



RÉGION ACADÉMIQUE  
PAYS DE LA LOIRE

MINISTÈRE  
DE L'ÉDUCATION NATIONALE,  
DE L'ENSEIGNEMENT SUPÉRIEUR  
ET DE LA RECHERCHE



**BACCALAUREAT GENERAL ET TECHNOLOGIQUE**  
**ÉPREUVE SPECIFIQUE MENTION**  
**« SECTION EUROPEENNE OU DE LANGUE ORIENTALE »**  
Académie de Nantes, binôme : Anglais/SVT

**Thème 2 - Enjeux planétaires contemporains**  
**2-A - Géothermie et propriétés thermiques de la Terre**

**Mission to the mantle: Drilling through the Earth's crust.**

**Using your knowledge and the documents, you will show:**

- that deep geothermal energy is more efficient than low-deep sources**
- that geothermal energy is not as renewable and eco-friendly as people might think.**

**Document 1: Iceland drills hottest hole to tap into energy of molten magma**

The drilling will penetrate a landward extension of the Mid-Atlantic Ridge says Albert Albertsson, assistant director of HS Orka, an Icelandic geothermal-energy company involved in the project. At that depth, magma that moves from below through volcanic activity meets and heats seawater that has penetrated beneath the ocean bed.

“People have drilled into hard rock at this depth, but never before into a fluid system like this,” says Albertsson.

5 He says the team could find the landward equivalent of ‘black smokers’, hot underwater springs along the ridge saturated with minerals such as gold, silver and lithium.

At that depth, pressures are high, too – at more than 200 times atmospheric levels. The consortium of energy companies and researchers behind the project expects the water to be in the form of ‘supercritical steam’, which is neither liquid nor gas and holds much more heat energy than either.

10 A well that can successfully tap into such steam could have an energy capacity of 50 megawatts, compared to the 5 MW of a typical geothermal well, says Albertsson. This would mean some 50,000 homes could be powered, versus 5,000 from a single well.

[...] The plan is to go one better this time, creating a long-term energy source.

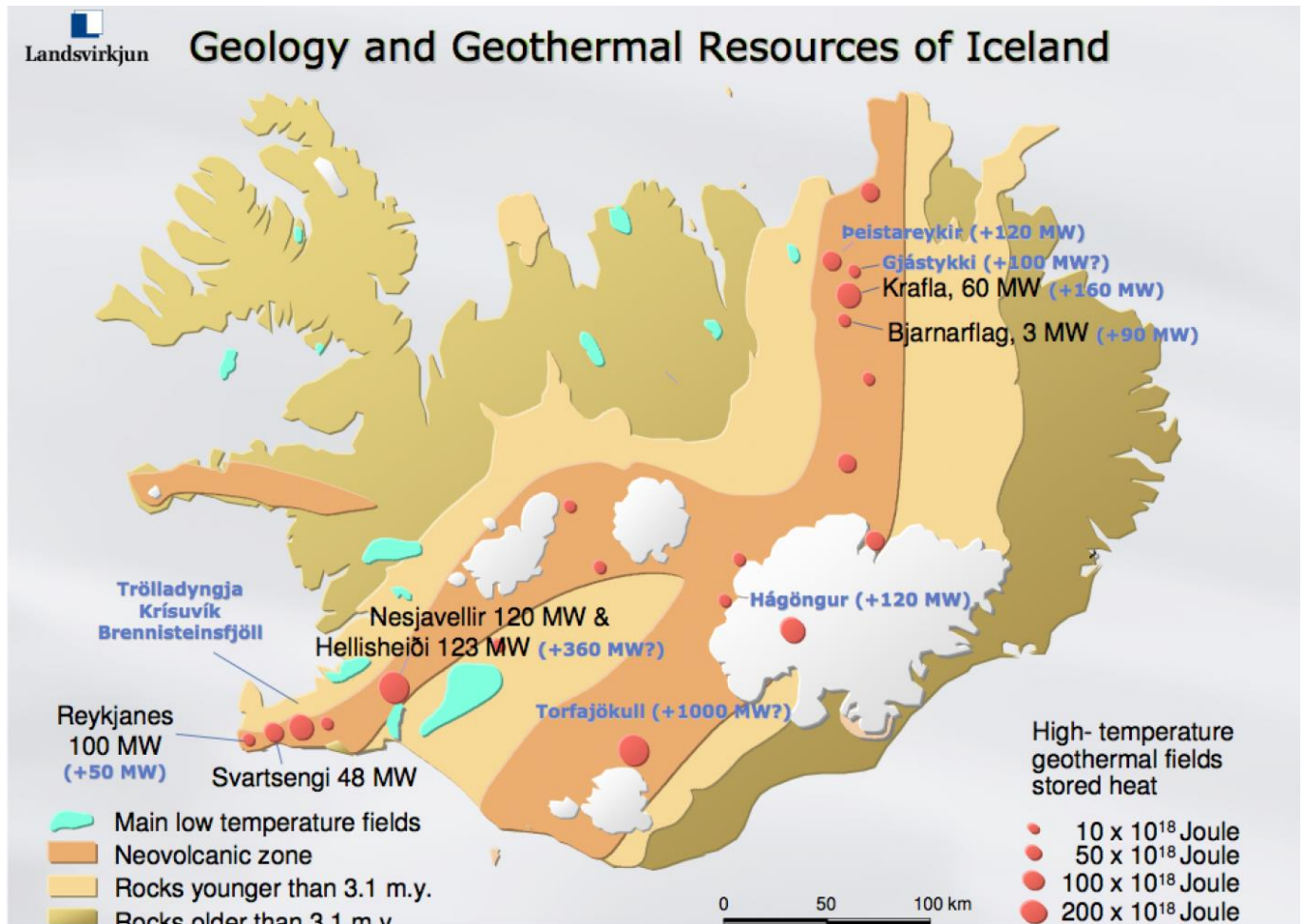
15 Iceland’s electricity is already entirely powered by non-fossil-fuel sources. But its string of geothermal power plants plays second fiddle to its large hydroelectric power stations, which generate three-quarters of the country’s electricity. That could change.

Source: <https://www.newscientist.com/article/2109872-iceland-drills-hottest-hole-to-tap-into-energy-of-molten-magma/>

From [DAILY NEWS](#) 21 October 2016

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## Document 2:



## Document 3: Destruction in Peistareykir

Peistareykir was first drilled in August 2007 and now contains three pods which belch huge quantities of sulphurous steam and make a sound similar to a jet taking off, which shakes the surrounding ground. Below the two most active pods and in front of a small sleeping hut for tourists is a huge blue lagoon, the source of which can be easily traced to a steaming outlet pipe from the drill pods. The pool has no outlet stream to drain the water away, and therefore must be continually expanding as more effluent water runs into it. This new lake is not shown on maps, and comparisons to photos taken in 2004 confirm that this is an utterly new phenomenon.

The Peistareykir effluent lagoon, with stream coming from boreholes geothermal outlet water contains a number of toxic elements including Arsenic (usually at 0.5-4.6 ppm, well over the WHO standard of 0.01 ppm) and Sulphur, which are very damaging to vegetation and animal life. Test drilling for geothermal power does not require an Environmental Impact Assessment (EIA) in Iceland, as it is supposed to have very limited effects on the environment, and effluent water is supposed to be pumped back into the boreholes. Instead hot, toxic water is being pumped directly onto grassland in an area which is designated a 'national memorial'. This careless act of pollution shows total disregard for this rare and sensitive environment.

Source: <http://www.savingiceland.org/2008/07/destruction-in-%C3%BEistareykir/>

### **Teacher's corner :**

Document 1 gives an account of a new type of geothermal energy. Very deep. Supercritical water. Right now, geothermal is already exploited.

Document 2: We can see the Icelandic geology. Note the ridge (deduced from the age of rocks).

Document 3: Geothermal energy is not that clean.

New lake: what do we do with exploited water pumped from the depth?

Impact on landscapes and fauna and flora due to Sulphur, Arsenic (poison).

Conclusion:

Sensitive matter... Not 100% eco-friendly.

### **Other possible questions:**

Would you like to live nearby a volcano? Why or why not?

Is this volcano dormant, inactive yet? ...More than a century after this last eruption...

Can you name other active volcanoes in Europe, in the world?...

Does the expression 'Ring of Fire' echoes in you? Can you define it?

Can you make a cross section in a subduction zone showing the connection within volcano and plates?

How thick is the crust in Iceland? Is it a continental or a oceanic one?