CIRCUM-PACIFIC GEOTHERMAL ENERGY USE
FOR ELECTRICITY IN 1990

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ABSTRACT

Extensive oceanic plate subduction, with its magmatic, volcanic and tectonic consequences, is the primary basis of the significant geothermal resource potential of the Circum-Pacific. Geothermal energy use for electricity in Pacific Ocean nations is reasonably measured by installed generating capacity in gross megawatts. Comparative national and regional achievements and outlook in 1990 are better obtained by separately considering California's large Geysers installation of 2044 MW. On this basis, the United States, Mexico and Central America have established 1660 MW of geothermal electric power on the eastern Pacific Rim. The Philippines, Japan, New Zealand and Indonesia and a few other coastal nations have 1623 MW on the western Pacific Rim.

Where sound production, injection and reservoir management are practiced, geothermal reservoirs are supporting reliable, high performance electric power generation. New technologies are further reducing geothermal's low environmental profile, particularly minimizing emissions to atmosphere. Geothermal energy use for electricity should continue its steady growth in the Circum-Pacific during the 1990 decade because of its large human population and its economic vitality.

INTRODUCTION

Development of geothermal energy on the Circum-Pacific Rim commenced in 1951 when the New Zealand government began drilling the production wellfield at Wairakei to supply geothermal steam for a new electrical power system. Generation to the North Island power grid started in 1960 and within five years attained the designed level of 165 megawatts (MW) in one central power station. Interestingly, a private endeavor in California, the Magma-Thermal Power Project, drilling new geothermal steam wells at The Geysers, had negotiated a steam sales contract and brought Pacific Gas & Electric Company (PG&E), the large, investor owned utility, into participation. By September 1960, PG&E was generating electricity from a 12 MW unit, a modest start to a tremendous investment following at The Geysers.

Today, thirty years following these opening events, eight Pacific coastal nations have made significant investments in electric power systems supported by forty one geothermal reservoirs. The total installed generating capacity is 5327 MW; however, The Geysers' 2044 MW capacity is best deleted from this total for the separate consideration it now requires. The larger portion of geothermal energy utilization in the Circum-Pacific has a significant distribution. The United States, Mexico and Central America operate 1660 MW in the eastern Pacific. Japan, the Philippines, New Zealand, Indonesia and a few other coastal nations operate 1623 MW in the western Pacific.

GEOLOGIC BASIS FOR THE RESOURCE

The internal thermal energy of the earth drives a continuous mass circulation in the mantle and crust. Tectonic plate transport and cycling, magmatic intrusion and volcanism are the consequential processes of concern to geothermal energy utilization. Subduction, the final phase of oceanic plate cycling, is the dominant boundary condition of the Pacific Ocean basin. Oceanic plate subduction is also the dominant cause of volcanism worldwide. Decker and Decker,