Oil & Natural Gas Technology

DOE Award No.: DE-FE0010160

Quarterly Research Performance Progress Report

(Period ending 03/31/2015)

Advanced Hydrate Reservoir Modeling Using Rock Physics Techniques

10/1/2012 – 9/30/2015

Submitted by:
Principal Investigator: Dan McConnell

Fugro GeoConsulting, Inc.
DUNS #: 118972301
6100 Hillcroft Ave., 3rd Floor
Houston, TX 77081
e-mail: dmcconnell@fugro.com
Phone number: (713) 778-6801

Prepared for:
United States Department of Energy
National Energy Technology Laboratory

April 23, 2015

Disclaimer

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. Discussions were held with Instituto Mexicano de Petroleo in Mexico City about collaboration under this research contract with the aim of being able to study the known gas hydrate deposits in the Frio sandstone on the Mexican side of the Perdido Fold Belt. Further discussions were held with Western Geco for the use of the data used for the Gulf of Mexico Gas Hydrate JIP Leg II. Discussions continued for the use of potentially suitable 3-D seismic data from the United States' Lund and The Elbow protraction areas in the Eastern Gulf of Mexico. On March 19th, Fugro Multi-Client Services agreed to in principle to provide a research license for these 3D seismic data in the Lund and The Elbow protraction areas, offshore Florida, for this consulting project.

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
- Agreement in principle for the use of approximately 12900 sq km of 3D seismic data in the Lund and The Elbow protraction areas, offshore Florida.(Exhibit 1).

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 extention 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.

Communications continued with Western Geco (Schlumberger) in order to secure data that were supplied for DOE Chevron Gulf of Mexico Gas Hydrate Leg II project for this research project

A meeting was held at the Mexican Petroleum Institute (IMP) in Mexico City in January, 2015 about potential research collaboration under this contract. IMP had interest in collaboration, but they concluded that the rapid changes of the state owned oil and gas interests as a consequence of Energy Reform legislation and implementation would make it difficult to secure data suitable the research project.

Post divestment sales agreements with CGG and others had hindered our ability to review all Fugro owned seismic data. On March 19th, an agreement in principle was reached for the provision of a limited research license for approximately 12,900 sq km of 3D seismic data in the United States' Lund and The Elbow protraction areas in the Eastern Gulf of Mexico. Execution of the research license and delivery of data are expected to be completed in April of 2015.

Future work in next reporting period

- Finalize research license for the use of the Eastern Gulf of Mexico 3D seismic dataset for this project
- Load and evaluate the Eastern Gulf of Mexico 3D seismic dataset.
- Scan the 3D seismic dataset for potential gas hydrate deposits
- Begin gas hydrate reservoir modeling research with the data

Changes or Problems

We hope to find potential gas hydrate deposits within the 12,900 sq km of 3D seismic data in the Eastern Gulf of Mexico that we expect to receive in April, 2015 so that we can proceed with rock physics based reservoir characterization of gas hydrate deposits using 3D seismic data. If potential gas hydrate deposits are identified then there should be no problems to complete the research as envisioned. It would have, however, been far preferable to have received permission to use the 3D data that had been licensed to the Gulf of Mexico Gas Hydrate JIP Leg II project.

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.

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	Guanzhou, China January- March 2015	Mexico City, Mexico January 2015	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.
$84,955 has been spent from a budget allocation of $213,444 to date. The federal share of the costs to date is $67,964 and the cost sharing is $16,991. The federal share of the costs per this reporting period is $6,952 and the cost sharing is $1,738.

1. Survey Name: Florida 3D, 516 blocks; as shown on the map.
Consisting of
1. PSTM and PSDM full stack data
2. Acquisition report
3. Processing report for PSTM and PSDM

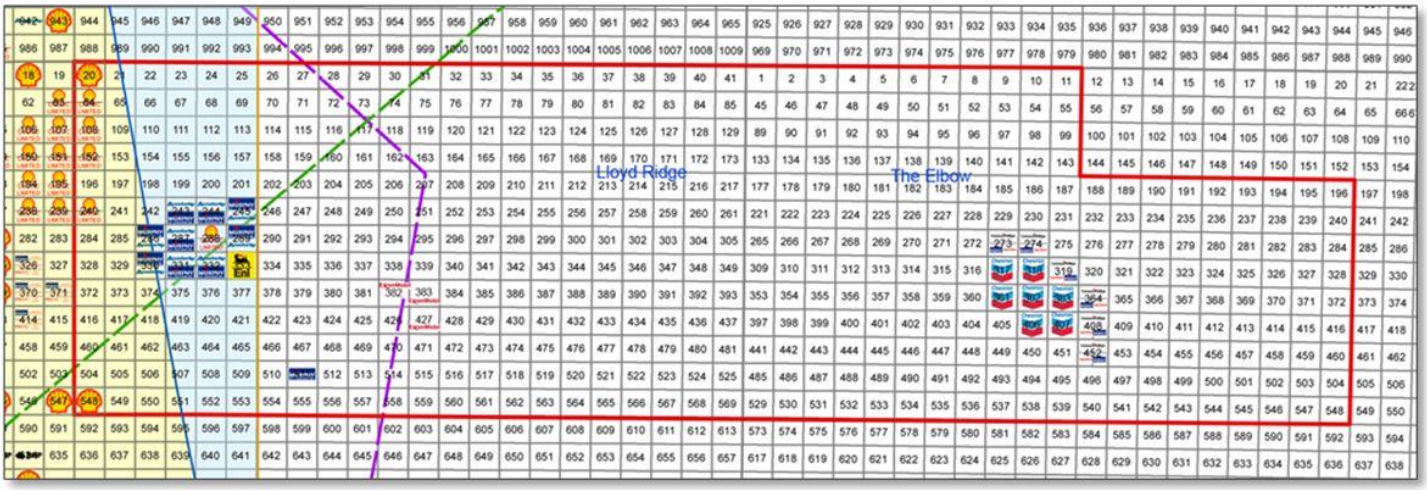

Exhibit 1. Extents of 3D Seismic Data Expected to be Made Available to the Research Project

Exhibit 2 Milestone Status

Milestone 1, Task 1 was completed November 14, 2012
Milestone 2 is on hold until suitable data are available.

Exhibit 3 Cost Plan

Baseline Reporting Quarter	Budget Period 1											
	Q1 2012		Q2 2013		Q3 2013		Q4 2013		Q1 2013		Q2 2014	
	Sept- Dec 2012		Jan-Mar 2013		April-June 2013		June-Sept 2013		Sept-Dec 2013		Jan-Mar 2014	
	Q1	Cumulative Total	Q2	Cumulative Total	Q3	Cumulative Total	Q4	Cumulative Total	Q1	Comulative Total	Q2	Comulative 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

Baseline Reporting Quarter	Budget Period 1				Budget Period 2							
	Q3 2014		Q4 2014		Q1 2014		Q2 2015		Q3 2015		Q4 2015	
	April - June 2014		June-Sept 2014		Sept-Dec 2014		Jan-Mar 2015		April-June 2015		July-Sept 2015	
	Q3	Comulative Total	Q4	Comulative Total	Q1	Cumulative Total	Q2	Cumulative Total	Q3	Comulative Total	Q4	Comulative 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	6952	67964		67964		67964
Non-Federal Share	1376	14445	0	14445	808	15253	1738	16991		16991		16991
Total Incurred Costs	6880	72224	0	72224	4041	76265	8690	84955		84955		84955
Variance												
Federal Share	0	0	0	0	(8767)	(8767)	(26706)	(35473)	(33658)	(69131)	(33659)	(102791)
Non-Federal Share	0	(0)	0	(0)	(2192)	(2192)	(6677)	(8869)	(8415)	(17284)	(8415)	(25698)
Total Variance	0	0	0	0	(10959)	(10959)	(33383)	(44342)	(42073)	(86415)	(42074)	(128489)

National Energy Technology Laboratory

626 Cochrans Mill Road
P.O. Box 10940
Pittsburgh, PA 15236-0940

3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880

13131 Dairy Ashford Road, Suite 225
Sugar Land, TX 77478

1450 Queen Avenue SW
Albany, OR 97321-2198

Arctic Energy Office
420 L Street, Suite 305
Anchorage, AK 99501

Visit the NETL website at:
www.netl.doe.gov

Customer Service Line:
1-800-553-7681

Customer Service Line:

1-800-553-7681