

Renewable Geothermal Cleantech Energy,

the Nisyros Hydrothermal Problem versus a Yali Geothermal Alternative

Memorandum by Prof. Dr. Volker J. Dietrich, Nisyros April 24, 2011

Geothermal Energy has become during the past twenty years one of the most promising future “Renewable Cleantech Energy”. It does not influence the earth’s surface and atmosphere either with radioactive radiation, toxic chemical particular matter, and gases or produces such items as waste products.

In 2010 Geothermal power plants had a capacity of 10,715 MW (Mega Watt) worldwide, producing electrical energy of 67,246 GWh (Giga Watt hours). Until 2015 the capacity will be raised to 20,000 (Source: Geothermal Power Generation in the World 2005–2010 Update Report, by Ruggero Bertani : Proceedings World Geothermal Congress 2010, Bali, Indonesia, 25-29 April 2010). Germany is planning to install geothermal power plants and producing geothermal energy on a large scale as major part of „Renewable Cleantech Energy“. By 2050 80% of all electrical energy in Germany should be provided by renewable energies.

Geothermal power plants in high-energy (-enthalpy) geothermal areas can produce directly high electrical energy. Modern “Binary Cycle” Power plant systems have been successfully developed and work in many areas of the world since twenty without any problems and environmental contamination.

The Nisyros Hydrothermal Problem

All activities concerning geothermal energy development in Greece have been documented by Nicolas Koutroupis 1992 in an established scientific journal: International Geothermics, Vol. 21, pages 881-890. The article summarizes all the Greek geothermal research, activities and problems between 1970 and 1991.

For Nisyros a proposal of a 10 MW power plant (“of course with a, at that time only available “condensing system plant”) exist in the locality of Ag. Irini, with a prospection of 5 drill holes, and with a possibly extended capacity of 50 MW, established by the Public Power Corporation S.A. (PPC, Δημόσια Επιχείρηση Ηλεκτρισμού Α.Ε. (DEI)).

Remarks to such a project on the basis of the GEOWARN project results (2003)

The locality of Ag. Irini lies in the main and most recent NE-SW active tectonic zone (fractures, hydrothermal activity, hydrothermal explosion craters (Stefanos, Kaminaki, Polybotis with explosions 1873-1887). Every input of fresh magma into the deep magma/hot rock reservoirs between most probably 8000 and 3000 m depth, will lead to earthquakes and major influence (heat) of the overlaying hydrothermal system, which may terminate in hydrothermal explosions. Fortunately, the magma input during 1996/1997 stopped, GEOWARN data recognized an uplift of the island; only the surface tension of the stress field in the impermeable caldera floor led to the Lakki rupture.

Drilling such an active system and exploiting continuous hot brine waters during the power plant operation might cause earthquake activity and might trigger unforeseen major hydrothermal explosions. Nisyros is a quiescent but still recently active volcano, even if no eruption occurred. No prediction can be made, how long quiescent!

The Yali Geothermal Alternative

The island of Yali represents in a sickle shape parts of a broken up volcano, which produced large amounts of pumice and obsidian during prehistoric eruptions (that exact dates are still not known today; most probably between 15000 and 30000 years ago).

During the GEOWARN project a **tomography 3D model of the underground down to 30km depth of the entire volcanic field between Kos-Perigusa-Yali and Nisyros** was produced, using 36 installed ocean floor seismographs combined with active seismic refraction/reflection profiling.

The tomographic results together with geochemical data yielded a large volume of very hot magmatic rocks also at depth between 3000 and 6000m (in the upper part at least 350°C, and thus of high-enthalpy), indicative as a very large heat source for geothermal power for at least several thousand years of cooling. Such a geothermal situation is ideal for geothermal exploitation in a “Binary Cycle Power Plant”: the volcano of Yali being extinct for thousands of years, and no fresh magma being present to feed a hydrothermal system.

The risk of a geothermal power plant in Yali is compared to Nisyros neglectable. The earthquake pattern is small to normal and caused by the general tectonic activity in the entire volcanic field. However, a thorough exploration campaign has to be undertaken before further planning.