"Characterizing Natural Gas Hydrates in the Deep Water Gulf of Mexico"

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Abstract

The main reason for conducting the research described in this presentation is to collect data, generate protocols, develop knowledge and promote safety in the future development of oil and gas fields in the deep water Gulf of Mexico (GOM). To accomplish this main objective, we have developed a comprehensive research plan that is divided into two phases, with an optional third phase, if warranted.

Phase I began in 2001 and will last through the first quarter of 2003. During Phase I, we will hold workshops, collect and analyze data, develop protocols, and plan a core and well log data collection effort that will be conducted during Phase II of this project.

A data collection workshop was held on March 14-15, 2002. The goals of the workshop were to develop a clear understanding of what is known and available about naturally occurring hydrates in the GOM, determine the additional data needed to meet the goals of the Joint Industry Project (JIP), and to identify individuals and institutions actively involved in projects related to this JIP. Additional workshops are planned for May 9-10, 2002, to develop details for modeling and drilling needs. The Modeling Workshop will be used to determine what data are required by geoscientists and engineers for their models. The Drilling and Coring Workshop will be conducted concurrently with the Modeling Workshop. Areas of interest to this workshop are how to drill through naturally occurring gas hydrates, how to core these hydrates, and how to handle, transport and test these core samples.

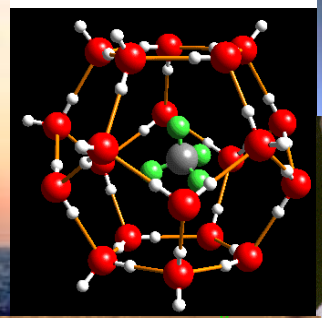
We will also encourage the development of gas hydrate sensors, develop well bore stability models, and improve seismic data acquisition and analyses of the formations near the seabed floor in deep water. We will also begin laboratory analyses of the kinetic, thermodynamic, physical and chemical properties of core samples that are saturated or partially saturated with gas hydrates. All of these measurements will improve our ability to measure the properties of gas hydrates using signals from seismic, drilling, MWD, logging and coring operations in future field tests. One important deliverable from Phase I will be a recommendation concerning the location for drilling test wells in Phase II.

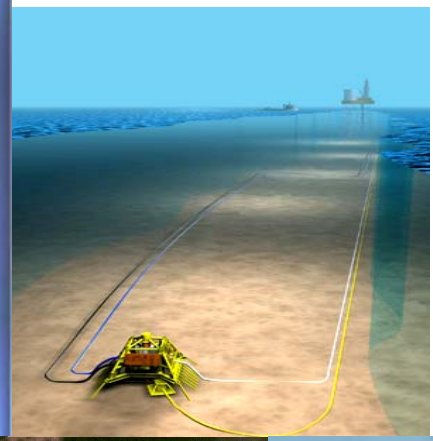
Phase II will primarily consist of drilling wells in two areas in the deep water GOM for the primary purpose of collecting drilling, MWD, logging and coring data. Phase II will occur during 2003 and 2005. We will evaluate all data in detail and integrate the data with existing data and seismic information. Two wells will be drilled in an area that

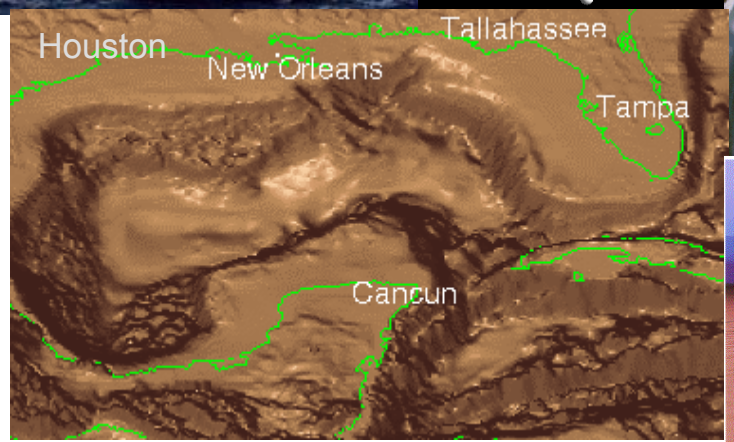
should contain a large volume of naturally occurring gas hydrates. The third well will be drilled nearby, but in an area that does not contain any gas hydrates. Ideally, the data sets from the two areas will allow us to determine the effects of gas hydrates in the pore space of the rocks upon the responses from seismic data, drilling data, MWD data, open hole logging data, core data and any test data we can acquire.

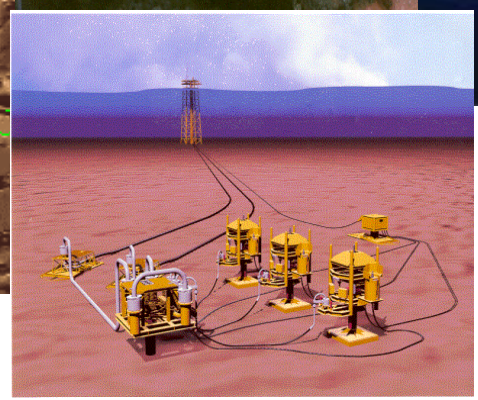
The results from Phases I and II will be evaluated. If warranted by the results, a Phase III project will be proposed. The Phase III project will begin in 2005 and will conclude in 2007. Phase III will involve drilling seven additional data collection wells in the deep water GOM.

Characterizing Natural Gas Hydrates in the Deep Water Gulf of Mexico





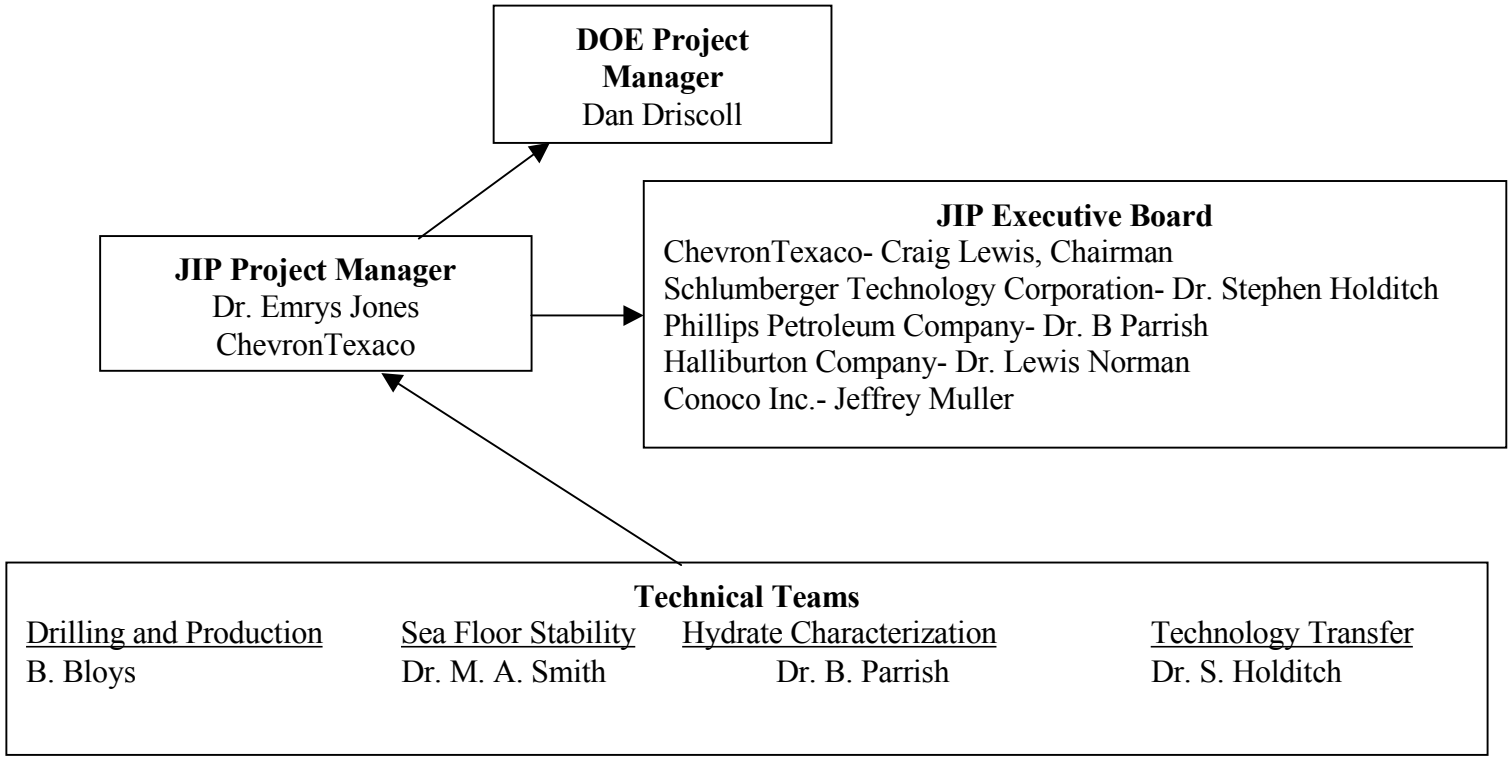




How Did We Get To Where We Are Today?

- August of 2000 the DOE and Chevron sponsored a workshop on hydrates in the GOM.
- The workshop developed the technical needs for hydrates in GOM
- JIP partners prioritized the needs on economic, technical, and business criteria. A program was then prepared addressing the areas where we thought we could add value.
- The JIP proposed a project plan to the DOE and received a cost sharing award in late September 2001.

Project Organization



Scope of Technical Work, Phase I

TASK	Phase I
TEAM	**Description**
1/H	Data Collection and Organization
2/S	Development of New Gas Hydrate Sensors
3/D	Develop Well Bore Stability Model
4/H	Seismic Modeling and Analyses
5/H	Kinetics and Thermodynamics Analyses
6/S	Determine data required for GeoModels
7/D	Develop Drilling and Coring Plans for Phases II
8/D	Core Handling and Core Tests
9/S	Review Data and Select Locations of 3 Core Collection Sites

Technical Teams H=Characterization, D=Drilling and Coring, S=Sea Floor Stability

Scope of Technical Work, Phase II

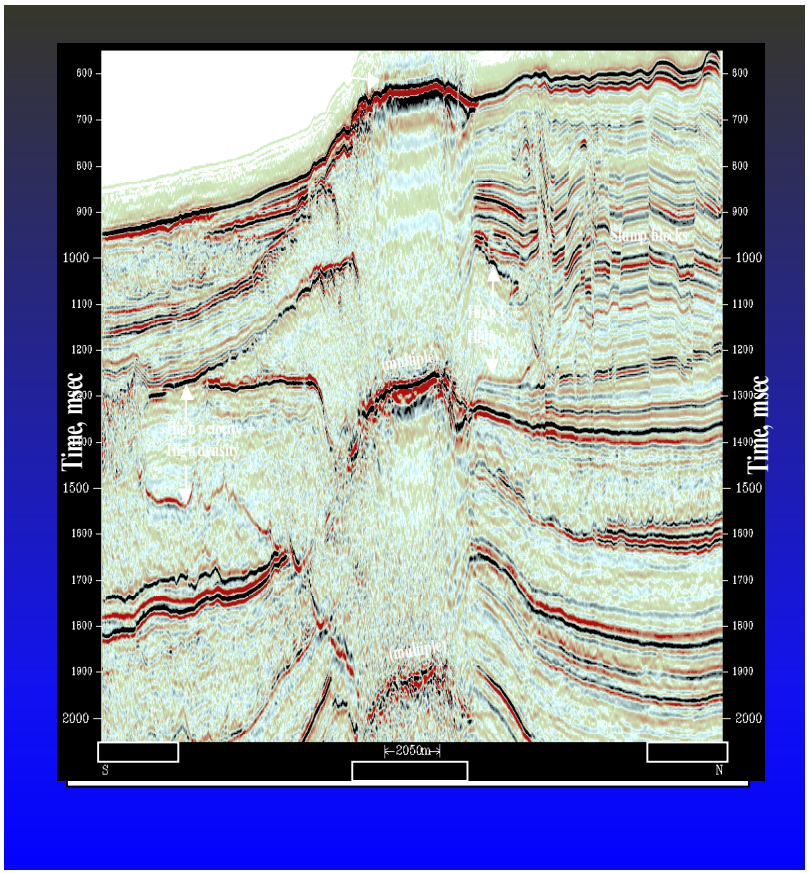
TASK	PHASE II
TEAM	Description
1/S	Validation of New Gas Hydrate Sensors
2	Validation of the Well Bore Stability Model
3/D	Drill 3 wells at 2 Sites in Area I
4/H	Analyze Data from Area I
5/H&D	Update Models, Plans and Protocols
6/H	Integrate New and Old Seismic Data in Test Areas

Technical Teams H=Characterization, D=Drilling and Coring, S=Sea Floor Stability

Where Do We Go From Here?

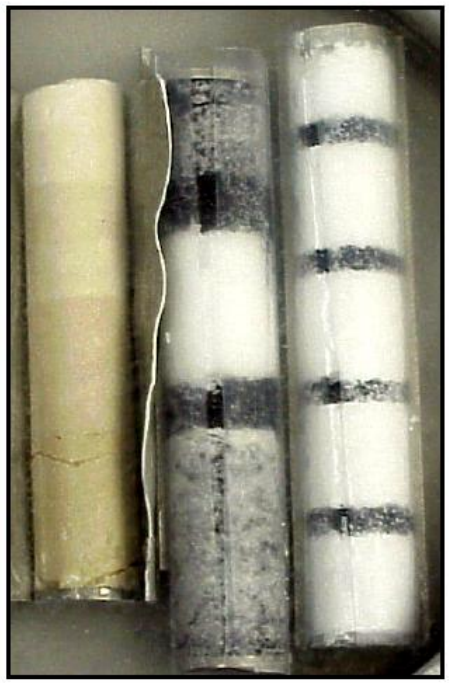
- Technical teams are formed.
- Data collection workshop conducted March 14 &15.
- Drilling and Coring Workshop planned for May 9&10.
- Geomodeling Workshop planned for May 9&10.
- Phase I to be completed by May 2003.
- Drilling and Coring to begin in Phase II Q1 2004.

Our Geophysical Challenge is How to Relate Seismic to Engineering Information



- The amount and distribution of hydrates.
- The mechanical properties of the sediment.
- The porosity of the sediment.
- Rock properties.
- Our seismic techniques must be good enough to select drilling sites.

Our Thermophysical and Mechanical Property Challenge is How to Relate Synthetic Core Data to Sediment Cores.



Synthetic methane hydrate + sediment aggregates. Our "seeding" method permits reproducible fabrication of both layered and mixed aggregates, as well as simulation of natural textures. **Left:** methane hydrate + quartz sand, varying the proportion of sand in each quarter of the sample. **Center and right:** Mixtures of pure methane hydrate (white material) and coarse Al_2O_3 particulate (black material).

- Yield strength
- PVT phase behavior
- Phase change energy
- Guest molecule concentration
- Heat transfer coefficients
- Transport properties
  - heat capacity, conductivity, etc.
- Speed of sound
- Geochemistry analysis
- Kinetics of dissociation

Our Drilling and Coring Challenge is How to Get High Quality Log and Core Data Safely

- Drilling procedures
- Core cutting and handling
- Core analysis
- LWD or Open Hole.
- Ensuring wellbore stability

Look for our Web Site

https:\\qpext.chevrontexaco.com\wwuexpl_gashydrates

Will hydrates provide the world with enormous amounts of energy or remain just another potential problem for production operations and something that we occasionally burn in the lab?