WESTERN PACIFIC
REGIONAL BRANCH

Cost Reduction Through Improved Geothermal Well Targeting

Joint WPRB/INAGA Technical Seminar

Nusa Dua, 26-28 April 2008

Course Notes

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WPRB Geothermal Lectures – Introduction

A vast amount of research and technical development has been carried out in geothermal science in the past fifty years. The geothermal literature is now far too large for any one person to read in a single lifetime! Also much of it has been written as scientific papers rather than necessarily giving direct guidance on how to make best use of the techniques.

Members of the WPRB have worked on many geothermal projects world-wide and have had much experience in how to derive practical benefit from the scientific techniques available. In this course the practical application of science to geothermal exploration and development, based on what we have found useful, is put forward in a simple format. At the same time sufficient theory is given to put the methods into context.

Course Objectives and Methodology

The objective of the course is cost reduction for geothermal development in Indonesia, concentrating on the resource-related aspects rather than, for example, capital cost of power plants, but with attention paid to maximising NPV by closely integrating power plant design characteristics with reservoir characteristics. One of the factors hampering geothermal development in Indonesia is that geothermal has to compete with other sources of generation especially cheap local coal. While some geothermal developments are on-going, there are a number of projects that are more or less stalled at the exploration/delineation stage. Therefore it is necessary to find ways to keep the costs of geothermal development down. Improving the success ratio of well targeting and the productivity of individual wells is one very important way of doing that. This is the principal focus of the seminar.

The course is based on a series of modules in which theory and principles are reviewed and practical exercises are given to allow attendees to participate in the course and practice the methods given. Each of the modules is complete in itself.

The course will cover the full range of geothermal activities, from early exploration through to on-going reservoir management. It also touches on aspects such as drilling and geotechnical issues, but from the perspective of what non-specialist professionals need to know – for example, what does a rig geologist need to know about drilling? .

Of particular note is the material on resource assessment. Although the methodology for various means of reservoir measurement and interpretation is widely understood, the next step of taking this through into a realistic assessment of resource capability on which economic decisions can be soundly based has been treated very differently by different organisations. This part of the course gives a practical guide to selection of appropriate resource assessment methodology at different stages of development and relating these to the underlying conceptual models and assumptions made.

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Lecture Course Contents: Part One

1 The Physical Properties of Hydrothermal Fluids
2 Magmatic-Related Hydrothermal Systems: The Basic Model
3 Introduction to Geothermal Geological Principles
4 Applications of Geology in Geothermal Development
5 Utilising Volcanic Facies Models in Geothermal Exploration
6 Hydrothermal Heat Sources and Evolution
7 Variations in Types of Hydrothermal Systems
8 Conceptual Hydrological Models
9 Paleohydrological Reconstruction
10 Resource Assessment
11 Bibliography

Appendix 1 Glossary and Definitions
Appendix 2 Steam Tables
Appendix 3 Tables for Boiling Point for Depth, Mineral Abbreviations, and Stability Ranges
Appendix 4 A Comparison of New Zealand and Sumatran Hydrothermal Systems
Appendix 5 An Example of Conversion Efficiencies