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Micro Jet drilling based reservoir intervention to boost geothermal energy harvesting and storage

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Climate change and politics do force energy and heating suppliers like municipalities and others to drastically reduce their CO*2*-emissions, e.g. through decarbonizing their heating and cooling supply chains. Moreover, recent, global developments within politics and the energy sector have proven the utmost importance of energy supply chain reliability, security as well as ample, longterm energy storage, consequently rendering increasing energy independence within Europe. Here, the harvesting of renewable energies and their storage do play a focal role. In order to make full and most efficient use of renewables, optimal match of production and demand as well as ample, efficient and especially seasonable, longer term energy storage systems are essential.
To tackle those rising challenges revolving around energy supply and demand, amongst others geothermal heating, cooling and storage present a sustainable, year round 24/7 energy resource, capable of providing heat, cold, power and, most importantly, large energy storage and seasonable independance. Nevertheless, improvements regarding efficiency of such subsurface, geothermal energy systems are contemporary as well as necessary.
One crucial aspect requiring attention besides targeting the required depth and geology is optimizing their productivity and thus, wellbore to reservoir interface and interaction. Subsequently, novel technologies have been under development to enhance just this exchange between wellbore and reservoir pay zone to accomplish a superior and enduring connectivity between both, resulting in highly efficient underground geothermal systems. These mechanical type micro jetting / milling technologies do facilitate economically and environmentally sound alternatives over conventional stimulation, e.g. “fraccing” type measures. Innovative, coiled tubing based, directed hydraulic rock erosion processes are being developed in connection with ultra-short radius and high deviation technologies to create small diameter, micro-size drain holes along the desired pay zones of any main wellbore within such subsurface geothermal system.
Operable in both, cased and open hole completion designs, these types of mechanical, micro size intervention methods have proven to result in significant, also practical improvements in hydraulic connectivity between reservoir and wellbore in laboratory and field demonstrations conducted at Fraunhofer IEG and partners. Demonstrations have elaborated the development and technological readiness of the technology for application in any, also harder rock formations, being targeted for underground geothermal harvesting and storage reservoirs.