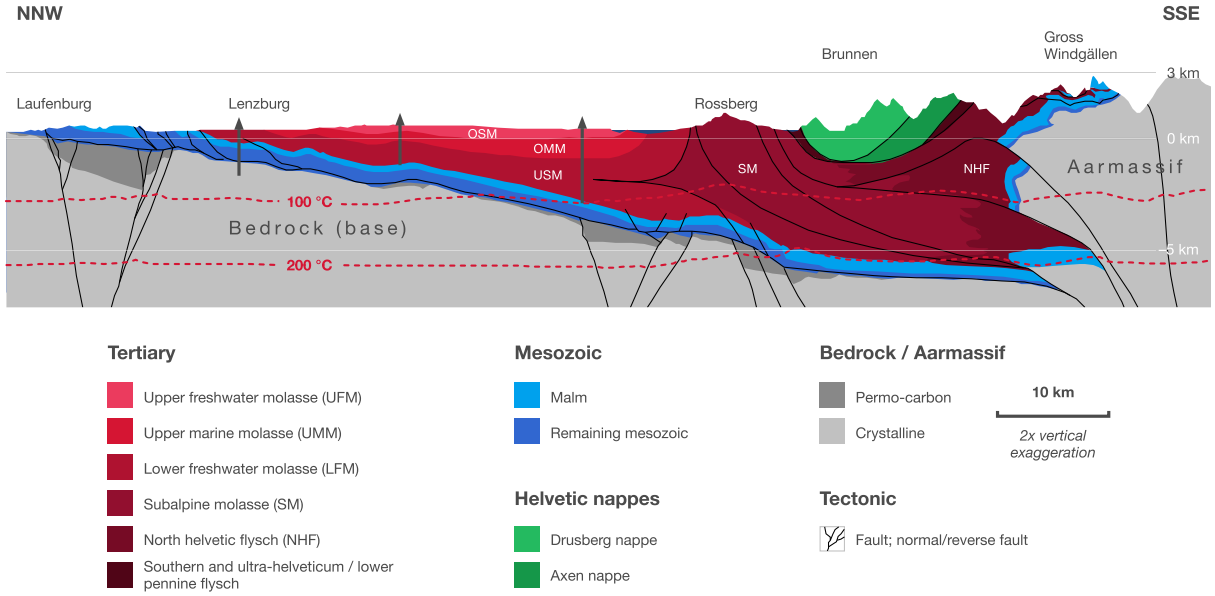
Energy
National Research Programmes 70 and 71

Card

Hydrothermal from permeable rock and petrothermal from dense rock

Resources # Cold / heat # Energy provision

Hydrothermal from permeable rock and petrothermal from dense rock



Geological profile of Central Switzerland *Source: Dr. Roland Wyss GmbH*

To extract geothermal energy from underground zones, a fluid – usually water – must be able to circulate through the hot rock. It warms up in direct contact with the rock and then transports the geothermal heat to the surface. Such a process requires the rock to be permeable enough for the fluid to move at the required velocity through a sufficiently large volume of hot rock. This permeability is different for different types of rock. While sedimentary rocks such as sandstone and limestone often exhibit natural water permeability, rocks such as granite and gneiss are almost impermeable.

Hot deep water can be transported directly from the porous sedimentary rocks to the surface by drilling into a water-bearing layer – a so-called aquifer (hydrothermal geothermal energy). In Switzerland, water-bearing layers can primarily be found in the Mesozoic (see figure, blue layers), a collective term for a series of rock formations dating back around 70 million to 250 million years that lie close to the surface in the north and at increasing depth towards the Alps and west. The yield is higher close to the surface – but temperatures are lower.

In the case of the less permeable crystalline rock (see figure, bedrock and the Aarmassif), the water permeability has to be increased using engineering methods (petrothermal geothermal energy). This process is referred to as an enhanced geothermal system (EGS). By injecting water, existing fissures in the rock are widened or new fissures are opened up. As the crystalline bedrock is under high tension due to the pressure of the tectonic continental plates, such stimulation causes discharge movements that can be perceived as earthquakes on the

surface. A core research topic is the prevention of damage caused by this so-called induced seismicity.