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PROJECT SUMMARY
DOE-CFE GEOTHERMAL AGREEMENT
15 November 1994

FEASIBILITY STUDY FOR USING EXCESS GEOTHERMAL POWER CAPACITY TO MANUFACTURE HYDROGEN

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Background:

Excess baseload geothermal electric power capacity could be utilized as a renewable energy resource to manufacture hydrogen for use as an energy carrier. Hydrogen would be valuable as a load-leveling mechanism for geothermal power plants or as a replacement for fossil fuels in transportation applications. The lower incremental cost of surplus geothermal capacity should lower the unit production cost of hydrogen, thus improving the cost competitiveness of geothermal hydrogen with other energy scenarios. Other cost reductions for geothermal hydrogen would be the air quality benefit derived from reduction in air pollutants and the value of the co-produced oxygen during electrolysis.

Objective:

The objective of the joint study is a feasibility report of the technical and economic potential for developing sufficient excess capacity of geothermal electric power to produce hydrogen as a commercial product at selected geothermal fields under development by CFE in Mexico and to evaluate the potential for hydrogen fuel to provide air pollution abatement in urban areas such as the Mexico City air basin.

Program for 1994:

The analysis of potential excess geothermal electricity capacity that could be used for manufacture of hydorgen will be completed for the Tres Virgenes field in B.C.S. and applied to other geothermal fields in Mexico, e.g., Cerro Prieto. Data are needed on estimates of current and future installed capacity of the geothermal resource, estimates of the incremental cost of the excess power and its

conversion to hydrogen by on-site electrolysis. Data are also needed on potential end-use markets for hydrogen and the associated environmental credits derived from health benefits and/or avoided costs of air pollution regulations.

Results to Date:

The feasibility study has identified three synergies between geothermal energy and hydrogen production:

1) incorporation of hydrogen production at geothermal sites can stimulate geothermal resource development, especially in remote areas with lower electricity demand or sites with commercially marginal resources;
2) incorporation of hydrogen production at geothermal sites allows for power plants to run at optimal baseload capacity; and
3) use of hydrogen produced from geothermal sites as a replacement for fossil fuels results in an energy pathway that produces a significant environmental benefit.

In addition, the major factors affecting cost of delivered hydrogen for end use have been identified, namely: cost of electricity, electrolyser technology, transport distance, and credit for environmental benefit.

The feasibility study has also identified geothermal hydrogen scenarios at three different scales appropriate for geothermal fields in Mexico: (1) a small, local (2-10 MWe) experimental facility; (2) a larger (100-300 MWe), regional energy/environmental network linking the Cerro Prieto field with polluted air basins near the US/Mexico border, such as Tijuana, San Diego, or Los Angeles; and (3) a nationwide (>1000 MWe) hydrogen infrastructure that could improve air quality for the Mexico City air basin.

Plans for 1995:

Further examination of the three identified geothermal hydrogen scenarios will detail critical economic, energy, and environmental parameters for each. Other issues affecting feasibility, including freshwater availability, environmental credits, and status of hydrogen technologies and markets will also be addressed for each scenario.