Oil & Natural Gas Technology

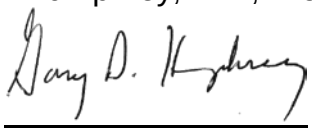
DOE Award No.: DE-FE0010175

Quarterly Research Performance Progress Report (Period ending 6/30/2014)

PLANNING OF A MARINE METHANE HYDRATE PRESSURE CORING PROGRAM FOR THE WALKER RIDGE AND GREEN CANYON AREAS OF THE GULF OF MEXICO

Project Period (10/1/2012 – 12/31/2014 (based on granted extension))

Submitted by:
Gary D. Humphrey, P.E., Project PI



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Prepared for:
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Office of Fossil Energy

DISCLAIMER

Executive Summary

This research effort will focus on developing a site characterization program for naturally occurring gas hydrate deposits. It is based on experience gained from a number of previous expeditions that Fugro has conducted for industry and for various National Hydrate Programs. We will draw upon our experience from previous work and combine the objectives and site specific aspects of the planning into a comprehensive document that summarizes the best practices and best approaches. We have solicited organizations and academia outside of Fugro for participation in a Workshop to encourage open sharing of experiences and required R&D improvements to help guarantee success in the next field expedition.

Key issues identified for future research include:

- Develop a better understanding of the structure and properties of methane hydrate reservoirs
- Develop improved methodologies to select exploration targets (Topic 3 work)
- Develop improved ability to sample and test the hydrates in their natural state
- Develop improved technology and methodologies to extract and deliver the gas from hydrates to downstream facilities.
- To take the experience and knowledge gained from previous expeditions to help others be better prepared for future expeditions.

We have proposed the following approach; 1) Desktop Study to Prepare Detailed Plans and Recommendations for all Aspects of the Proposed Offshore Campaign (proposed advances in knowledge/technology), and 2) Prepare detailed plans of execution and make budgetary estimates for a future fieldwork program to collect the pressure cores including a recommended Scope of Work.

Accomplishments

- Continued to review related scientific/industry research efforts including attendance of the Hydrate-focused Gordon Research Conference in Galveston, Texas late March 2014.
- Continued updates to the PMP according to the new tasks identified (e.g. Workshop).
- Completed the development of a project execution plan (PEP) for the planning phase through the field work execution and reporting that will assist in identifying critical discussion points and critical cooperation items.
- PEP incorporates the lessons learned from our most recent hydrate expedition in the South China Sea for GMGS, as well as previous hydrate expeditions that Fugro have been involved with.
- Conducted additional planning sessions with Geotek (Peter Schultheiss) and J.A. Aumann & Associates, (Jim Aumann) and Tim Collett, (USGS) in person and by phone.
- Attended planning meetings with Geotek and other Fugro Data Acquisition Groups.
- Conducted a Workshop that incorporated key interested parties from Fugro, Jim Aumann & Associates, Geotek, Georgia Tech University and others that was held in Houston the first week of May (end of OTC week).
- Made plans for a peer review to follow the Workshop findings and make final recommendations.
- Selected preliminary list of Peer Review candidates.

Progress, Results, and Discussion Summary of technical progress

For this quarter, minimal progress was made over this reporting period including those things listed above in the Accomplishments Section. Our main accomplishment was to conduct the Workshop and start assimilating those notes and suggestion into a meaningful report that will be subject to peer review at a later date.

We have advanced the plan for testing of the improvements to the tool based on issues identified during the GMGS program as well as the tests on a similar tool developed directly for DOE that were conducted in Catoosa, OK at the drilling research center facility.

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Review previous research projects

Research programs have been undertaken in numerous countries to investigate the occurrences and characteristics of natural methane hydrates. The ultimate objective in most cases is a long-term goal to exploit methane hydrate reservoirs as a source of alternative energy in the future. The complexities of finding and economically exploiting these reserves demand substantial investment in research efforts devoted to understanding the science and developing technologies that may ultimately prove successful in achieving the long-term objective.

Much of the research effort has focused on offshore drilling campaigns whose goals included direct sampling and testing of methane hydrates. Several such campaigns have been undertaken in the United States, including the Ocean Drilling Program (ODP) Leg 164 (South Carolina, 1995), ODP Leg 204 (Oregon, 2002), the Integrated Ocean Drilling Program (IODP) Expedition 311 (Cascadia Margin, Canadian northwest, 2005), the Joint Industry Project (JIP) Leg I (Gulf of Mexico, 2005) and most recently the JIP Leg II campaign in the Gulf of Mexico that was completed in 2009.

The JIP Leg II campaign was specifically conceived to investigate the nature of hydrate occurrences in sand-dominated systems, (Petroleum Systems Approach) principally by means of Logging While Drilling (LWD) operations. The campaign confirmed the presence of gas hydrate reservoirs at two boreholes and two boreholes in Walker Ridge Block 313 (WR313) of the Gulf of Mexico. The locations for the four wells had been selected utilizing prospectivity analysis based primarily using a petroleum systems approach for gas hydrate using 3D exploration seismic data and derivative analyses that produced predicted gas hydrate saturation volumes. The success of the four wells was a significant achievement and legitimized the conceptual approach taken to prospecting for potential producible methane hydrate reservoirs in deep water that could be exploited with modifications to present-day technology. .

One of the objectives of the JIP Leg II campaign was to prioritize the best sites for subsequent geotechnical pressure coring and conventional coring during a proposed JIP Leg III campaign which was tentatively planned to occur as early as 2010. To date the JIP Leg III campaign has not materialized, however the research merit for a campaign of this nature has not changed.

Additionally, numerous other offshore expeditions to characterize hydrate occurrences including: DGH India 2006, Shell Gumusut (Malaysia 2006), China (GMGS 2007), South Korea (KNOC 2007) and South Korea (KNOC 2010) will be used to influence our recommendations in this project. As of now, we have completed a second expedition to investigate hydrate reservoir potential in the South China Sea for GMGS (China 2013) involving LWD, in situ testing, coring and pressurized coring and analysis. Our intention is to use all the experience gained from our involvement in these programs and incorporate it into our comprehensive plan for the next pressure coring expedition in the Gulf of Mexico that will be based on data and information from the 2009 JIP, subsequent high-resolution seismic surveys and potentially some new sites (like Mad Dog) in Green Canyon Area.

An excellent summary of all these expeditions (in addition to the Arctic Expeditions) is provided in the report released at the DOE/NETL/COL Methane Hydrates Workshop in Washington D.C, early June 2013.

We continue to review the most recent marine hydrate expedition, GMGS China and to apply that experience and its teaching issues to this project.

Identify technical research concepts

The various research topics include:

- Development of safe drilling procedures for riserless drilling in known hydrate formations based on previous expeditions conducted by Fugro, ODP and IODP.
- Development of core quality measures for rotary pressure coring systems.
- Development of pressure core handling procedures and protocols to ensure best quality results.

Future work in next reporting period

- We will finalize and report on the updated PMP.
- We will conduct a Peer Review of Project Workshop and liaise with our key collaborators.
- We will continue our work on the pressure core acquisition and quality issues based on the PMP and analysis of the recently completed work in the South China Sea for GMGS.
- We will continue our work on the pressure core analysis handling, timing and quality issues
- We will continue to work on safe drilling practices for hydrate bearing sediments using open-hole techniques.
- We will report the findings and recommendations from the Project Workshop.

Key References

Collett, T.S, et. al., USDOE/NETL Report Prepared by Consortium for Ocean Leadership, Project No. DE-FE0010195, Development of a Scientific Plan for a Hydrate-Focused Marine Drilling, Logging and Coring Program – **Historical Methane Hydrate Project Review**, June 2013

Campbell, K.J., Humphrey, G.D. and Little, R.L., "Modern Deepwater Site Investigation: Getting It Right the First Time" for the 2008 **Offshore Technology Conference** 06-May-08 in Houston, Texas. Paper No. 19535.

Humphrey, G.D., Schultheiss, P.J., Holland, M., "Borehole Pressure Coring and Laboratory Pressure Core Analysis for Gas Hydrate Investigations" for the 2008 **Offshore Technology Conference** held May 2008 in Houston, Texas. Paper No. 19601.

Scientific Drilling Magazine, "Wireline Coring and Analysis Under Pressure: Recent Use and Future Developments of the HYACINTH System", Article by Peter Schultheiss, Melanie Holland and Gary Humphrey, published in March 2009.

P.J. Schultheiss, Geotek Ltd.; J.T. Aumann, Aumann & Associates, Inc.; and G.D. Humphrey, Fugro GeoConsulting, Inc., " Pressure Coring and Pressure Core Analysis for the Upcoming Gulf of Mexico Joint Industry Project Coring Expedition " for the 2010 **Offshore Technology Conference** held May 2010 in Houston, Texas. Paper No. 20827.

E. Tervoort, J. Peuchen & G. Humphrey, Gas Hydrate Quantification By Combining Pressure Coring And In-Situ Pore Water Sampling Tools**, Proceedings of the 7th International Conference on Gas Hydrates (ICGH 2011)**, Edinburgh, Scotland, United Kingdom, July 17-21, 2011.

Changes or Problems

We recognized the need to incorporate additional collaborators outside of those listed in our original proposal back in 2012. The primary reason for this was a realization that additional expertise and experience outside of Fugro would prove to benefit the effectiveness of the study. The shift in the timeline has been communicated to the NETL project manager.

There are no significant changes or problems with the direction of the project as originally proposed. We do appreciate the granting of a “No-Cost Extension” for the project of nine (9) months which extended the completion date until end of December 2014. We believe that all the project objectives can be accomplished within this timeframe.

Participants and Other Collaborating Organizations

	Gary D. Humphrey, Principal Investigator / Project Director, Fugro Employee Houston, Texas	Jim Aumann Salt Lake City, Utah	Dr. Peter Schultheiss, Technical Advisor, Geotek, Ltd. Employee United Kingdom
Nearest month worked	1	0	0
Collaboration outside USA	Discussion with offices in UK and The	Worked with Fugro entities in UK and	Discussion with offices in USA and The

	Netherlands	Holland to review performance on GMGS to establish baseline PEP	Netherlands
Travel outside USA	None this reporting period	None this reporting period	None this reporting period

Other Collaborating Organizations:

Oklahoma State University and Fugro GeoConsulting have agreed to share progress and results from their respective DOE research projects (DE-FE0009904 and Fugro project DE-FE0010160).

Fugro, Jim Aumann & Associates and Geotek all collaborated on the GMGS China Gas Hydrate field expedition for LWD, coring and pressure coring and in situ testing at several locations in the South China Sea. This work was completed on 08 September 2013.

Impact

The research findings from this project may potentially contribute to the US gas hydrate resource assessment but also international science and governmental organizations that are measuring gas hydrate exploration potential in Japan, Korea, China, India, Colombia, Brazil and New Zealand.

Additionally the findings from this project can also have the potential to aid imaging of sequestered C02 gas hydrate for greenhouse gas reduction if that technology advances.

Special Reporting Requirements

None identified this quarter and we appreciate the granting of the no-cost extension. We do, however, see slower progress than expected due to a number of unspecified reasons. We expect to have an interim reporting requirement based on the findings and recommendations post Workshop. However, these will be covered in the next quarterly report. Subsequent to that, we expect yet another interim reporting requirement that will come from the Peer Review findings and recommendations so they are incorporated into the final report deliverable.

Budgetary Information

A cumulative total of $91,838 has been spent of an allocation of $578,850. The federal share of the costs incurred to date is $73,470 and the cost sharing is $18,368. We do count several meeting, contacts, and other efforts as being consistent with advancing the research project but these are not reflected in the budget spend to date.

Exhibit I - Milestone Status

- Milestone 1, Task 1 was completed November 14, 2012.
- Milestone 2 has been completed prior to December 2013.
- Completion Milestone will be adjusted to 31 December 2014 based on the DOE approval of our no-cost extension, approved in Q1 2014.
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We will continue to check the milestone status versus what has been updated in the PMP.

Exhibit 2 - Cost Plan (see next page)

Baseline Reporting Quarter	Budget Period 1													
	Q4 2012		Q1 2013		Q2 2013		Q3 2013		Q4 2013		Q1 2014		Q2 2014	
	Q1	Comulative Total	Q2	Comulative Total	Q3	Comulative Total	Q4	Comulative Total	Q5	Comulative Total	Q6	Comulative Total	Q7	Comulative Total
Baseline Cost Plan														
Federal Share	115770	115770	115770	231540	115770	347310	118080	465390	0	465390	0	465390	0	465390
Non-Federal Share	28942.5	28942.5	28942.5	57885	28942.5	86827.5	29520	116347.5	0	116347.5	0	116347.5	0	116347.5
Total Planned	144712.5	144712.5	144712.5	289425	144712.5	434137.5	147600	581737.5	0	581737.5	0	578850	0	578850
Actual Income Cost														
Federal Share	2456	2456	3715	6171	6064	12235	7380	19615	44979	64594	8876	73470	12977	86447
Non-Federal Share	614	614	929	1543	1516	3059	1845	4904	11245	16149	2219	18368	3244	21612
Total Incurred Costs	3070	3070	4644	7714	7580	15294	9225	24519	56224	80743	11095	91838	16221	108059
Variance														
Federal Share	(113314)	(113314)	(112055)	(225369)	(109706)	(335075)	(110700)	(445775)	44979	(400796)	8876	(391920)	12977	(378943)
Non-Federal Share	(28329)	(28329)	(28014)	(56342)	(27427)	(83769)	(27675)	(111444)	11245	(100199)	2219	(97980)	3244	(94736)
Total Variance	(141643)	(141643)	(140069)	(281711)	(137133)	(418844)	(138375)	(557219)	56224	(500995)	11095	(487012)	16221	(470791)

Exhibit 3 - Example Project Execution Plan Outline

Prepared for: DOE and Gas Hydrates Consortium
in Deep Water Gulf of Mexico

Client Reference No: TBD

Rev	**Description**	**Prepared**	**Checked**	**Approved**	**Date**

OPCO Address: TBD

1. INTRODUCTION

1.1 General Project Description

The project will be comprised of planning study to successfully and efficiently investigate the presence of Gas Hydrates at a currently unspecified number of locations in the Deep Water Gulf of Mexico. This will be accomplished by taking the past experience from a number of collaborators to establish the current state of practice and develop a plan to bring the technology and methods forward through research and development efforts. Below we have provided an outline for the operational (fieldwork) phase of the work that we plan to incorporate into our final report for this study. The details of the actual client/consortium that funds the project would be completed once authorized with a final scope of work.

1.2 Purpose of the PEP

The Project Execution Plan (PEP) is the operational document for the project and provides a statement of how and when objectives are to be achieved. It also details the management stages and control points for the project.

1.3 Use and Owner of the PEP

The owner of the PEP is the Project Manager who has the responsibility to ensure that project is executed in the manner described and that the PEP is kept up to date with changes to the project as they develop. The PEP is the 'road map' for the Project team. It enables the effective day-to-day management and control of the project.

The Project Execution Plan	Provides guidance to involved personnel for management of the scope, performance and safety of the services.
	Identifies Client-Contractor/Consultant interfacing to suit the Quality Management Process Model of ISO 9001-2008, particularly: Client Requirements > Input > Service Product Realisation > Output > Client Satisfaction;
	Acts as a bridging document between Contractor/Consultant and the Client's Management System.
The Fugro Project Manager	Is the owner of the Project Execution Plan.
	Is **Name with contact details Email namename@fugro.com; Tel; +1-713-369-5600**
	Is responsible for document issue and revisions.
The user of the Project Execution Plan	Must perform a management of change procedure when deviation from the plan is required.
	Must implement and execute any adjusted requirements.
	Must inform the Project Manager about receipt of the document.

1.4 Updating the Project Execution Plan

This plan will be updated when appropriate during the project life cycle. ny updates to the PEP will be issued via the Project Manager to the project ftp site and to the holders of controlled copies. Minor updates may be transmitted by e mail in the form of an additional appendix to the relevant volume or part.

1.5 Intended Audience

The intended audience of this document includes representatives of the Client and members of the Project Team from the Contractor/Consultant. Controlled copies of the document are held on the project ftp site (ftp:\\????:…..) and with the following, a list of Project Team members, Clients and other stakeholders who shall hold a controlled copy of the PEP.

Insert a table of names and contact details of who need to have a controlled copy

Company	Name	Position	Email address

1.6 Purposely Left Blank

1.7 Document Structure

Volume 1: **PROJECT EXECUTION PLAN (PEP) INTRODUCTION**

Volume 2: **DETAILED PEP**

PART A: OPERATIONAL PLAN

PART B: QUALITY PLAN

PART C: HSE PLAN

PART D: CLIENT / CONTRACTOR HSE INTERFACE DOCUMENT

PART E: EMERGENCY RESPONSE PLAN

A summary of these documents is shown below and is presented at the front of all of the PEP sections to allow for quick and easy understanding of the documents structure and purpose. A detailed summary of the contents of each of the PEP sections is included as Appendix A.

Volume 1: **PROJECT EXECUTION PLAN**
The level 1 Project Execution Plan (PEP) document gives an introduction to the user of the purpose of the PEP and explains the structure of the document including where to find certain types of information. **The complete PEP is the bridging (Interface) document that provides overall project governance to and control of Part A to Part D, detailed below.**
Volume 2, PART A: OPERATIONAL PLAN
The Operational Plan communicates project specific details to the project team for execution of the project according to the Clients and Contractor/Consultant's contractually agreed objectives. This includes the scope of work for each Work Package, references to the appropriate documents applicable to the execution of the project including management systems, method statements and standard operating procedures, organisation

diagrams, communication protocol and provides details of the equipment (assets) technical specification references, site specific information is detailed to a level of detail that is expected to be appropriate for the purpose of efficient operational planning and execution.
Volume 2, PART B : QUALITY PLAN
The Quality Plan references and explains how Contractor/Consultant's quality management systems shall be applied maintain quality control of the project and will be used as a basis for monitoring and assessing compliance with the project specific and Contractor/Consultant's quality requirements for the type of project and equipment described in Volume 2, Part A – Operational Plan.
Volume 2, PART C: HSE PLAN
The Health, Safety and Environment Plan provides a clear statement of the methods and procedures Fugro will use to conduct the services in a safe and responsible manner. It details the responsibilities, reporting systems and procedures to be used by Contractor/Consultant's throughout the project.
Volume 2, PART D: CLIENT / CONTRACTOR HSE INTERFACE DOCUMENT
The Client Interface Document is an interface management plan (bridging document) that identifies the particular requirements, amplifications and amendments against Contractor/Consultant's HSE Plan that are required to conform to the Client's HSE management procedures.
Volume 2, PART E: EMERGENCY RESPONSE PLAN
The Emergency Response Plan provides project specific information, guidance and procedures for dealing with emergency events. It details response procedures and sequences; together with details of the person(s) responsible for coordinating efforts on behalf of Contractor/Consultant should they occur.

2. PROJECT MANAGEMENT APPROACH

2.1 Project Governance

Responsible Company's standard approach to managing projects is to separate the project into logically defined Work Packages, each managed by their own Work Package Manager who reports to the Project Manager. The Project Manager and the Work Package Managers plan and execute the project and services using the following hierarchy of documentation. This hierarchy will be referenced throughout Volume 2, Parts A through E as well as within this document.

Level 1	Client / Contract Requirements, Policies and Procedures

Level 2	Corporate Policies and Procedures
Level 3	OpCo Policies and Procedures
Level 4	Project Specific Policies and Procedures

Wherever possible, existing policies, procedures and guidance will be followed. These are typically Volume 2 and 3 documents with Level 3 documents prepared for specific technical, operational or HSE activities by the operating company most suited and experienced to produce them. Level 3 documents are developed with due recognition of the mandatory requirements of Volume 2 policy and procedure. Level 4 documents are those created specifically for this project.

2.2 Project Management Procedure

The following documents will be used by the Project Manager at appropriate times during the project.

Level 1	Contract
	Call-off Order
	Client's specific requirements and documents.
Level 2	Project Management Handbook (v4.0)
Level 3	Opco Integrated Management System
	e.g. Technical proposal No. ??
	e.g. Commercial proposal No. ??
Level 4	Relevant OpCo Management Systems and Policies

2.3 Project Life Cycle Management

Responsible contracting party is responsible for the delivery of the project from initiation, through implementation, to close out and subsequent handover. The Project Manager will oversee the planning, execution and delivery of the services and will act as the sole primary point of contact with the Client (unless agreed specifically for particular technical items, in which case the PM will remain cc'd on all correspondence).

The Project Manager will follow the process and procedures of a Project Management Handbook. This will be the Project Manager's primary reference tool and has been developed such that it dovetails with the management processes derived from PRINCE2 and APM (Association for Project Management) methodologies. Its basis is the effective management of the Fugro Project Life Cycle, see Figure 2.1. The Life

Cycle defines the sequence of Phases through which the project will pass from conception to completion and whilst providing a logical structure, it also provides flexibility for the Project Manager to tailor processes and procedures to align with the Client's requirements and systems.

Figure 2.1: The Project Life Cycle (ref. Project Management Handbook)

2.4 Risk Strategy and Risk Management

From the inception of the project it is vitally important that a sound and effective risk management philosophy and process is followed to ensure successful project completion. Appropriate project risk management enhances visibility into the project activities, strengthens decision making and facilitates the achievement of the project objectives. Risk management is already an integral part of the management of the project in the Pre-project Phase and will continue to occupy a central position throughout the project lifecycle. As the project progresses, the nature of the risks and the context and environment in which they will have to be managed, will change, and therefore the risk management process will be reviewed and adapted on a regular basis.

APPENDIX A – PEP DETAILED CONTENTS LIST VOLUME 2

PART A **Operational Plan**	PART B **Quality Assurance Plan**	PART C **HSE Plan**	PART D **Interface QHSSE**	PART E **Emergency Response Plan**
1. Objectives and Project KPIs	1. Quality Management System	1. Introduction and Interface Statement	1. Introduction	1. Emergency Response Responsibility
2. Project Organization and Management (including definition of Work Packages covering fieldwork, lab and office work)	2. Management Responsibility	2. HSE Policies and Procedures	2. Project Overview	2. Emergency Communication Organigram
3. Work Scope	3. Project Quality Controls (Including Inspection and Test plans)	3. Project Safety Organization and Responsibilities	3. Responsibilities	3. Roles and Responsibilities
4. Project Assets	4. Control of Outsourced Service	4. Communications	4. Communications	4. Medevac
5. Simops and Mopo	5. Measurement Analysis and Improvement	5. Emergency	5. Emergency Response	5. Emergency and Operational Contacts
6. Project Site Information	6. Appendices	6. Experience and Training	6. Accident, Incident, and Spill Reporting	6. Client Emergency and Operational Contacts
7. Appendices	Appendix A – Project specific Quality Requirements	7. Working with Suppliers, Subcontractors and Others	7. Monitoring, Reviewing, and Audits	7. Third Party Organization and Contacts
Appendix A – Communications Plan	Appendix B – Quality Policy and Accreditation Certificates	8. Hazard Management	Appendix A – HSE in Interface Matrix/Bridging Document	8. Emergency Notification Flowchart
Appendix B – Level 1 References - Client / Contract Requirements, Policies and Procedures	Appendix C – Equipment Certification / Capability Documentation	9. Environmental Management		
Appendix C – Volume 2 References - Fugro Corporate Policies and Procedures	Appendix D – Project Internal Audit Schedule	10. Project Health		
Appendix D – Level 3 References - Fugro OpCo Policies and Procedures	Appendix E – Client Feedback Form	11. Reporting and Investigation Procedures		
Appendix E – Level 4 Reference Documents - Fugro Project Specific		12. Safety Equipment		

Policies and Procedures				
Appendix F – Roles and Responsibilities		13. HSE Monitoring, Audit and Review		
Appendix G – Client Project specific instructions		Appendix A – HSE Commitments		
Appendix H – Management of change form (MOC), Variation Order Template, Client Concession Template, Acceptance / Completion Certificate Template etc		Appendix B – TRA Register		
Appendix I – Staff Competency Records		Appendix C – Training Matrix		
		Appendix D – Project Hazid		

Exhibit 4 – Actual Project Planning Workshop Participants

In order to capture the experience and knowledge from several hydrate expeditions previously conducted, we propose that a Workshop was conducted at the beginning of May 2014 to pull all of this experience together and establish a "Best Practices" outline or pathway to success. We have identified the following personnel that were included in the Workshop:

Professional's Name	Affiliation	Comments
Brian Ferri	Fugro	35 years+ drilling experience
Steve Brittain	Fugro	30 years+ experience with tool development and implementation on DW projects
Jeff Scott	Fugro	10 years+ drilling and vessel design experience
Jens Breinbjerg	Fugro	10 years+ project management experience on hydrate and DW projects
Michael Benting	Fugro	10 years+ project management and hydrate experience on DW projects
Pedro Regino	Fugro	15+ years of project management and 10+ years of hydrate experience on DW projects
Frank Gozeling	Fugro Holland	Senior Project manager with 30 years+ experience in offshore geotechnical operations and 10 years+ on hydrate project experience
Floris Tuynder	Fugro Holland	Equipment Designer and special consultant for Pressure Coring Systems since 2002.
Dan McConnell	Fugro	Geoscientist with 25 years+ experience also involved in JIP II and responsible for prospecting efforts to find massive sand deposits with hydrates indicated based on LWD work.
Luke Hamilton	Fugro UK	Drilling Manager for Fugro Seacore and offshore driller on two previous hydrate expeditions. 10+ years of offshore drilling experience.

Potential Peer Review Candidates for our Workshop:

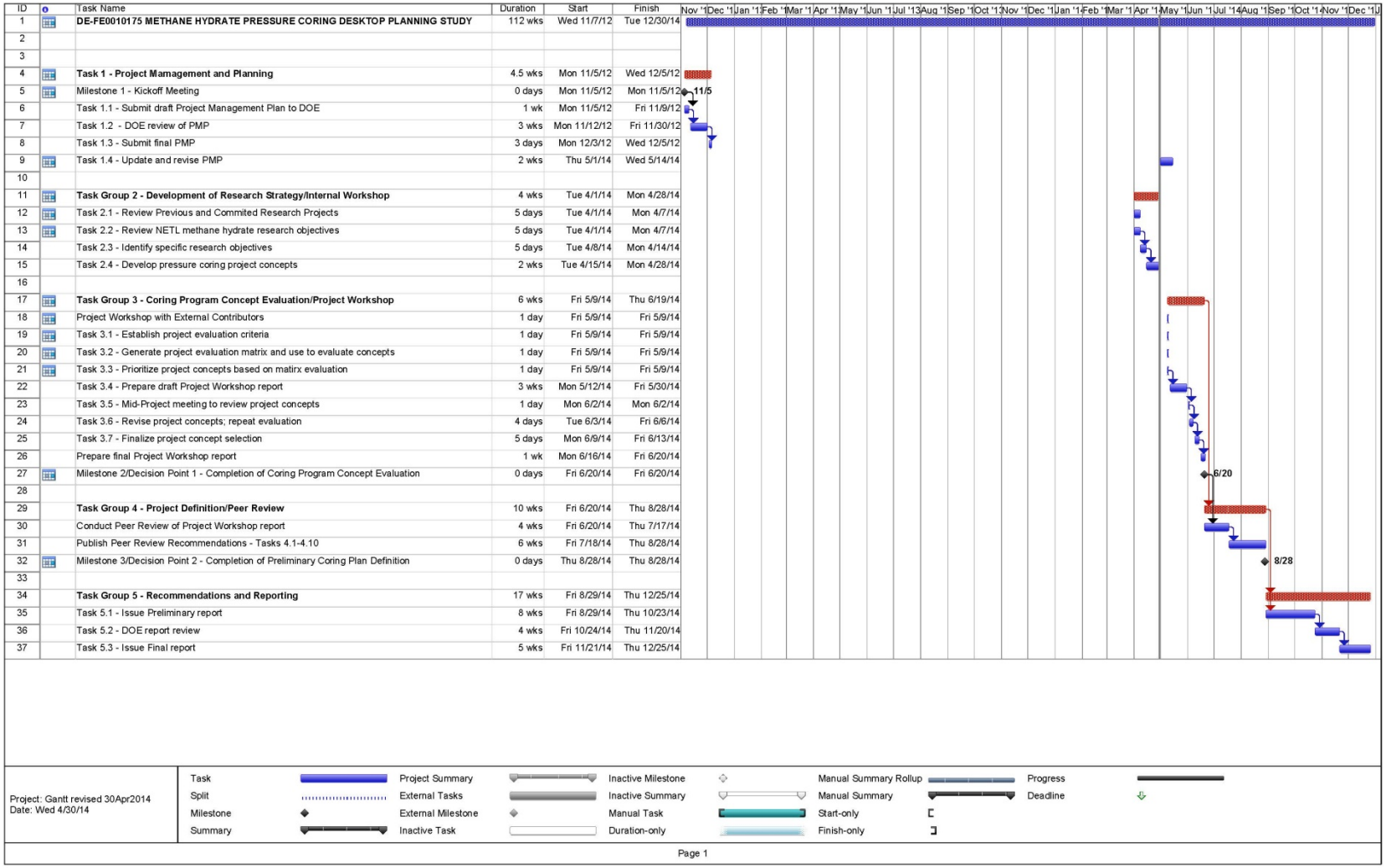
Professional's Name	Affiliation	Comments
Tim Collett	USGS	World-wide expert on hydrates
Ray Boswell	US DOE / NETL	World-wide expert on hydrates
Richard Baker	US DOE / NETL	World-wide expert on hydrates
Michael Riedel	Canadian Geologic Survey	World-wide expert on hydrates
Brian Anderson	Univ. West Virginia	Expert Modeler for hydrates
Brad Clements	IODP	possibly Michael Storms
Koji Yamamoto	JOGMEC	Koji Yamamoto or others
Beong-jae Ryu	KIGAM	World-wide expert on hydrates
Scott Dallimore	Geologic Survey of Canada	World-wide expert on hydrates
Pushpendra Kumar	ONGC/DGH	World-wide expert on hydrates
Craig Shipp	Shell	Industry expert on hydrates

Exhibit 5 – Milestones Table

Milestone Title / Description	Planned Completion Date	Actual / Anticipated Completion Date	Verification Method	Comments (progress toward achieving milestone, explanation of deviation form Plan, etc)
Kickoff Meeting	11/5/12	11/5/12	Fugro participation in kickoff meeting and provision of Kickoff meeting presentation to DOE	Complete. Kickoff meeting held via web-ex on 11/5/12
Complete Coring Program Concept Evaluation	1/25/13	6/20/14	Provision of a mid-project report (task 3.4) to DOE documenting the coring program evaluation process and the resulting recommendation for full concept development.	We anticipate that upon completion of the Project Workshop this Milestone 2 will be completed including the vetting process
Complete Preliminary Coring Plan Definition	5/24/13	8/28/14	Provision of a preliminary version of the final report (task 5.1), to DOE, fully documenting the efforts and results of project efforts to define operational and scientific plans for a future hydrate-focused marine coring program.	Allowed time after the Peer Review vetting of the Workshop results in Milestone 2 to complete this Milestone
Recommendations and Reporting	6/7/13	12/23/14	The Recipient shall, document and present to DOE, the full results of project efforts and shall make recommendation to DOE regarding most prudent options for a methane hydrate-focused pressure coring program. **Task 5.1 -** The Recipient shall prepare a preliminary version of the project final report fully documenting the efforts and results of project activity and deliver to DOE for review and consideration. **Task 5.2 -** The Recipient shall convene a meeting with DOE to review and present the results of the project as documented within the preliminary version of the project final report. **Task 5.3 -** Based on outcome of Task 5.2, The Recipient shall, if necessary, revise the content of the project Final Report	Final reviewed and vetted report to be issued.

Exhibit 6 – Gantt Chart – Schedule

See attachment on following page.



ID	Task Name	Duration	Start	Finish
1	**DE-FE0010175 METHANE HYDRATE PRESSURE CORING DESKTOP PLANNING STUDY**	112 wks	Wed 11/7/12	Tue 12/30/14
2				
3				
4	**Task 1 - Project Mamagement and Planning**	4.5 wks	Mon 11/5/12	Wed 12/5/12
5	Milestone 1 - Kickoff Meeting	0 days	Mon 11/5/12	Mon 11/5/12
6	Task 1.1 - Submit draft Project Management Plan to DOE	1 wk	Mon 11/5/12	Fri 11/9/12
7	Task 1.2 - DOE review of PMP	3 wks	Mon 11/12/12	Fri 11/30/12
8	Task 1.3 - Submit final PMP	3 days	Mon 12/3/12	Wed 12/5/12
9	Task 1.4 - Update and revise PMP	2 wks	Thu 5/1/14	Wed 5/14/14
10				
11	**Task Group 2 - Development of Research Strategy/Internal Workshop**	4 wks	Tue 4/1/14	Mon 4/28/14
12	Task 2.1 - Review Previous and Commited Research Projects	5 days	Tue 4/1/14	Mon 4/7/14
13	Task 2.2 - Review NETL methane hydrate research objectives	5 days	Tue 4/1/14	Mon 4/7/14
14	Task 2.3 - Identify specific research objectives	5 days	Tue 4/8/14	Mon 4/14/14
15	Task 2.4 - Develop pressure coring project concepts	2 wks	Tue 4/15/14	Mon 4/28/14
16				
17	**Task Group 3 - Coring Program Concept Evaluation/Project Workshop**	6 wks	Fri 5/9/14	Thu 6/19/14
18	Project Workshop with External Contributors	1 day	Fri 5/9/14	Fri 5/9/14
19	Task 3.1 - Establish project evaluation criteria	1 day	Fri 5/9/14	Fri 5/9/14
20	Task 3.2 - Generate project evaluation matrix and use to evaluate concepts	1 day	Fri 5/9/14	Fri 5/9/14
21	Task 3.3 - Prioritize project concepts based on matirx evaluation	1 day	Fri 5/9/14	Fri 5/9/14
22	Task 3.4 - Prepare draft Project Workshop report	3 wks	Mon 5/12/14	Fri 5/30/14
23	Task 3.5 - Mid-Project meeting to review project concepts	1 day	Mon 6/2/14	Mon 6/2/14
24	Task 3.6 - Revise project concepts; repeat evaluation	4 days	Tue 6/3/14	Fri 6/6/14
25	Task 3.7 - Finalize project concept selection	5 days	Mon 6/9/14	Fri 6/13/14
26	Prepare final Project Workshop report	1 wk	Mon 6/16/14	Fri 6/20/14
27	Milestone 2/Decision Point 1 - Completion of Coring Program Concept Evaluation	0 days	Fri 6/20/14	Fri 6/20/14
28				
29	**Task Group 4 - Project Definition/Peer Review**	10 wks	Fri 6/20/14	Thu 8/28/14
30	Conduct Peer Review of Project Workshop report	4 wks	Fri 6/20/14	Thu 7/17/14
31	Publish Peer Review Recommendations - Tasks 4.1-4.10	6 wks	Fri 7/18/14	Thu 8/28/14
32	Milestone 3/Decision Point 2 - Completion of Preliminary Coring Plan Definition	0 days	Thu 8/28/14	Thu 8/28/14
33				
34	**Task Group 5 - Recommendations and Reporting**	17 wks	Fri 8/29/14	Thu 12/25/14
35	Task 5.1 - Issue Preliminary report	8 wks	Fri 8/29/14	Thu 10/23/14
36	Task 5.2 - DOE report review	4 wks	Fri 10/24/14	Thu 11/20/14
37	Task 5.3 - Issue Final report	5 wks	Fri 11/21/14	Thu 12/25/14

Project: Gantt revised 30Apr2014
Date: Wed 4/30/14

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Progress	
Split	External Tasks	Inactive Summary	Manual Summary	Deadline	
Milestone	External Milestone	Manual Task	Start-only		
Summary	Inactive Task	Duration-only	Finish-only		

Exhibit 7 – Example Table of Contents (TOC) for Final Report

1. INTRODUCTION
1.1 Purpose
1.2 Scope
1.3 Data Used
1.4 Project Participants
1.5 Report Format
2. GEOLOGIC SETTING AND SEAFLOOR CONDITIONS
2.1 Regional Geologic Setting
2.2 Seafloor Conditions in the Study Areas
2.2.1 Levels of Site Assessment Achievable using the Current Dataset
2.2.2 LWD program from 2009 JIP
3. HAZARDS CONCERNS FOR THE CORING AND PRESSURE CORING OPERATIONS
3.1 Seismic Hazard
3.1.1 Seismic Hazard Evaluation in the JIP LWD sites
3.1.2 Consideration of Seismic Hazard Effects for Coring Sites
3.2 Hazards for Drilling Rigs
4. POSSIBLE HAZARDS POSED BY HYDRATES
4.1 Hydrate Dissociation Fundamentals
4.2 Hydrate Habitat and Dissociation Processes
4.3 Sediment Volume Change Caused by Dissociation
4.4 Sediment Control of Dissociation Phenomena
4.5 Sediment Strength Change During and After Dissociation and Slope Instability.
5. CONVENTIONAL OIL AND GAS SITE SURVEYS IN DEEP WATER
5.1 Site Survey Guidelines Reviewed
5.2 Summary of Survey Extents and Line Spacing
5.3 Summary of Recommended Survey Equipment Types
6. POTENTIAL HIGH RESOLUTION GEOPHYSICAL SURVEYS
6.1 Survey Areas
6.2 Potential AUV High Resolution Geophysical Survey
6.3 Potential 2-DUHR Survey
7. GEOTECHNICAL AND GEOMECHANICAL SITE SURVEYS
7.1 Introduction
7.2 Geotechnical Site Investigation
7.2.1 Seabed Wheel-Drive Piezocone Penetration Tests (PCPTs)
7.2.2 Seabed Remote Vane Shear Tests (VSTs)
7.2.3 Seabed Box Core (BC) Sampling
7.2.4 Large Diameter Piston Coring
7.2.5 Exploratory Soil Borings
7.3 Geotechnical Laboratory Testing
7.3.1 Conventional Laboratory Testing
7.3.2 Advanced Laboratory Testing
8. PRESSURE CORING AND PRESSURE CORE ANALYSIS
8.1 Introduction
8.2 Non-destructive measurements
8.3 Imaging techniques
8.4 De-gassing experiments

8.5 Triaxial Testing
8.6 Storage chambers for additional on-shore/post-cruise testing and experiments

9. METHOD STATEMENT FOR CORE ANALYSIS (NON-PRESSURIZED AND PRESSURIZED CORES

10. POST CRUISE ACTIVITIES

11. SCHEDULE, TIMING AND COST ESTIMATES

12. PERMITTING ISSUES/PROCEDURES

12. RECOMMENDATIONS AND CONCLUSIONS .....

13. REFERENCES.....

ILLUSTRATIONS FOLLOWING TEXT

TABLES

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Table 6.1: Geophysical Survey Areas.....
Table 7.1: Sampling Intervals for the Exploratory Soil Borings.....

FIGURES WITHIN TEXT

Page

Figure 1. Location Map(s). .....
Figure 2. A typical phase diagram for methane gas hydrate.....
Figure 3. Schematic diagram of the typical geotechnical site investigation package.. .....

ILLUSTRATIONS FOLLOWING TEXT

Plate

Detailed Location

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