

Chemical Energy Carriers Can Increase Power Generated by Geothermal Energy

Unlike enhanced geothermal systems technology that is used to access low-temperature fluid heat trapped deep inside the Earth, chemical energy carrier (CEC) systems can capture and transport the geothermal energy as chemical energy, in addition to sensible and latent energy. Transported energy can be delivered to a power plant from the exothermic (heat-releasing) reaction of the CEC system at higher temperatures and efficiency than the latent heat of most fluids, like water. CEC systems must be tailored to each geothermal reservoir.

The Challenge

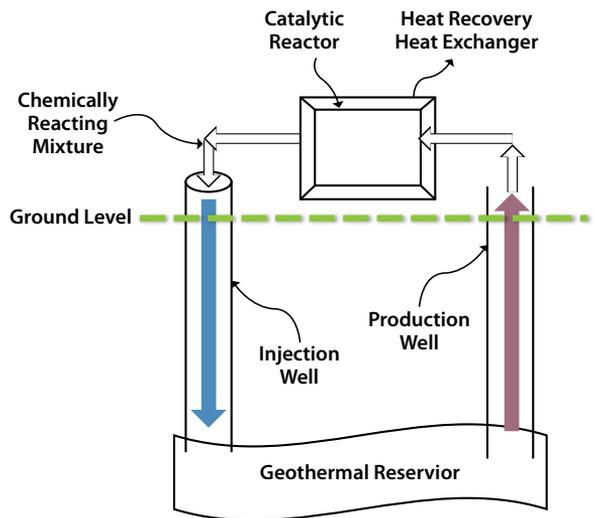
To develop CEC processes which match the properties of specific geothermal reservoirs to recover, convert, store and transport thermal energy as chemical energy instead of low-temperature fluid heat. Such a method will minimize heat loss and increase electric power cycle efficiency and output.

The Solution

Argonne is evaluating CEC processes that convert geothermal heat to chemical energy via a cycle of reversible chemical reactions. The chemical energy is then released at higher constant temperatures for power generation. Products of CEC endothermic (heat-absorbing) reactions, such as hydrogen and carbon monoxide, can also be recovered for use as is or for making other chemicals.

The Results

Use of a CEC process has the potential to significantly increase the power generated per unit of geothermal heat recovered. Current work focuses on identifying useful reversible reactions including thermal decomposition and steam reforming of hydrocarbons.



Conceptual design using methanol as a CEC system

“CECs provide an opportunity to capture, store and transport the geothermal energy for power generation at higher exergy (energy available for use) so it can increase the efficiency of the power generation cycle,” stated Argonne scientist Bassam Jody. *“CECs can also create new applications for geothermal energy by making the geothermal reservoir an in situ chemical reactor.”*