

## Thesis description:

### Geothermal power: LCA assessment including seismic impacts due to drilling activities

Geothermal energy is a potential sustainable energy provision technology. Enhance geothermal systems (EGS) are very promising and have been tested in Switzerland (Basel and St.Gallen). However, due to small earthquakes, local population (over-)reacted and the tests have stopped. Therefore, induced seismicity because of EGS is a risk, and should be recognized and assessed. Public perception to induced seismicity is very important and it is a major factor in the decision of establishing/continuing an EGS project or not. Up until now, the biggest earthquakes "directly" related to EGS was a 4,4 earthquake in Berlín, El Salvador, which is still relatively low. According to the Mercalli intensity scale the effects are such that the earthquake is "felt by almost everyone, small objects move". Other human induced earthquakes from other activities have reached higher levels up to 6.5 Richter like in India in 1967 (was related to weight of water in a dam reservoir that changed the stresses in the subsurface). But in general, EGS and it's activities have not yet caused any severe damage.

In LCA, seismic effects are not addressed so far and therefore it is important to develop a method to account for the potential impacts and compare it to impacts of other power technologies. Based on previous work, the goal of this thesis is to further develop the methodology to make it operational, by addressing the risk of earthquake as a function of drilling activity and then to relate seismic events to damage categories in LCA (mainly through costs of damage on man-made resources, since no human health impacts are expected). This is important in order to compare the impacts objectively within an LCA study and the method can be expanded to seismic impacts of other drilling activities (e.g. coal and gas extraction) in future work.

The thesis will be supervised by Dr. Stephan Pfister in collaboration with Prof. Peter Bayer (Geothermics at the Ingolstadt University of Applied Sciences) and Dr. Valentin Gischig (ETH Zürich, Swiss Competence Center for Energy Research).

For further information please contact: [Pfister@ifu.baug.ethz.ch](mailto: Pfister@ifu.baug.ethz.ch)