

Oil & Natural Gas Technology

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Quarterly Research Performance Progress Report

(Period ending 12/31/2014)

Advanced Hydrate Reservoir Modeling Using Rock Physics Techniques

10/1/2012 – 9/30/2015

Submitted by:

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Executive Summary

This research effort focuses on developing and refining techniques that integrate rock physics modeling, amplitude analysis, and spectral decomposition to characterize complex gas hydrate reservoirs. The expected outcome of the research efforts will be an enhanced ability to quantitatively evaluate and prioritize potential gas hydrate accumulations that may be selected as exploration drilling targets based on 3-D seismic data.

Preliminary work has been done, but in order to meet the research project objectives, suitable 3D seismic data that contain gas hydrate deposits are required. Work has been essentially halted until appropriate 3D seismic is made available to the project.

Work in period was focused on securing suitable 3D seismic data.

Accomplishments to date

- Reviewed related scientific/industry research efforts.
- Identified relevant research concepts.
- Investigated well logs data in WR 313 and GC955
- Selection of initial rock physics model.
- Progress on selection of possible statistical classification techniques.
- Contact with communities of interest after the award announcement. USGS, Colombian Petroleum Institute, KIGAM, Guanzhou Marine Geological Survey, Shell, BP, Chevron, Petronas, National University of Singapore, and Texas A&M University
- Continued professional development for Dr. Zhang, building on recent past work.
- Received in-kind contribution Jason Workbench Suite of petrophysical and inversion software to develop analytical routines.
- Purchased Hampson Russell AVO and inversion software that can be used in this project
- Modeling mixtures of methane and thermogenic gas hydrate signatures against flux and geothermal gradients and depositional architecture.
- Presentation of Poster showing research progress at Gordon Research Conference in March, 2014.
- Researched attenuation concepts
- Preparation of oral talk for International Conference on Gas Hydrates.
- Negotiated donation of seismic lines in WR 313 and GC955 by CGG for use in this project.
- Presented oral talk at International Conference on Gas Hydrates in Beijing

Progress, Results, and Discussion Summary of technical progress

The project was postponed for the period January 1, 2013 to September 30, 2013. Task Groups 1 (Project Management and Planning) and 2 (Project Initiation) were completed prior to this reporting period. Work was also done on Task Group 3 (Development of Project Research Concepts) prior to the work hiatus. The project restarted with continuation of work within Task Group 3 and Task Group 4. Because of difficulties getting permission to use 3D seismic data in the area of interest, a no-cost extension was granted that extends the research project until September 30, 2015.

At this time we are conserving time spent on the project until suitable 3D data are made available.

To date, we have two arbitrary seismic lines from WR 313 and GC 955 from CGG. The project has permission to use these for research purposes until June 2015. These data, however do not go through the gas hydrate deposits and CGG was unwilling to supply equivalent data that do.

We are trying to get permission to use the Western Geco (Schlumberger) data that were supplied for DOE Chevron Gulf of Mexico Gas Hydrate Leg II project.

Post divestment sales agreements with CGG and others have hindered our ability to review all Fugro owned seismic data. We expect this impasse to resolve in the near future. There are several datasets that could be prospective for gas hydrates but the data need to be returned to Fugro's possession and reviewed for suitable gas hydrate prospects.

The Mexican Petroleum Institute (IMP) was contacted about potential research collaboration. A meeting was scheduled for January 2015 to discuss potential collaboration. If this avenue for progress seems feasible, then we will approach DOE about adding additional scientists from Mexico onto the project.

Future work in next reporting period

- Continue to work to secure the 3-D seismic volumes for testing and calibration.
- Proceed with project once suitable data are made available.

Changes or Problems

We have still not secured sufficient 3D seismic data from GC955 and WR313 for this project. CGG has made parts of those volumes available to Oklahoma State University for related hydrate research in the same DOE funding cycle. We were finally able to get a research donation contract for seismic data from CGG for WR313 and GC955 on May 30, 2014. The data were received in June, 2014. Unfortunately, the data are limited to single lines extracted from the 3D volumes. The data for WR313 consist of a single E-W oriented line approximately 300 m south of the north block line. The data received in GC955 is a single SW-NE line in the southeast quadrant of the block. Neither line intersects the hydrate deposits discovered during JIP Leg II that are the focus of this study. We will look to other multivendor seismic vendors that may have 3D seismic data in WR313 and GC955.

Software and work commitments from CGG are still outstanding issues. CGG has indicated that it is likely to not support the project with Jason Workbench software and technical advice.

Except for the no-cost time extensions, and the lack of suitable data to proceed, there are no significant changes or problems with the direction of the project as originally proposed. However, the work will be diminished in direct application to any coring of the JIP Leg II locations if suitable 3D seismic data are not made available to this project.

Participants and Other Collaborating Organizations

	Zijian Zhang, Geophysicist, Fugro Employee	Dan McConnell, Principal Investigator, Fugro Employee	Peter Mesdag, Technical Advisor, ex Fugro now after divestiture a CGG Employee (Netherlands)
Nearest month worked this reporting period	0	0	0
Collaboration outside USA	Not this reporting period	Not this reporting period	None this reporting period
Travel outside USA to communities of interest	None this reporting period	None this reporting period	None this reporting period

Special Reporting Requirements

None this quarter.

Budgetary Information

A new budget has been calculated for the remaining time on the contract.

\$76,265 has been spent from a budget allocation of \$213,444 to date. The federal share of the costs to date is \$61,012 and the cost sharing is \$15,253. The federal share of the costs per this reporting period is \$3,233 and the cost sharing is \$808.

Exhibit I Milestone Status

Milestone 1, Task 1 was completed November 14, 2012

Milestone 2 is on hold until suitable data are available.

Baseline Reporting Quarter	Budget Period 1												
	Q1 2012		Q2 2013		Q3 2013		Q4 2013		Q1 2013		Q2 2014		
	Sept- Dec 2012	Cumulative Total	Jan-Mar 2013	Cumulative Total	April-June 2013	Cumulative Total	June-Sept 2013	Cumulative Total	Sept-Dec 2013	Q1	Cumulative Total	Jan-Mar 2014	Cumulative Total
Baseline Cost Plan													
Federal Share	7114	7114	16226	23340	0	23340	0	23340	17135	40475	11800	52275	
Non-Federal Share	1778	1778	4057	5835	0	5835	0	5835	4284	10119	2950	13069	
Total Planned	8892	8892	20283	29175	0	29175	0	29175	21419	50594	14750	65344	
Actual Income Cost													
Federal Share	7114	7114	16226	23340	0	23340	0	23340	17135	40475	11800	52275	
Non-Federal Share	1778	1778	4057	5835	0	5835	0	5835	4284	10119	2950	13069	
Total Incurred Costs	8892	8892	20283	29175	0	29175	0	29175	21419	50594	14750	65344	
Variance													
Federal Share	0	0	0	0	0	0	0	0	0	0	0	0	
Non-Federal Share	0	0	(0)	(0)	0	(0)	0	(0)	0	(0)	0	(0)	
Total Variance	0	0	0	0	0	0	0	0	0	0	0	0	

Exhibit 2 Cost Plan

Baseline Reporting Quarter	Budget Period 2											
	Q3 2014		Q4 2014		Q1 2014		Q2 2015		Q3 2015		Q4 2015	
	April - June 2014	Cumulative Total	June-Sept 2014	Cumulative Total	Sept-Dec 2014	Cumulative Total	Jan-Mar 2015	Cumulative Total	April-June 2015	Cumulative Total	July-Sept 2015	Cumulative Total
Baseline Cost Plan												
Federal Share	5504	57779	0	57779	12000	69779	33658	103437	33658	137096	33659	170755
Non-Federal Share	1376	14445	0	14445	3000	17445	8415	25860	8415	34274	8415	42689
Total Planned	6880	72224	0	72224	15000	87224	42073	129297	42073	171370	42074	213444
Actual Income Cost												
Federal Share	5504	57779	0	57779	3233	61012		61012		61012		61012
Non-Federal Share	1376	14445	0	14445	808	15253		15253		15253		15253
Total Incurred Costs	6880	72224	0	72224	4041	76265		76265		76265		76265
Variance												
Federal Share	0	0	0	0	(8767)	(8767)	(33658)	(42425)	(33658)	(76083)	(33659)	(109743)
Non-Federal Share	0	(0)	0	(0)	(2192)	(2192)	(8415)	(10607)	(8415)	(19022)	(8415)	(27436)
Total Variance	0	0	0	0	(10959)	(10959)	(42073)	(53032)	(42073)	(95105)	(42074)	(137179)

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