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DEMONSTRATION OF A BIPHASE WELLHEAD POWER SYSTEM

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PROGRESS REPORT for 1994

Introduction

This project was proposed to demonstrate the application of Biphase turbine systems to improve the power output of the Cerro Prieto geothermal resource. The units proposed will be add-on units which generate power from the high-pressure well flow and which then deliver steam to the existing separators at the conditions required by the existing power plants. The Biphase units have isolation valves which enable the wells and plant to operate independently of the Biphase units.

A study previously conducted for CFE found that the best 40 wells could produce an additional 80 megawatts if Biphase turbines were added. The current agreement to demonstrate a single Biphase unit was signed in September of 1994.

Planned Scope of Project for 1994

The final engineering for the project is planned to be completed in 1994. Major equipment including the Biphase turbine, a back pressure steam turbine, the generator and electrical switchgear is planned to be ordered.

## Results to Date

The following results have been achieved to date:

1. The well for the project was selected to be number 103.
2. The final Process and Instrumentation Diagram was prepared.
3. The final design of the Biphase turbine was completed. Power output of the Biphase wellhead system was calculated with the following results:

Present equipment The well presently feeds a separator which operates at 110 psig. The well produces 81.5 T/h of steam. Steam from the separator feeds a condensing steam turbine. The steam rate is 11 T/MWh. The power produced by the flash steam flow from the well is 7410 kW.

Equipment including the Biphase turbine A Biphase wellhead power system will be installed in parallel to the existing flash orifice. The Biphase wellhead system consists of a Biphase turbine, back pressure steam turbine, common generator and electrical switchgear. The Biphase turbine system accepts the two-phase flow from the well directly and expands it to the separator pressure, generating power. The steam flows through the separator to the existing central steam turbine generating additional power. The Biphase wellhead system generates 4150 kW. The steam leaving the Biphase system generates an additional 6610 kW in the existing central steam turbine.

Obtained benefit with present equipment at Cerro Prieto I The present equipment produces 7410 kW from well 103. The addition of the Biphase wellhead power system results in a total of 4150 kW + 6610 kW = 10,760 kW. The power from the well is increased by 45%. The new steam rate, based on the flash steam flow is 7.6 T/MWh.

Obtained benefit with improvements to present equipment If the present equipment at Cerro Prieto I is improved to a steam rate of 8 T/MWh the well would produce 10,190 kW. Addition of a Biphase wellhead power system will produce a total of 4150 kW + 9090 kW = 13,240 kW with the improved equipment. The power from the well is increased by 30% in this case. The new steam rate is 6.2 T/MWh.

## Plans for 1995

The Biphase unit will be manufactured, installed and started in 1995. Startup should occur during the 4th quarter. The unit will be tested to determine if there are any deleterious effects on the operation of the well and steam system. Performance will be measured and compared to predictions. Reliability will be determined beginning in 1995 for a two year period of operation.