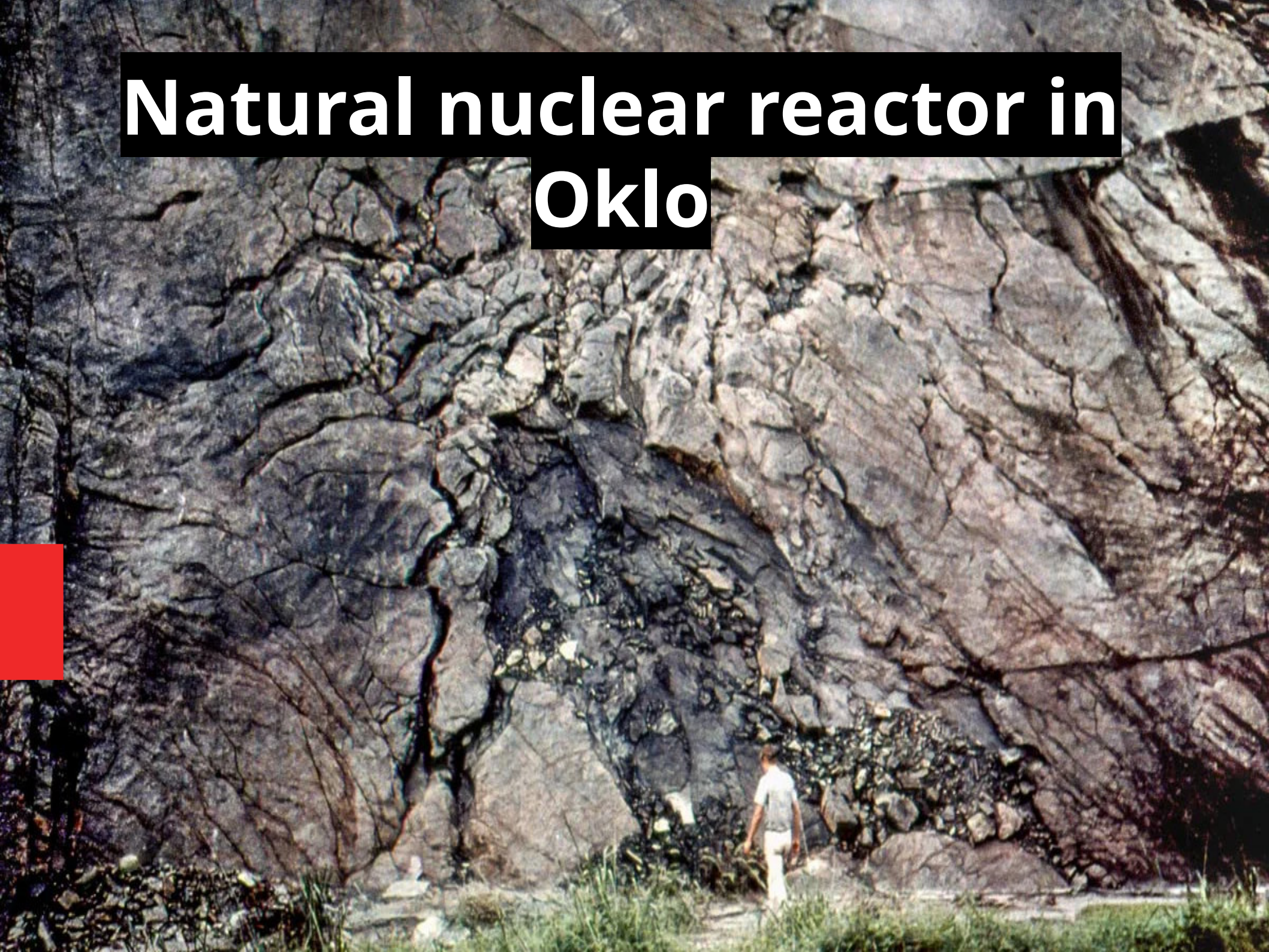


Natural nuclear reactor in Oklo





Topics

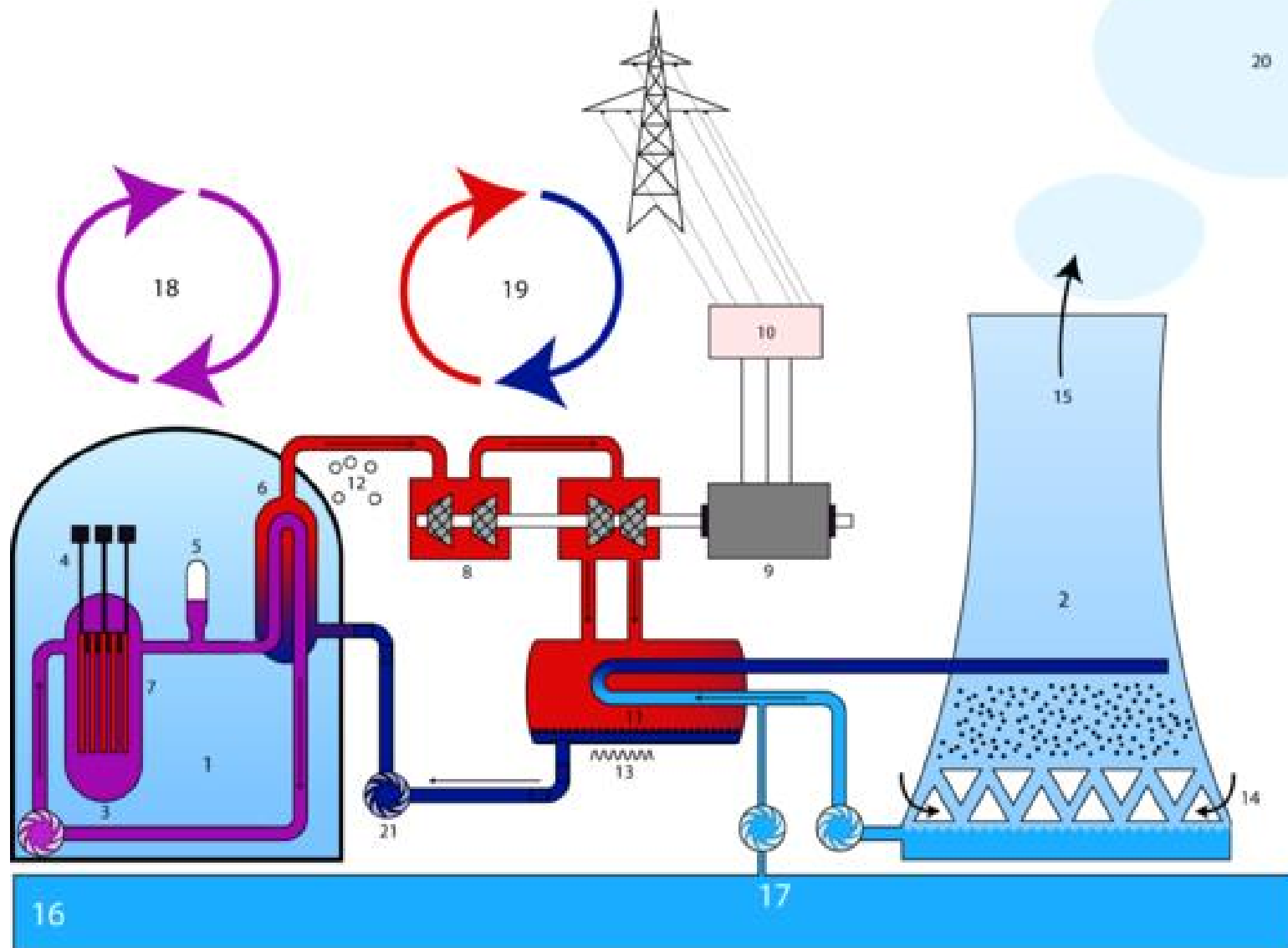
- Basics of the nuclear reactors.
- History of the nuclear energy
- Nuclear powerplant in the world
- Nuclear reactor in the nature
- How it worked



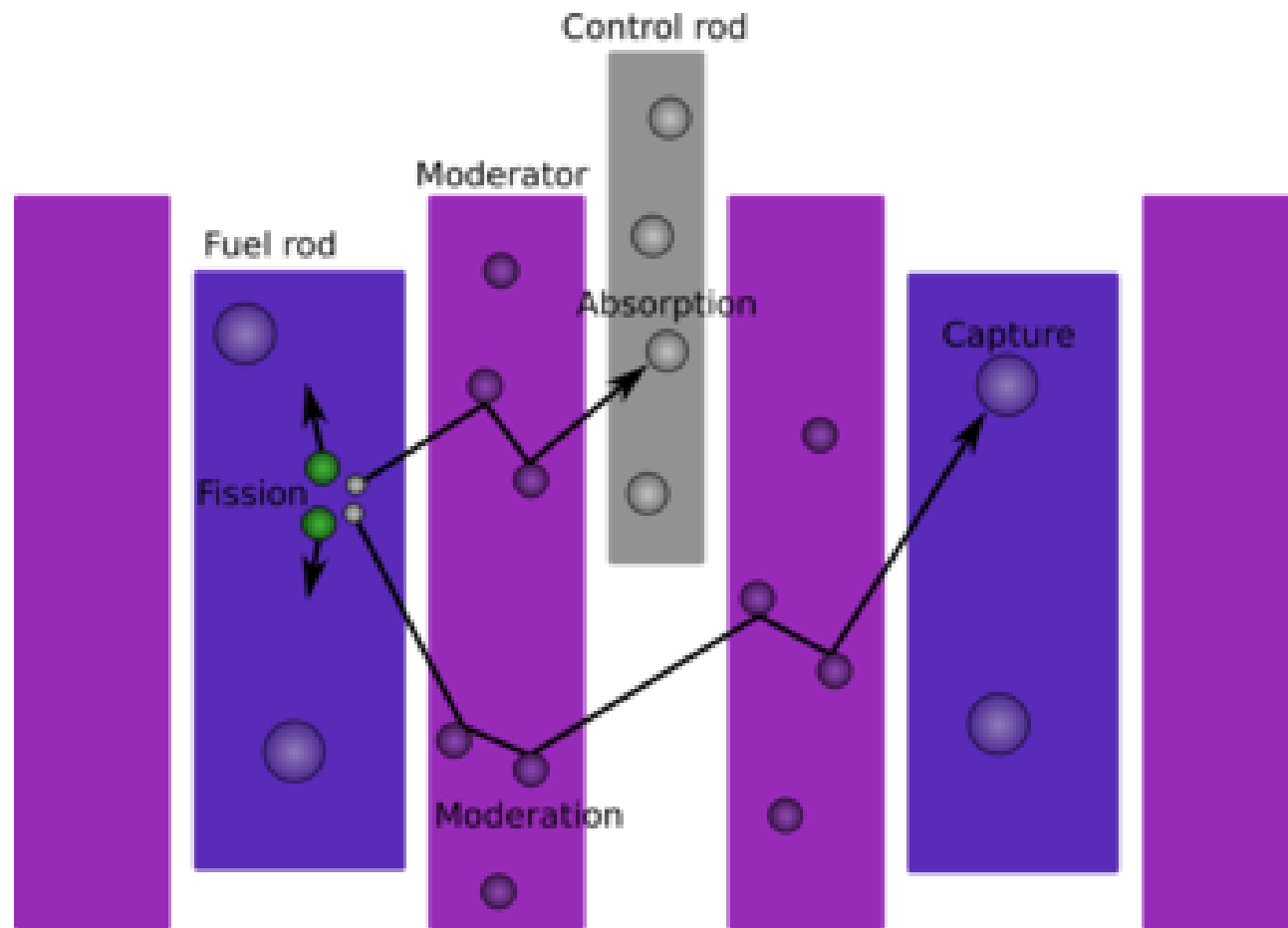
Basics of the nuclear reactors

- Where the energy come from?
- What is happening in a reactor?
 - } How can we get the energy?
 - } How can we use this as electricity?

Basics of the nuclear reactors



Basics of the nuclear reactors

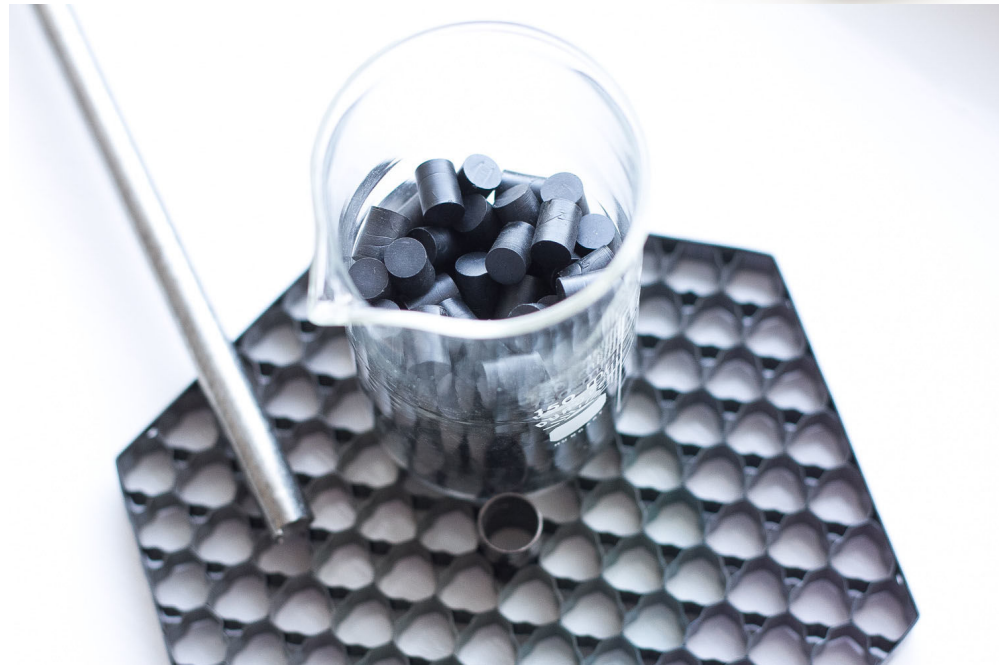


Fissile materials

- In the nature



- In the reactors





History of the nuclear energy

- Chicago Pile-1 (1942)
 - } led by Enrico Fermi
- Chain reaction (Leo Szilard)
- The reactor used natural uranium
- The moderator was graphite
- Around 380 tons



Nowadays

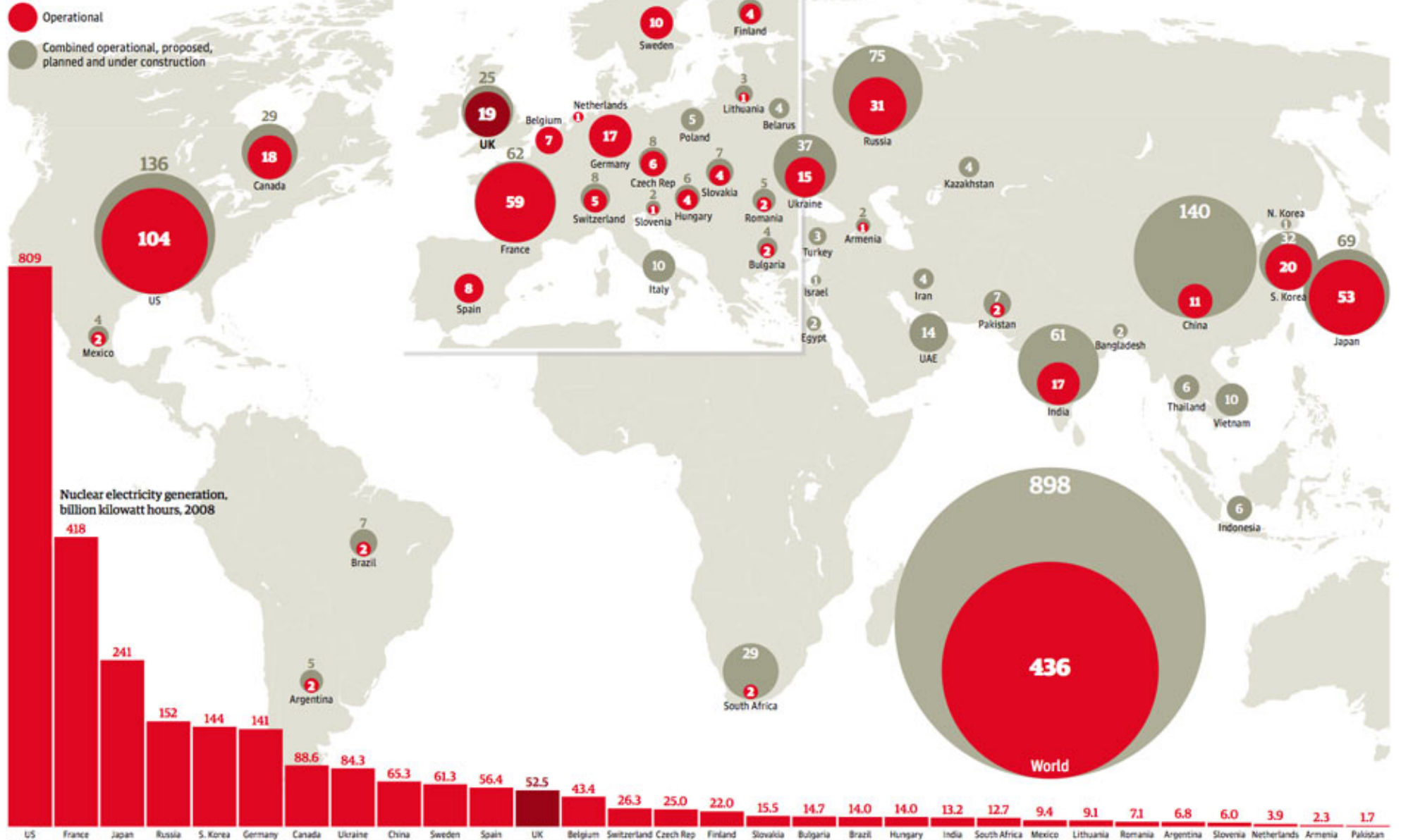
- In Hungary
 - } Paks I – 50MW, more with Paks II
 - } BME, KFKI, Debrecen
- World
 - } Exist: 436
 - } Under construction : 462

Nowadays

How the UK compares

The world's nuclear reactors, October 2009

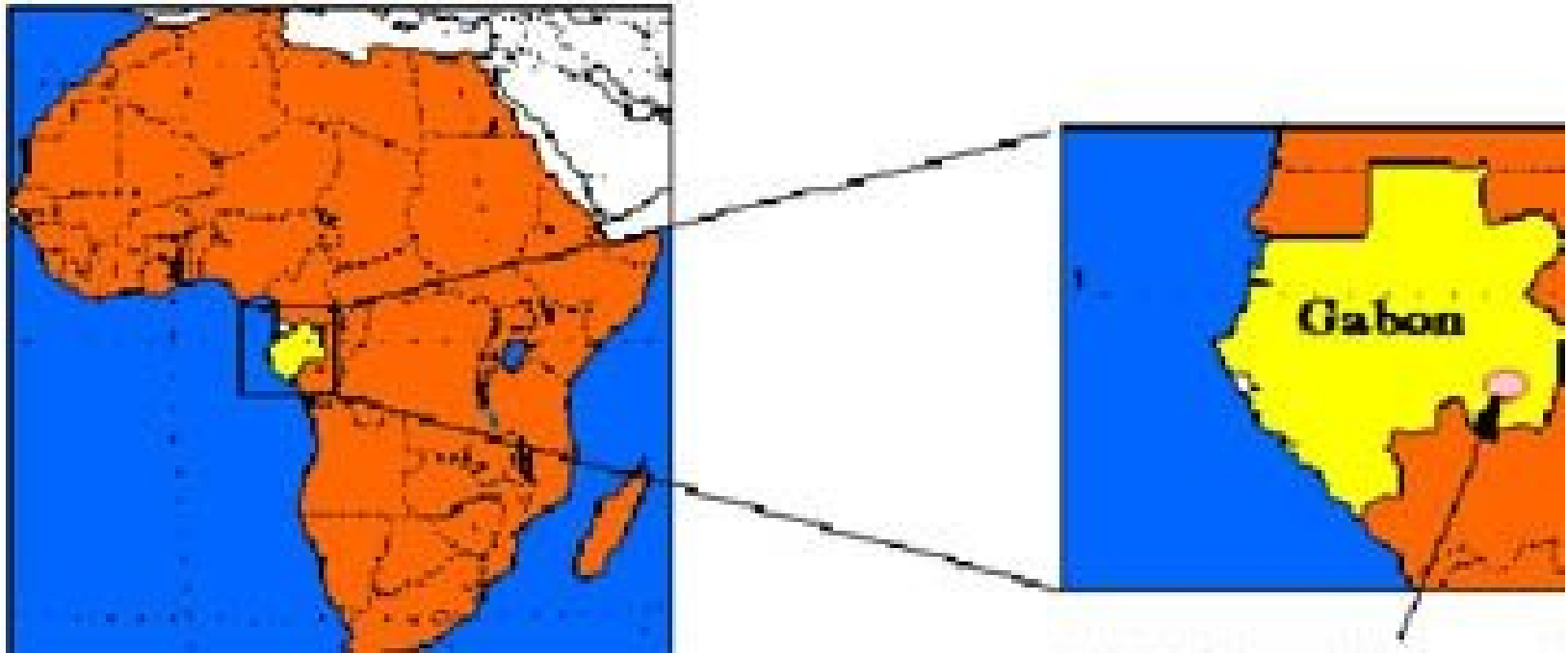
SOURCE: WORLD NUCLEAR ASSOCIATION



Is this possible in the nature?

- Prof. Paul Kuroda (1956)
 - } Uranium ore thickness is min. 1m.
 - } U^{235} commonness more than 1%
 - } Water for moderation
 - } Free of Boron and Lithium

Where we found it ?



Ore measurements

- Francis Perrin (1972)
- The proportion of U^{235} U^{238} is not the natural
- The proportion was 0.716 % not 0.72%
- Need more measurements
 - } The average prop. 0.6%.
 - } Somewhere the concentration decreased to 0.3%



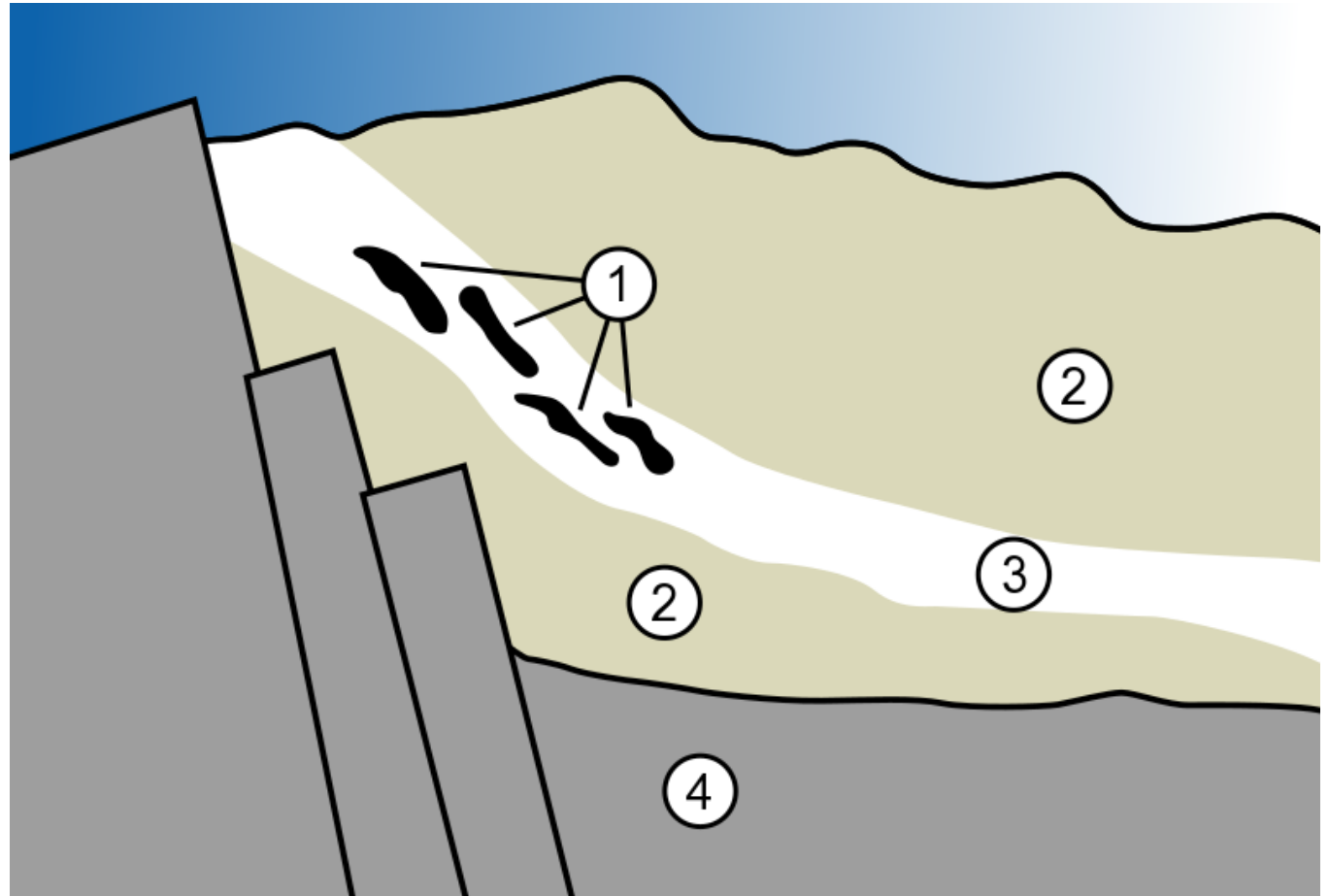
What happen?

- Natural fission and chain reaction
- Missing around 200kg U²³⁵

Molten rock



Layers



1. reactor zone
2. sandstone
3. uranium ore
4. granite



Product of the nature

- 20%-60% uranium ore
- Lense type geometry
- Water and appropriate rocks
- Free of Boron and Lithium



How it worked?

- 1.8 billion years ago
- Worked in pulse mode
- 30min work, 2.5hour rest

Brief story of the reactors

- They worked for 20 000-800 000 years
- Average achievement : 100kW
 - } Nowadays ~ 2kW/house
- 90TWh energy altogether
 - } Paks 225 Twh
 - comparable



} Thank you for your attention!

References

- [Atomcsill - Dr. Horváth Ákos](#)
- [Chain reaction](#)
- [History](#)
- [Okló](#)
- [Paul Kuroda](#)
- [Rapport isotopique](#)
- [Okloi atomreaktor](#)