

Technical Challenges to the Development of Commercial EGS in the USA

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The resource base of mineable geothermal heat in the US is vast—one recent estimate exceeds 10^{25} J—and represents a distributed source of base-load electrical and thermal energy that is potentially clean, reliable, and low in carbon emissions. However, in contrast to more mature renewable energy sources such as wind, solar, and hydroelectric, there are still a number of challenges to the commercialization of Engineered/Enhanced Geothermal Systems (EGS). These challenges exist in the legal, social, and economic arenas, as well as in the technical aspects of constructing and operating viable EGS projects. The technical areas, in particular, offer excellent scope for collaborative research by geologists, geophysicists, geochemists, and hydrogeologists. At the present state of the science, methods for characterizing potential EGS targets, controlling the stimulation process in uncertain environments, acquiring better estimates of stimulated reservoir volume, and managing the heat extraction process all represent areas in which even incremental advances can make a significant impact. Furthermore, these research areas will continue to be of value to the EGS community for the foreseeable future, because every target for EGS development represents a unique geological environment.

The nature of these challenges makes them amenable to field, laboratory, and theoretical/computational approaches, which offers research opportunities for Earth scientists and engineers with a wide range of interests and skill sets. Successful researchers in the EGS field will combine their skills with a practical, results-oriented attitude that is mindful of project economics and the needs of industry. In short, the challenges inherent in developing EGS as a commercially viable alternative energy source offer a wealth of stimulating research problems for Earth scientists with a flexible mindset and a willingness to consider creative solutions to practical problems.