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GEOTHERMAL RESERVOIR MANAGEMENT TECHNOLOGY AND PROBLEM AREAS

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ABSTRACT

This paper focuses on the technology and problem areas related to the management of low enthalpy geothermal reservoirs dedicated to direct uses, chiefly space and district heating.

Accordingly it reviews the headings, deemed the most sensitive, itemised below:

- well drilling and completion
- well restoration and workover
- production and injection technology
- corrosion and scaling thermochemical shortcomings
- risk assessment
- sustainable reservoir development.

The latter, indeed a key issue, is illustrated by the reservoir simulation of two 50 year projected development scenarios in view of investigating well longevities and reservoir life.

1. INTRODUCTION

Once a geothermal resource has been identified and the reservoir assessed, leading to a conceptual model of the geothermal system, reservoir development and relevant management issues come into play.

In the broad sense, reservoir management is an extension of reservoir engineering. Whereas the latter addresses key issues such as heat in place, reservoir performance, well deliverabilities, heat recovery, water injection and reservoir life, reservoir management aims at optimised exploitation strategies in compliance with technical feasibility, economic viability and environmental safety requirements.

Reservoir management involves also resource management, a matter raising growing interest in the perspective of sustainable development of alternative, preferably renewable, energy sources as highlighted by the debate on Global Warming/Climatic Changes and recommendations of the recent World Environmental Summits (Kyoto Protocol) reducing greenhouse gas emissions.

The foregoing arise the crucial question on whether geothermal heat is a renewable energy source. It is not, at human time scale, for the simple reason that the heat is abstracted from the reservoir via convection and resupplied by conduction.

Hence longevity of heat mining should be sought through properly balanced production schedules and designed water injection strategies in order to achieve sustainability, a concept defined in practical terms as the ability of a heat mining scheme to secure production over very long times [1]. This is indeed a challenging accomplishment, in which reservoir/resource management takes an important share.

It requires an integrated approach of the most sensitive problems areas encountered during early reservoir development stages to be performed, alongside a thorough analysis of related exploitation risks. Those should ultimately allow to assess, in the light of sustainability i.e. long term issues, the relevance of several candidate development scenarios ad associated mining schemes, implemented via adequate reservoir simulation codes, according to the rationale sketched in fig. 1 flowchart.

Accordingly, the problems addressing sensitive headings such as:

(i) well drilling and completion,
(ii) (ii) maintenance and workover,
(iii) (iii) production/injection technologies,
(iv) thermochemical (corrosion/scaling) shortcomings,
(v) risk assessments and system lifetimes will be reviewed through case studies and records borrowed chiefly to the low enthalpy Paris Basin reservoir, exploited since the early 1970s