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Tremors behind the power outlet - where earthquakes appear on our monthly bill

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The world's appetite for energy has significantly increased over the last decades, not least due to the rapid growth of Asian economies. In parallel, the Fukushima shock raised widespread concerns against nuclear power generation and an increasing desire for clean energy technologies. To solve the conflict of higher demands, limited resources and a growing level of green consciousness, both up-scaling of conventional and development of renewable energy technologies are required. This is where the phenomenon of man-made earthquakes appears on the radar screen. Several of our energy production technologies have the potential to cause small, moderate, or sometimes even larger magnitude earthquakes.
There is a general awareness that coal mining activities can produce moderate sized earthquakes. Similarly, long-term production from hydrocarbon reservoirs can lead to subsurface deformations accompanied by even larger magnitude earthquakes. Even the "renewables" are not necessarily earthquake-free. Several of the largest man-made earthquakes have been caused by water impoundment for hydropower plants. On a much smaller scale, micro earthquakes can occur in enhanced geothermal systems (EGS).
Although still in its infancy, the EGS technology has an enormous potential to supply base load electricity, and its technical feasibility for a large scale application is currently being investigated in about a dozen pilot projects. The principal concept of heat extraction by circulating water through a subsurface reservoir is fairly simple, the technical implementation of EGS, however, exhibits several challenges not all of which are yet being solved. As the hydraulic conductivity at depth is usually extremely low at EGS sites, a technical stimulation of hydraulic pathways is required for creating an artificial heat exchanger. By injecting fluid under high pressure into the subsurface, tectonic stress on existing fractures can be released and the associated shearing of the fractures (micro earthquakes) increases the hydraulic conductivity.
Magnitudes of the induced micro earthquakes are typically below the human detection threshold, but a few exceptionally strong events in the order of ML=3.5 have occurred in EGS reservoirs. In one case, slight material damage was caused, which eventually led to a project stop. Although these induced micro earthquakes are usually generated under well-controlled conditions, the possibility of rare occurrences of felt events in EGS reservoirs remains part of the technology. The same applies for the up-scaling of hydrocarbon production. Tapping unconventional resources requires similar stimulation technologies as used for EGS. Every power production technology has got its prize – we have to decide what currency we are willing to pay and to what extent we are ready to accept the small tremors behind our power outlet.