

NET POWER CAPACITY OF GEOTHERMAL WELLS VERSUS RESERVOIR TEMPERATURE – A PRACTICAL PERSPECTIVE

Subir K. Sanyal, James W. Morrow, and Steven J. Butler
GeothermEx, Inc., 5221 Central Avenue, Suite 201, Richmond, CA 94804 USA

Keywords:

Net power capacity, pump capacity, temperature gradient

ABSTRACT

This paper investigates the practical range of net power capacity available from conventional and enhanced geothermal wells as a function of temperature and productivity index. For a temperature range of 100°C to 190°C, which is the operating temperature limit of presently available downhole pumps, wells are typically pumped and power is usually generated in a binary-cycle plant, and in rare cases in a flash-cycle or hybrid-cycle plant. In this temperature range, the net MW capacity of a well has an upper limit of about 7.3 MW, irrespective of how high the well's productivity index is. This capacity limit cannot be improved unless technology can be improved to allow setting pumps deeper in the well than the current limit of 457m (1,500 feet) and pumping at a higher rate than the present limit of about 160 ℓ/s (2,500 gallons per minute). For resource temperatures greater than 190°C, wells must be self-flowed, and power is generated from such wells in a flash-cycle or hybridcycle plant. In the temperature range of 190°C to nearly 220°C a self-flowing well's net power capacity (irrespective of its productivity index) is less than the maximum of 7.3 MW for a pumped well. Above 220°C, the net power capacity of a well increases rapidly with increasing temperature and productivity index, and there is no practical upper limit. The maximum net power capacity available from an EGS well depends on reservoir depth and local temperature gradient; the optimum depth being increasingly shallow for higher temperature gradients. The trend of decrease in the optimum depth with temperature gradient applies whether this optimum is defined in terms of the maximum net MW capacity of a well or the minimum drilling cost per net MW capacity.

[For a copy of this paper please e-mail us at mw@geothermex.com](mailto:mw@geothermex.com)