

CLASSIFICATION OF GEOTHERMAL SYSTEMS - A POSSIBLE SCHEME

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ABSTRACT

At the request of the United States Department of Energy, the author was asked by the Geothermal Energy Association (Washington, D.C.) to prepare a white paper on the subject (in connection with a new national assessment of geothermal resources). This paper offers a possible scheme in which geothermal resources are classified into seven categories based on temperature: non-electrical grade (<100°C), very-low temperature (100°C to <150°C), low temperature (150°C to 190°C), moderate temperature (190°C to <230°C), high temperature (230°C to <300°C), ultra-high temperature (>300°C), and steam fields (approximately 240°C with steam as the only mobile phase). In the first four classes of reservoirs, liquid water is the mobile phase; in the "high" and "ultra-high" temperature reservoirs, the mobile fluid phase is either liquid or a liquid-vapor mixture.

This scheme is based not only on temperature but also according to a set of additional attributes important for practical utilization of geothermal energy: (a) steam fraction in the mobile fluid phase in the reservoir (a controlling factor in reservoir performance), (b) type of power generation technology applicable, (c) production mechanism and the state of the fluid at the wellhead (which influence operational economics), (d) factors other than temperature that control well productivity (these factors affect the optimization of field development and operation), and (e) unusual operational problems that impact power cost (such as scaling, corrosion, high content of non-condensable gases, etc.). The paper discusses the rationale for this scheme and why some other possible schemes were not considered. Finally, the paper considers the distribution of the identified geothermal systems in the United States vis a vis these categories. The author invites comments on this scheme that may lead to a generally accepted one.

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