QUARTERLY STATUS REPORT**Received by OSTI**

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FUNDING AGENCY: US Department of Energy**COOPERATIVE AGREEMENT NO.:** DE-FC07-85NV10425**RECIPIENT:** Louisiana Geological Survey, School of Geoscience
Louisiana State University**PROJECT TITLE:** Environmental Monitoring at Designed
Geopressured-Geothermal Well Sites,
Louisiana and Texas**BUDGET PERIOD:** 01 January, 1990 - 31 December, 1990

Research Objectives

Implement and maintain the ongoing environmental monitoring program around DOE geopressured - geothermal test wells in Louisiana and Texas. Analyze and interpret collected data for evidence of subsidence and induced microearthquakes which may be brought about by geopressured - geothermal well testing and development. Continue geological - geophysical studies of the Hulin and Gladys McCall sites incorporating new seismic data. Continue review of previously identified and tested geopressured - geothermal prospects in Louisiana to determine if any link exists between such reservoirs and the existence of free gas in commercial or subcommercial quantities. Initiate review of geology, co-location and properties of geopressured brines with medium and heavy oil reservoirs in Louisiana utilizing existing maps, databases, reports, and journal articles.

Contract Tasks:**Microearthquake and Subsidence Monitoring****Background**

Subsidence and induced faulting are key environmental issues associated with the withdrawal of large volumes of geopressured - geothermal fluids in the Gulf Coast Region. It is of particular concern in coastal Louisiana and

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Texas, where a combination of man's activities and natural processes has accelerated rates of marshland deterioration and estuary enlargement. Land-surface subsidence causes damage and value losses to coastal property, as inundation by tidal waters is increased and the potential for flooding is intensified. Also, growth faults may be activated as a result of massive fluid withdrawal and injection. Accelerated movement along fault planes can damage pipelines, roads, levees, and buildings.

Direct field measurements have been used to determine baseline rates of subsidence at each prospect before well testing and to monitor changes during and after testing. Networks of first-order elevation benchmarks and microearthquake monitoring stations have been installed in the immediate vicinity of each test well.

Microearthquake Arrays: Each continuous recording network consists of four to six short-period vertical motion seismometers installed in boreholes up to 30 m deep. The seismic signals detected at each site are amplified and transmitted via phone lines to the Louisiana Geological Survey seismological laboratory in Baton Rouge. Records are scanned daily to detect possible microearthquake activity.

Benchmarks: Networks around each well consist of closely spaced benchmarks installed to intersect the projected surface positions of major faults. These benchmarks are surveyed and tied to the regional National Geodetic Survey (NGS) vertical control network every other year.

Current Reporting Period

Microearthquake monitoring is continuing at the Gladys McCall, Hulin, and Pleasant Bayou test wells. Field visits were made to Pleasant Bayou and Gladys McCall during this reporting period for routine maintenance and repairs. Replacement batteries and a new geophone were installed at station GAR in the Gladys McCall network. Maintenance performed at Pleasant bayou included battery replacement and moving receiving antennas at the central collection site higher on the tower. Trees have grown over the past few years and interfered with radio communication. Moving the antennas higher seemed to take care of the problem. The signals are now coming in nicely. Through April and May Teledyne Geotech provided us with a loaner PDAS-100 portable digital event detector. Loan of this instrument allowed us to familiarize ourselves with operation and setup procedures before bidding and purchase of the package. The package is to be placed within the Pleasant Bayou network to cut down on the phone line costs as outlined in task A in this years contract agreement. Requests for bids were sent out in middle June

All subsidence monitoring work is continuing on schedule. The next round

of leveling for the Pleasant Bayou and Gladys McCall networks is now set for summer. Subcontractors have been contacted and letters of estimated cost and scheduling have been received for the Gladys McCall leveling network. The subcontractor that performs leveling around Pleasant Bayou has been contacted, but has not yet provided us with a cost estimate or tentative scheduling dates.

Geological Investigations

Background

The Louisiana Geological Survey has been involved with geological investigations of the geopressured-geothermal resource in Louisiana since the beginning of the DOE geopressured-geothermal research program. These studies have provided documentation on the regional geology of sites selected and listed as being suitable for geopressured-geothermal well drilling, testing, and development. Currently, LGS/LSU investigations are continuing and are centered around the DOE/Superior Hulin #1 well and the Gladys McCall #1 well. Collocation of geopressured reservoirs with medium to heavy oil in the state of Louisiana has been added to included as a new task for this year's contract.

Current Reporting Period

The areal extent of the Hulin prospect continues to be studied using the seismic data purchased for this prospect area. Figure #1 shows location of purchased seismic lines at the Hulin prospect area. Preliminary interpretation of the lines has been recently completed. A preliminary revised structure map at the top of the geopressured sandstone is being prepared and will be included in the next quarterly report (July - September). Factors complicating the interpretation process have included increased faulting and rapid degeneration of data quality within the section at the Hulin prospect depths (20,000 feet).

Information and data related to the collocation of geopressured brines with medium and heavy oil reservoirs in south Louisiana continues to be gathered. The Department of Natural Resources, State of Louisiana published yearly summaries of field statistics and drilling operations up until 1978. After that time publication was discontinued. Information from these reports is presently being tabulated to determine areas in south Louisiana where medium (<25° API) gravity oil reservoirs are located. A map showing the geopressured - geothermal corridors in south Louisiana using previous work done at LGS has been completed. It is proposed to use this map in conjunction with regional maps published by the GEOMAP company to locate fields suitable for further detailed studies.

The Bureau of Mines Circular 8263 (1965) entitled 'Heavy Crude Oil

Reservoirs in the United States: A Survey' by W.D. Dietzman et al contains some preliminary general but relevant information. This report states that the average net thickness of the majority of such reservoirs in south Louisiana is less than 100 feet and they are found up to a maximum depth of 12,200 feet. Approximately 50% of these reservoirs are at depths of less than 3,000 feet. Medium gravity oil reservoirs in south Louisiana are found in sandstones, while some reservoirs in north Louisiana are contained in limestones.

ADDITIONAL PROJECT RELATED ACTIVITIES:

Two papers presented at the annual meeting of the American Association of Petroleum Geologists meeting at San Francisco:

- 1) Test Results of the Geopressured - Geothermal Resource In South Louisiana (Michael Byron Miller and Chacko J. John) - oral presentation
- 2) A Decade of Environmental Monitoring at Geopressured - Geothermal Well Test Sites along the Texas - Louisiana Gulf Coast (Donald A. Stevenson, Chacko J. John, and C.G. Groat)

A paper entitled 'Assessment of Geopressure - Geothermal Resources for Near - Term Utilization' (C.G. Groat, Chacko J. John, and Donald A. Stevenson) was prepared and submitted for publication in the Proceedings of the DOE Review Meeting held at San Francisco in April 1990. The Louisiana Geological Survey was represented by Dr. C.G. Groat at this meeting.

Coordination Assistance- Copies of slides of LGS research activities were made and provided to Dr. Jane Negus deWys for use at future DOE geopressured - geothermal meetings.

Preparation of the final water quality summary report detailing water quality collection and analyses results reported to us by Southern University is in preparation and should be submitted to DOE Idaho Falls by end of July. Also, preparation of our regular annual report is in progress and should be ready by end of July for submittal.

 Charles Groat or Don Stevenson
 Co-Principal Investigators

Figure 1: Location map of purchased seismic reflection lines. These lines will be used in preparing a revised structured map of the Hulín area at the depth of the geopressed-geothermal prospect.

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