The Multiris System

(0:02) 99% of the Earth is at a temperature of over 1000°C. (0:07) This heat represents an almost inexhaustible energy reservoir. (0:14) Profitable production of geothermal currents requires rock temperatures of over 150°C. (0:23) In Switzerland, these temperatures are reached at a depth of around 4000 metres. (0:29) To extract this heat, water is injected through a deep borehole. (0:34) It heats up as it passes through the rock, then returns to the surface through a second borehole. (0:43) It is then used to produce electricity and to heat buildings. (0:50) In certain favourable cases, the rocks are naturally permeable. (0:55) In most regions of Switzerland, however, the crystalline rocks in question are not permeable. (1:02) The flow paths must first be created. (1:06) To do this, water is injected under high pressure into the rock. (1:11) The pressures to which the rock is subjected vary according to the orientation. (1:17) Under the water pressure, cracks open in the rock perpendicular to the minimum pressure. (1:23) Once created, the cracks remain open even in the absence of water pressure, because the walls have shifted slightly. (1:31) Shocks are emitted each time new cracks are created. (1:35) Thus, a disc-shaped area of water-permeable fractures forms around the wellbore. (1:42) This is known as rock stimulation. (1:46) In order to achieve a sufficient volume of rock for profitable energy production, (1:50) the surface area of all the cracks must be approximately 4 km². (1:56) The Deep Heat Mining project in Basel attempted to stimulate such a surface area in a single operation. (2:03) During the work, the seismic tremors became stronger and stronger. (2:08) After about a third of the surface had been created, the work had to be interrupted even before the second borehole was made because of strong seismic tremors. (2:18) In Basel, subsequent studies have shown that the strength of the seismic tremors produced in principle increases significantly with the increase in the stimulated surface, which was not yet known at the time. (2:30) Stimulation of a single large area also presents the risk of seeing some preferential flow paths develop in the upper, colder parts, (2:40) instead of well-branched paths distributed between the two wells. (2:45) The deeper, warmer rocks remain unused. (2:49) Stimulation can thus lead to reduced energy output, in addition to seismic shocks. (2:56) Both problems can be solved by using a horizontal multifracture system. (3:03) Up to forty small subsurface sections are stimulated in series along the boreholes. (3:09) As the Basel project had shown, strong seismic tremors can be emitted when stimulating large areas. (3:16) Thanks to the multifracture system, instead of marked earthquakes, only weak tremors are produced when stimulating small volumes of rock. (3:26) If this process had been used, even in the difficult geological conditions of Basel, only weak seismic tremors would probably have been produced. (3:38) Good energy efficiency is also guaranteed. (3:41) Even if a few stimulations were to create preferential flow paths, most of the volume of the surrounding rock can be exploited. (3:50) This means that the rock can efficiently transfer its heat to the water circulation. (3:56) The new multifracture system from Geoenergie Suisse S.A. thus minimises seismic risk compared to conventional stimulation processes, while guaranteeing high energy efficiency. (4:10) A decisive step in the use of one of the world's largest potential sources of renewable energy.