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## LIFE CYCLE OF GEOTHERMAL WELLS – GENERAL EXPERIENCE

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### ABSTRACT

The first high temperature geothermal wells were completed a century ago but geothermal development was gradual and mainly in Italy until about 60 years ago. After WW II drilling started in a number of countries for power generation. Experience has shown that geothermal wells have a long productive lifetime, even longer than the power plants (30-40 years), and the annual operation and maintenance (O&M) cost is below 2% of the initial investment. The operation and maintenance of geothermal wells is by now well established and thus some general conclusions can be drawn on the life cycle of geothermal wells. There are cases of accidents or the loss of wells, but there are methods to avoid such incidences and carry out the daily O&M in such a way that the plants can receive uninterrupted supplies of steam and can dispose the waste fluids back into the ground. Geothermal energy is superior to other renewable energy sources because of this reliability, as it typically produces twice as much power annually as hydro and three times more than solar or wind due to the higher load factor. This lecture will describe the general experience from Iceland, but it reflects also what has been found in other countries. It will focus on the daily operation of the wells and the maintenance activity, be it: regular inspections, preventive maintenance, major overhaul or repairs and also some catastrophic failures. In extreme cases wells have to be plugged and abandoned or a new sidetrack made through a milled window in the casing. The life of wells depends greatly on proper drilling practices while drilling the original well and especially on good cementing of the casing. It is therefore important to have access to the original drilling records and “as built” drawings to aid in any failure analysis. Maintenance systems and regular records of the well operation and any maintenance activities, are also important to have right from the first day. In the daily operation of the well it is especially important to minimize thermal cycling on the well casing, due to shut-in or killing, as then the yield point of the steel is exceeded and a few such cycles are likely to break the casing. The best way of insuring a long life of a geothermal well is to keep the wellhead hot at all times. The lecture will not dwell on the cost issue as for a “life cycle cost analysis”, but rather on the technology applied, which affects these costs and how they can be minimized.