DOE Award No.: DE-FE0023919

Quarterly Research Performance Progress Report

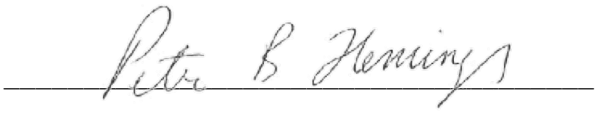
(Period Ending 03/31/24)

Deepwater Methane Hydrate Characterization & Scientific Assessment

Project Period 6: 11/15/23 - 09/30/25

Submitted by:

Peter B. Flemings



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U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

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DISCLAIMER

1 ACCOMPLISHMENTS

This report outlines the progress of the second quarter of the tenth fiscal year of the project from Jan. 1 – Mar. 31, 2024 (Budget Period 6, Year 1). Highlights from this period include:

- **UT-GOM2-2 Expedition Report**
  Throughout this performance period, the primary focus of the UT-GOM2-2 Science Team has been to advance the draft of the UT-GOM2-2 expedition report.

1.1 Major Project Goals

The primary objective of this project is to gain insight into the nature, formation, occurrence and physical properties of methane hydrate-bearing sediments for the purpose of methane hydrate resource appraisal. This was accomplished through the planning and execution of a state-of-the-art drilling, coring, logging, testing and analytical program that assess the geologic occurrence, regional context, and characteristics of marine methane hydrate deposits in the Gulf of Mexico Continental Shelf. Project Milestones are listed in Table 1-1 and Table 1-2.

Table 1-1. Previous Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
1	M1A	Project Management Plan	Mar-15	Mar-15	Project Management Plan
	M1B	Project Kick-off Meeting	Jan-15	Dec-14	Presentation
	M1C	Site Location and Ranking Report	Sep-15	Sep-15	Phase 1 Report
	M1D	Preliminary Field Program Operational Plan Report	Sep-15	Sep-15	Phase 1 Report
	M1E	Updated CPP Proposal Submitted	May-15	Oct-15	Phase 1 Report
	M1F	Demonstration of a Viable Pressure Coring Tool: Lab Test	Sep-15	Sep-15	Phase 1 Report
2	M2A	Document Results of BP1/Phase 1 Activities	Dec-15	Jan-16	Phase 1 Report
	M2B	Complete Updated CPP Proposal Submitted	Nov-15	Nov-15	QRPPR
	M2C	Scheduling of Hydrate Drilling Leg by IODP	May-16	May-17	Report directly to DOE PM
	M2D	Demonstration of a Viable Pressure Coring Tool: Land Test	Dec-15	Dec-15	PCTB Land Test Report, in QRPPR
	M2E	Demonstration of a Viable Pressure Coring Tool: Marine Test	Jan-17	May-17	QRPPR
	M2F	Update UT-GOM2-2 Operational Plan	Feb-18	Apr-18	Phase 2 Report
3	M3A	Document results of BP2 Activities	Apr-18	Apr-18	Phase 2 Report
	M3B	Update UT-GOM2-2 Operational Plan	Sep-19	Jan-19	Phase 3 Report
4	M4A	Document results of BP3 Activities	Jan-20	Apr-20	Phase 3 Report
	M4B	Demonstration of a Viable Pressure Coring Tool: Lab Test	Feb-20	Jan-20	PCTB Lab Test Report, in QRPPR
	M4C	Demonstration of a Viable Pressure Coring Tool: Land Test	Mar-20	Mar-20	PCTB Land Test Report, in QRPPR

5	M5A	Document Results of BP4 Activities	Dec-20	Mar-21	Phase 4 Report
	M5B	Complete Contracting of UT-GOM2-2 with Drilling Vessel	May-21	Feb-22	QRPPR
	M5C	Complete Project Sample and Data Distribution Plan	Jul-22	Oct-21	Report directly to DOE PM
	M5D	Complete Pre-Expedition Permitting Requirements for UT-GOM2-2	Mar-23	Jul-23	QRPPR
	M5E	Complete UT-GOM2-2 Operational Plan Report	May-21	Sep-21	QRPPR
	M5F	Complete UT-GOM2-2 Field Operations	Jul-23	Sep-23	QRPPR

Table 1-2. Current Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
6	M6A	Document Results of BP5 Activities	Mar-23	-	Phase 5 Report
	M6B	Complete Preliminary Expedition Summary	Mar-23	-	Report directly to DOE PM
	M6C	Initiate comprehensive Scientific Results Volume	Jun-24	-	Report directly to DOE PM
	M6D	Submit set of manuscripts for comprehensive Scientific Results Volume	Sep-25	-	Report directly to DOE PM

1.2 What Was Accomplishments Under These Goals

1.2.1 Previous Project Periods

Tasks accomplished in previous project periods (Phase 1, 2, 3, 4, 5) are summarized in Table 1-3, Table 1-4, Table 1-5, Table 1-6, and Table 1-7.

Table 1-3. Tasks Accomplished in Phase 1

PHASE 1/BUDGET PERIOD 1	
Task 1.0	**Project Management and Planning**
Task 2.0	**Site Analysis and Selection**
Subtask 2.1	*Site Analysis*
Subtask 2.2	*Site Ranking / Recommendation*
Task 3.0	**Develop Operational Plan for UT-GOM2-2 Scientific Drilling Program**
Task 4.0	**Complete IODP Complimentary Project Proposal**
Task 5.0	**Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 5.1	*PCTB Scientific Planning Workshop*
Subtask 5.2	*PCTB Lab Test*
Subtask 5.3	*PCTB Land Test Prep*

Table 1-4. Tasks Accomplished in Phase 2

PHASE 2/BUDGET PERIOD 2	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of Complimentary Project Proposal**
Task 7.0	**Continued Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 7.1	*Review and Complete NEPA Requirements for PCTB Land Test*
Subtask 7.2	*PCTB Land Test*
Subtask 7.3	*PCTB Land Test Report*
Subtask 7.4	*PCTB Modification*
Task 8.0	**UT-GOM2-1 Marine Field Test**
Subtask 8.1	*Review and Complete NEPA Requirements for UT-GOM2-1*
Subtask 8.2	*UT-GOM2-1 Operational Plan*
Subtask 8.3	*UT-GOM2-1 Documentation and Permitting*
Subtask 8.4	*UT-GOM2-1 Marine Field Test of Pressure Coring System*
Subtask 8.5	*UT-GOM2-1 Marine Field Test Report*
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.1	*Review and Complete NEPA Requirements for Core Storage and Manipulation*
Subtask 9.2	*Hydrate Core Transport*
Subtask 9.3	*Storage of Hydrate Pressure Cores*
Subtask 9.4	*Refrigerated Container for Storage of Hydrate Pressure Cores*

Subtask 9.5	*Hydrate Core Manipulator and Cutter Tool*
Subtask 9.6	*Hydrate Core Effective Stress Chamber*
Subtask 9.7	*Hydrate Core Depressurization Chamber*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.1	*Routine Core Analysis (UT-GOM2-1)*
Subtask 10.2	*Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.3	*Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**

Table 1-5. Tasks Accomplished in Phase 3

PHASE 3/BUDGET PERIOD 3	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of CPP Proposal**
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.8	*X-ray Computed Tomography*
Subtask 9.9	*Pre-Consolidation System*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.1	*Assemble and Contract Pressure Coring Team Leads for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.2	*Contract Project Scientists and Establish Project Science Team for UT-GOM2-2 Scientific Drilling Program*

Table 1-6. Tasks Accomplished in Phase 4

PHASE 4/BUDGET PERIOD 4	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Subtask 13.7	*X-ray Computed Tomography*
Subtask 13.8	*Pre-Consolidation System*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Subtask 14.3	*PCTB Land Test*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*

Table 1-7. Tasks Accomplished in Phase 5

PHASE 5/BUDGET PERIOD 5	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Maintenance and Storage of Hydrate Pressure Cores from UT-GOM2-1*
Subtask 13.7	*Maintain X-ray CT*
Subtask 13.8	*Maintain Preconsolidation System*
Subtask 13.9	*Transportation of Hydrate Core from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.10	*Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.11	*Hydrate Core Distribution*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.4	*PCTB Modifications/Upgrades*
Subtask 14.5	*PCTB Land Test III*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.4	*Review and Complete NEPA Requirements*
Subtask 15.5	*Finalize Operational Plan for UT-GOM2-2 Scientific Drilling Program*
Task 16.0	**UT-GOM2-2 Scientific Drilling Program Field Operations**
Subtask 16.1	*Execute UT-GOM2-2 Field Program*
Optional Subtask 16.2	*Add Conventional Coring*
Optional Subtask 16.3	*Add Spot Pressure Coring*
Optional Subtask 16.4	*Add Second Hole at H-Location*
Optional Subtask 16.5	*Add Additional Cores and Measurements*
Task 17.0	**UT-GOM2-2 Core Analysis**
Subtask 17.1	*Routine UT-GOM2-2 Core Analysis*
Optional Subtask 17.2	*UT-GOM2-2 Expanded Core Analysis*

1.2.2 Current Project Period

Current project period tasks are shown in Table 1-8.

Table 1-8. Current Project Tasks

PHASE 6/BUDGET PERIOD 6	
Task 1.0	**Project Management and Planning**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Subtask 13.7	*Maintain X-ray CT*
Subtask 13.8	*Maintain Preconsolidation System*
Subtask 13.10	*Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.11	*Hydrate Core Distribution*
Task 16.0	**UT-GOM2-2 Scientific Drilling Program Field Operations**
Subtask 16.6	*Post-Expedition Permitting*
Task 17.0	**UT-GOM2-2 Core Analysis**
Task 18.0	**Project Data Analysis and Reporting**
Subtask 18.1	*Sample and Data Distribution and Archiving*
Subtask 18.2	*Collaborative Post-Field Project Analysis of Geologic Data and Samples*
Subtask 18.3	*Scientific Results Volume and Technical Project Presentations*

1.2.2.1 Task 1.0 – Project Management & Planning

1.2.2.1.1 *Coordinate the overall scientific progress, administration and finances of the project:*

- UT monitored and controlled the project budget, scope, and schedule.
- UT initiated planning for an in-person UT-GOM2-2 post-cruise science workshop, which will tentatively be held in Texas in October, 2024.
- UT submitted a cost-growth proposal and budget justification to DOE to cover UT-GOM2-2 costs incurred in BP5. Specifically, this cost-growth proposal covered UT-GOM2-2 supply boat and drilling fluid disposal / cleaning costs that exceeded the budgeted amount. UT, through Helix, did not have a pre-negotiated contract for boat cleaning. Without a pre-negotiated contract, UT ended up in an inflated market-driven situation where neither UT or Helix could negotiate special pricing or scheduling. This resulted in long wait times, additional supply boat rental days, and high cleaning costs.

1.2.2.1.2 *Communicate with project team and sponsors:*

- UT organized UT-GOM2-2 science meetings to advance UT-GOM2-2 post-cruise science, analytical, and reporting efforts.
- UT organized sponsor and stakeholder meetings.
- UT organized task-specific working meetings, as needed, to plan and execute project tasks per the Project Management Plan and Statement of Project Objectives.
- UT managed SharePoint sites, email lists, the project website, and the UT-GOM2-2 expedition website.

1.2.2.1.3 *Coordinate and supervise service agreements:*

- UT monitored and validated subcontractor workplans and deliverables.

1.2.2.1.4 *Coordinate subcontractors:*

- UT completed amendments to fund subcontracts through BP6
- UT continued to monitor and control subaward and contractor efforts.

1.2.2.2 Task 13.0 – Maintenance & Refinement of Pressure Core Transport, Storage, & Manipulation Capability

1.2.2.2.1 *Subtask 13.1 – Hydrate Core Manipulator and Cutter Tool*

The mini-PCATS system underwent a full pressure test and continual minor leak mitigation efforts to ensure long-term stability of the system. The X-ray system underwent quarterly calibration.

1.2.2.2.2 *Subtask 13.2 – Hydrate Core Effective Stress Chamber*

We continued to focus on improving our capability to conduct uniaxial strain deformation tests, where the cylindrical samples deform exclusively along the axial direction. In the previous quarters, we identified that, under high pressure, the samples experience radial reduction. This effect was not observed in previous tests conducted at low pressure. We had identified that (1) minor leaks from the pore chamber to the external environment and (2) an underestimated compressibility of the equipment may have caused this behavior.

In this quarter, UT resolved these issues mentioned above. First, UT conducted a detailed, high pressure Nitrogen leak test of the Effective Stress Chamber and its entire plumbing assembly. Two substantial leaks were found and corrected with new fittings. Second, we conducted apparatus compressibility tests at high pressure. To assess the effectiveness of these measures, we carried out two calibration tests under high fluid pressure using well-known resedimented clay samples. Results of these tests show that we are still experiencing radial

reduction under high pressure. Based on these results, we have now identified that the resedimented samples were affected by the initial pressurization before conducting the test. Thus, we developed a high-stress resedimentation approach that strengthens the resedimented clay sample and limits the initial effects of pressurization on sample quality.

UT also installed an additional computer monitor on the Effective Stress Chamber's computer to improve operational capabilities.

1.2.2.2.3 *Subtask 13.3 – Hydrate Core Depressurization Chamber*

In the previous quarter, the manifold plumbing of the system was fully disassembled for sediment removal and cleaning. In this quarter, the manifold underwent a pressure test and flush to ensure proper function. The computer system used to track system pressures during depressurization underwent additional software and firmware updates. The system in now in standby mode for future use.

1.2.2.2.4 *Subtask 13.6 – Continued Storage of Hydrate Cores from UT-GOM2-1*

The UT Pressure Core Center continues to accommodate the four remaining pressure cores from UT-GOM2-1 as well as the 13 pressure cores collected during UT-GOM2-2.

1.2.2.2.5 *Subtask 13.7 – Maintain X-ray Computed Tomography*

The X-Ray CT continues to operate as designed.

1.2.2.2.6 *Subtask 13.8 – Maintain Pre-Consolidation System*

The system will continue to be evaluated to ensure proper pressure maintenance to generate effective stresses in pressure cores.

1.2.2.2.7 *Subtask 13.10 – Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*

The UT PCC continues to maintain hydrate-bearing pressure cores at 6°C and connected to the pressure maintenance system, which supplies one-way high-pressure water into the pressure storage chambers. The pressure cores continue to maintain stable storage pressures.

1.2.2.2.8 *Subtask 13.11 – Hydrate Core Distribution*

Future task.

1.2.2.3 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

1.2.2.3.1 *Subtask 16.6 – Post-Expedition Permitting*

No update this period.

1.2.2.4 Task 17.0 – UT-GOM2-2 Core Analysis

1.2.2.4.1 *Curation*

UT reviewed core reports, coring data, curation data, logs and images to confirm the final recovery data for each core.

1.2.2.4.2 *Lithostratigraphy*

UNH continued work on smear slide interpretation and writing this up.

1.2.2.4.3 *Biostratigraphy*

UT (Purkey-Phillips), in collaboration with UNH (Johnson) continued to refine an initial biostratigraphy-based age model. The age model was constructed from the quantitative examination of calcareous nannofossils from 68 total samples collected from both core catchers and split cores through both holes H003 and H002. A total of 6 biostratigraphic horizons were identified; and the deepest sample collected for biostratigraphic analysis, at 859.15 mbsf, is interpreted to be <0.91 Ma.

1.2.2.4.4 *Physical Properties*

1.2.2.4.4.1 In-situ Temperature

UT reworked the in-situ temperature and pressure prediction using seismic data and started comparison to the measured in-situ data from UT-GOM2-2.

1.2.2.4.4.2 Core Logs

A tremendous amount of work was put into improving Core logging figures in Strater by UT.

1.2.2.4.4.3 Index Properties

1.2.2.4.4.3.1 Laser Diffraction Particle Size Analysis

Grain size analysis from UT was reworked and presented as a poster (Van der Maal, et al., 2024) at the 2024 GeoFluids Annual Meeting.

1.2.2.4.5 *Microbiology*

Oregon State completed more DNA extractions and submitted samples for DNA sequencing.

1.2.2.4.6 *Geochemistry*

1.2.2.4.6.1 Pore Water Geochemistry

Unfortunately, the UW ion chromatograph was still down and could not be brought to working condition in order to measure SO_4, Cl, and Br pore water content and assess pore water contamination.

1.2.2.4.6.2 Gas Geochemistry

More Gas chromatography of GOM2-2 gas samples were run at Ohio State to assess isotopes of methane.

1.2.2.5 Task 18.0 – Project Data Analysis and Reporting

1.2.2.5.1 *Subtask 18.1 – Sample and Data Distribution and Archiving*

No additional sample or data requests were received. All data is available to the science team via password protected websites. When the full expedition report is published (estimated Dec 31, 2024) the data will be archived and made public.

1.2.2.5.2 *Subtask 18.2 – Collaborative Post-Field Project Analysis of Geologic Data and Samples*

The science team spent most of the quarter collaborating on drafts of UT-GOM2-2 Preliminary Summary and full Expedition Report. The Preliminary summary is the first high-level report from the expedition and is more operational in nature. The full Expedition report includes four chapters: Chapter 1 Initial Expedition Summary; Chapter 2 Methods, Chapter 3 H003, and Chapter 4 H002. Longer-term scientific results and interpretation will be reported in journal articles and data reports.

Planning started on a hydrate session at AGU Dec 2024.

1.2.2.5.3 *Subtask 18.3 – Scientific Results Volume and Technical Project Presentations*

Future task.

1.3 What Will Be Done In The Next Reporting Period To Accomplish These Goals

1.3.1 Task 1.0 – Project Management & Planning

- UT will continue to execute the project in accordance with the approved Project Management Plan (PMP) and Statement of Project Objectives (SOPO).
- UT will continue to manage and control project activities in accordance with their established processes and procedures to ensure subtasks and tasks are completed within schedule and budget constraints defined by the PMP.

1.3.2 Task 13.0 – Maintenance And Refinement Of Pressure Core Transport, Storage, & Manipulation Capability

- UT will continue to refine our experimental approach to conduct uniaxial strain tests at high fluid pressure. We will use the high-stress resedimented clay samples using the approach developed in this quarter.
- The Mini-PCATS, PMRS, analytical equipment, and storage chambers will undergo continued observation and maintenance at regularly scheduled intervals and on an as-needed basis. Installation of new or replacement parts will continue to ensure operational readiness.
- UT will continue to evaluate and pursue perfecting the uniaxial testing procedures and the upgraded Effective Stress Chamber software.
- UT will continue to test the Effective Stress Chamber computer system upgrade to ensure operational stability.
- UT will continue to evaluate and refine the temperature measurement capabilities of the Effective Stress Chamber test section.

1.3.3 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

- Post Expedition Regulatory Compliance:
    - UT will request termination of the period of liability for RUE OCS-G 30392 and cancellation of the UT Austin's lease bond from BOEM Financial Assurance Section.
    - UT will continue work on the following BSEE well record requirements:
        - Core Reports
        - Paleontological Reports
        - Geochemical Analysis Reports

1.3.4 Task 17.0 – UT-GOM2-2 Core Analysis

- UNH, USGS, and UT will continue sedimentology work on discrete samples of sediment assessing stratigraphy and incorporating information into Strater.
- Tufts will continue index property measurements and ship a select subset of samples for x-ray powder diffraction.
- UW will get a technician in to repair the ion chromatograph and possibly restart pore water analysis by first measuring chlorinity and reassessing salinity and alkalinity measurements for contamination from drilling fluids. UW will begin analysis of preserved routine and organic pore water samples for a variety components.
- Oregon St will continue DNA extractions and amplifications.
- USGS and Ohio State will continue assessing gas sample composition and log-core correlations. More degassing experiments are planned to be run and more gas samples collected over the summer.

1.3.5 Task 18.0 – Project Data Analysis and Reporting

- All will continue working on the Expedition Report, currently in 4 Chapters, to be published ~ Dec 31, 2024.
- UT will publish the preliminary expedition summary

2 PRODUCTS

Project publications webpage: https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-publications/

2.1 Publications

Bhandari, A.R., Cardona, A., Flemings, P.B., Germaine, J. T. (In Review). Geomechanical behavior of sandy silt from Green Canyon 955 hydrate reservoir - Deepwater Gulf of Mexico for gas hydrate dissociation, Marine and Petroleum Geology

Boswell, R., Collet, T.C., Cook, A.E., Flemings, P.B., 2020, Introduction to Special Issue: Gas Hydrates in Green Canyon Block 955, deep-water Gulf of Mexico: Part I: AAPG Bulletin, v. 104, no. 9, p. 1844-1846, http://dx.doi.org/10.1306/bltnintro062320.

Cardona A., Bhandari A., and Heidari M. and Flemings P.B. (2023). The viscoplastic behavior of natural hydrate bearing sediments under uniaxial strain compression (K0 loading), Journal of Geophysical Research: Solid Earth, v. 128, e2023JB026976, doi:10.1029/2023JB026976

Chen, X., and Espinoza, D. N., 2018a, Ostwald ripening changes the pore habit and spatial variability of clathrate hydrate: Fuel, v. 214, p. 614-622. https://doi.org/10.1016/j.fuel.2017.11.065

Chen, X., Verma, R., Espinoza, D. N., and Prodanović, M., 2018, Pore-Scale Determination of Gas Relative Permeability in Hydrate-Bearing Sediments Using X-Ray Computed Micro-Tomography and Lattice Boltzmann Method: Water Resources Research, v. 54, no. 1, p. 600-608. https://doi.org/10.1002/2017wr021851

Chen, X. Y., and Espinoza, D. N., 2018b, Surface area controls gas hydrate dissociation kinetics in porous media: Fuel, v. 234, p. 358-363. https://doi.org/10.1016/j.fuel.2018.07.030

Chen, X.Y., Espinoza, D. N., Tisato, N., Flemings, P. B., in press, Gas Permeability, Pore Habit and Salinity Evolution during Methane Hydrate Dissociation in Sandy Sediments: Energy & Fuels, Manuscript ID: ef-2022-017204.R2

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2.3 Proceeding of the UT-GOM2-1 Hydrate Pressure Coring Expedition

Volume contents are published on the UT-GOM2-1 Expedition website and on OSTI.gov.

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2.3.2 Prospectus

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2.4 Proceeding of the UT-GOM2-2 Hydrate Coring Expedition

Volume contents will be published on the UT-GOM2-2 Expedition Proceedings website and on OSTI.gov.

2.4.1 Prospectus

Peter Flemings, Carla Thomas, Tim Collett, Fredrick Colwell, Ann Cook, John Germaine, Melanie Holland, Jesse Houghton, Joel Johnson, Alberto Malinverno, Kevin Meazell, Tom Pettigrew, Steve Phillips, Alexey Portnov, Aaron Price, Manasij Santra, Peter Schultheiss, Evan Solomon, Kehua You, UT-GOM2-2 Prospectus: Science and Sample Distribution Plan, Austin, TX (University of Texas Institute for Geophysics, TX). http://dx.doi.org/10.2172/1827729, 141 p.

2.5 Websites

- Project Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/

- UT-GOM2-2 Expedition Website

https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-2-expedition/

- UT-GOM2-1 Expedition Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/expedition-ut-gom2-1/

- Project SharePoint:

https://sps.austin.utexas.edu/sites/GEOMech/doehd/teams/

- Methane Hydrate: Fire, Ice, and Huge Quantities of Potential Energy: https://www.youtube.com/watch?v=f1G302BBX9w
- Fueling the Future: The Search for Methane Hydrate: https://www.youtube.com/watch?v=z1dFc-fdah4
- Pressure Coring Tool Development Video: https://www.youtube.com/watch?v=DXseEbKp5Ak&t=154s

2.6 Technologies Or Techniques

Nothing to report.

2.7 Inventions, Patent Applications, and/or Licenses

Nothing to report.

3 CHANGES/PROBLEMS

3.1 Changes In Approach And Reasons For Change

None.

3.2 Actual Or Anticipated Problems Or Delays And Actions Or Plans To Resolve Them

None.

3.3 Changes That Have A Significant Impact On Expenditures

None.

3.4 Change Of Primary Performance Site Location From That Originally Proposed

None.

4 SPECIAL REPORTING REQUIREMENTS

4.1 Current Project Period

Task 1.0 – Revised Project Management Plan

Subtask 18.1 – Project Sample and Data Distribution Plan

Subtask 18.3 – UT-GOM2-2 Scientific Drilling Program Scientific Results Volume

4.2 Future Project Periods

None.

5 BUDGETARY INFORMATION

The Budget Period 5 cost summary is provided in Table 5-1.

Table 5-1. Phase 5 / Budget Period 5 Cost Profile

Baseline Reporting Quarter	Budget Period 6							
	Y1Q1		Y1Q2		Y1Q3		Y1Q4	
	11/16/23-12/31/23		01/01/24-03/31/24		04/01/24-06/30/24		07/01/24-09/30/24	
	Y1Q1	Cumulative Total	Y1Q2	Cumulative Total	Y1Q3	Cumulative Total	Y1Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 555,325	$ 71,091,055	$ 471,086	$ 71,562,141	$ 456,085	$ 72,018,226	$ 456,085	$ 72,474,312
Non-Federal Share	$ 282,554	$ 32,363,632	$ 271,503	$ 32,635,135	$ 269,534	$ 32,904,669	$ 269,535	$ 33,174,204
Total Planned	$ 837,880	$ 103,454,687	$ 742,590	$ 104,197,276	$ 725,619	$ 104,922,895	$ 725,620	$ 105,648,516
Actual Incurred Cost								
Federal Share	$ 2,871,720	$ 70,588,076	$ 391,191	$ 70,979,267		$ 70,979,267		$ 70,979,267
Non-Federal Share	$ 745,317	$ 34,398,513	$ 152,951	$ 34,551,464		$ 34,551,464		$ 34,551,464
Total Incurred Cost	$ 3,617,037	$ 104,986,589	$ 544,142	$ 105,530,731	$ -	$ 105,530,731	$ -	$ 105,530,731
Variance								
Federal Share	$ 2,316,395	$ (502,979)	$ (79,895)	$ (582,875)				
Non-Federal Share	$ 462,762	$ 2,034,882	$ (118,552)	$ 1,916,330				
Total Variance	$ 2,779,157	$ 1,531,902	$ (198,448)	$ 1,333,455				
Baseline Reporting Quarter	**Budget Period 6**							
	Y2Q1		Y2Q2		Y2Q3		Y2Q4	
	10/01/24-12/31/24		01/01/25-03/31/25		04/01/25-06/30/25		07/01/25-09/30/25	
	Y2Q1	Cumulative Total	Y2Q2	Cumulative Total	Y2Q3	Cumulative Total	Y2Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 401,106	$ 72,875,417	$ 401,106	$ 73,276,523	$ 385,250	$ 73,661,774	$ 385,250	$ 74,047,024
Non-Federal Share	$ 218,494	$ 33,392,698	$ 218,494	$ 33,611,191	$ 216,156	$ 33,827,347	$ 216,156	$ 34,043,503
Total Planned	$ 619,599	$ 106,268,115	$ 619,599	$ 106,887,715	$ 601,406	$ 107,489,121	$ 601,406	$ 108,090,527
Actual Incurred Cost								
Federal Share		$ 70,979,267		$ 70,979,267		$ 70,979,267		$ 70,979,267
Non-Federal Share		$ 34,551,464		$ 34,551,464		$ 34,551,464		$ 34,551,464
Total Incurred Cost	$ -	$ 105,530,731	$ -	$ 105,530,731	$ -	$ 105,530,731	$ -	$ 105,530,731
Variance								
Federal Share								
Non-Federal Share								
Total Variance								

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7 ACRONYMS

Table 7-1. List of Acronyms

ACRONYM	DEFINITION
AAPG	American Association of Petroleum Geologists
AGU	American Geophysical Union
AOM	Anaerobic Oxidation of Methane
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CFR	Code of Federal Regulation
CHNS	Carbon, Hydrogen, Nitrogen, Sulfur
CMT	Cement
CPP	Complimentary Project Proposal
CT	Computed Tomography
DNA	Deoxyribonucleic Acid
DOE	U.S. Department of Energy
DST	Data Storage Tag
GC	Green Canyon
GHSZ	Gas Hydrate Stability Zone
HSTB	Hydrate Stability Temperature Boundary
IODP	International Ocean Discovery Program
JIP	Joint Industry Project
LDEO	Lamont-Doherty Earth Observatory
LF	Low Frequency
LWD	Logging While Drilling
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NMR	Nuclear Magnetic Resonance
NTL	Notice to Lessees
OCS	Outer Continental Shelf
OSR	Organoclastic Sulfate Reduction
OSTI	Office of Scientific and Technical Information
OSU	The Ohio State University
PCATS	Pressure Core Analysis and Transfer System
PCC	Pressure Core Center
PCTB	Pressure Core Tool with Ball Valve
PI	Principle Investigator
PM	Project Manager
PMP	Project Management Plan
PMRS	Pressure Maintenance and Relief System
QRPPR	Quarterly Research Performance and Progress Report
RPPR	Research Performance and Progress Report

RUE	Right-of-Use and Easement
SMTZ	Sulfate-Methane Transition Zone
SOPO	Statement of Project Objectives
TN	Total Nitrogen
TOC	Total Organic Carbon
TS	Total Sulfur
UNH	University of New Hampshire
USGS	United States Geological Survey
UT	University of Texas at Austin
UW	University of Washington
WOB	Weight on Bit
WR	Walker Ridge
XCT	X-ray Computed Tomography

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