

GEOTHERMAL ENERGY UTILIZATION IN THE UNITED STATES - 2000

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ABSTRACT

Geothermal energy is used for electric power generation and direct utilization in the United States. The present installed capacity for electric power generation is 3,064 MWe with only 2,212 MWe in operation due to reduction at The Geysers geothermal field in California; producing approximately 16,000 GWh per year. Geothermal electric power plants are located in California, Nevada, Utah and Hawaii. The two largest concentrations of plants are at The Geysers in northern California and the Imperial Valley in southern California. The direct utilization of geothermal energy includes the heating of pools and spas, greenhouses and aquaculture facilities, space heating and district heating, snow melting, agricultural drying, industrial applications and ground-source heat pumps. The installed capacity is 4,000 MWt and the annual energy use is 20,600 billion Btu (21,700 TJ - 6040 GWh). The largest applications is ground-source (geothermal) heat pumps (59% of the energy use), and the largest direct-use is in aquaculture. Direct utilization is increasing at about six percent per year; whereas, electric power plant development is almost static. Geothermal energy is a relatively benign energy source, displaying fossil fuels and thus, reducing greenhouse gas emissions. A recent initiative by the U.S. Department of Energy, "Geo-Powering the West," should stimulate future geothermal development. The proposal is especially oriented to small-scale power plants with cascaded uses of the geothermal fluid for direct applications

GEOTHERMAL ELECTRIC POWER GENERATION

Introduction

The United States continues to lead the world in installed geothermal power capacity as well as in electrical generation producing 16,000 GWh/yr from 2,212 MWe capacity for a load factor of 0.83%. However, geothermal energy is a small contributor to the electric power capacity and generation in the United States. In 1998, geothermal plants constituted about 0.25 percent of the total operable power capacity. In 1998, those plants contributed 0.38 percent of the total generation and, for 2000, it stands at 0.45 percent.

On a state level, geothermal is a major player in California and Nevada. It is a minor source of power in Hawaii and Utah. Further, it has the potential to become significant on the Big Island of Hawaii and perhaps, in the future, the Pacific Northwest.

The most impressive geothermal growth in the United States occurred during the 1980s, with an average annual increase in capacity of about 11 percent. In contrast, from 1990-2000, it has averaged only one percent due to a leveling off of new plant construction. This recent period also saw a reduction at The Geysers in California to an operating capacity of about 1,137 MWe, down from a total installed capacity of 1,989 MWe. Contributing to the capacity stagnation are the decline in steam production, and the retirement and shut down of six units at The Geysers in California. These include the four original units (78 MWe), both the Central California Power Agency (CCPA) units (130 MWe), and the 55 MWe Bottle Rock plant. However, the Bottle Rock plant has been purchased by ThermaSource, Inc. and should start operation by the summer of 2001. CalEnergy has completed Unit 5, a 49-MW facility and a 10-MW turbine at the Salton Sea in mid 2000.