ODP GAS HYDRATE PROPOSALS

Solicitation and Advice: The Science Committee of the Ocean Drilling Program (ODP) has established a Program Planning Group (PPG) to stimulate Gas Hydrate research. The Gas Hydrate PPG received a mandate to develop a strong, long-range plan for drilling and sampling naturally occurring gas hydrates. The first meeting of the Gas Hydrate PPG was held on June 23-24, 1998. A series of discussions focused on the relevance of gas hydrate research, the environment of gas hydrate deposits, and the tools needed for gas hydrate evaluation. The panel believes there should be at least three inter-related ODP legs devoted to gas hydrate research that would form an integrated effort. The Gas Hydrate PPG is now actively soliciting proposals for individual ODP drilling legs that are dedicated to gas hydrate drilling and wishes to foster the best proposals. The Gas Hydrate PPG offers the following generic guidelines to help proponents to develop a drilling proposal for submission to the normal ODP proposal evaluation structure. Proponents are encouraged to contact and directly interact with members of the Gas Hydrate PPG. Fundamental Objective of a Gas Hydrate Research Program: *The fundamental objective is to establish the mass and distribution of naturally occurring gas and gas hydrates at all relevant spatial and temporal scales.* Individual proposals and ultimately a package of legs that are selected as a program should emphasize this theme.

Program Relevance and Focus: Answering the question of the mass and distribution of gas hydrate has many impacts and consequences that are both practical and of scientific interest which include the following: The size of the gas hydrate pool is considered to be a very large reservoir of natural gas. Understanding the amounts and associated reservoir characteristics are required to evaluate the potential that parts of this reservoir may be a future energy resource. Because methane is a green house gas, atmospheric release of large quantities of methane from gas hydrates could seriously affect climate. Knowledge of the amount of methane in hydrate is important in understanding how the planet sequesters carbon. Changes in bottom water temperature or changes in pressure (sea level) can destabilize hydrate layers, and potentially can result in large landslides. Any human activity on the seafloor (drilling, laying pipe lines) can also change hydrate stability leading to significant environmental hazards. Finally, because the gas hydrate acts as a pore-filling cement and its dissociation can increase fluid pressure, gas hydrates can influence sediment physical properties, diagenetic pathways, and even sedimentary tectonics. A successful research program on gas hydrates will require investigation of the interrelated processes that affect the formation and dissociation of hydrate within its sedimentary host rock. Thus, proposals should focus on several of the following general themes: Documenting the geomicrobiological and biogeochemical activity that produce gas (especially methane) in marine sediments. Determining the partitioning of the gas into the dissolved gas, gas hydrate, and free gas phases. Establishing the diffusive and advective processes that move gas into and out of the pressure and temperature conditions of the gas hydrate stability field. Defining where gas hydrate develops within the host sediment and what its habit is. Documenting the effect that the presence of hydrate has upon the diagenesis of the host sediment. Understanding how hydrate changes the physical properties of the sediment. Refining and calibrating our use of remote detection techniques to quantify gas hydrate amounts. Determining whether gas hydrate plays a role in slope failure on continental margins. Learning how bodies of gas hydrate evolve with time (grow or diminish). Finally, it is critical to understand how the importance of these processes vary among different geological settings.

Generic Gas Hydrate Program The panel is keenly aware that addressing many of these questions is difficult with the existing techniques. To assure a maximally successful program will require careful application of existing techniques, clever drilling strategies, development of new innovative techniques, and new technology to document the in-situ nature of gas and gas

hydrates. The proponents are encouraged to specifically identify how the available techniques will be applied and integrated into a unified research program. The basic components of any dedicated gas hydrate leg should include: 1) remote geophysical data for site characterization (e.g., 2D and/or 3D seismic data, OBS, side-scan sonar, etc.); 2) core recovery and analysis (including the use of Pressure Core Samples, porewater geochemistry, gas analyses, physical properties, and advanced core analysis procedures); 3) downhole measurements (porewater samples, temperature measurements, conventional wireline logging, logging while drilling, VSP, tomography, etc.); and in some cases 4) long-term monitoring (e.g, CORKS). An end-member strategy was endorsed by the panel as an approach for selecting regions for individual drilling legs. For example, during the course of the multiple legs that will collectively comprise this program, it will be desirable to drill sites with high versus low fluid flow; porous versus conduit flow, locally produced versus thermogenic gas, and within distinct sediment facies. It will also be important to ground truth the most typical environments and features. Thus, proponents of individual drilling legs are encourage to identify how their proposed sites fit within this end-member concept. Within individual leg proposals, proponents are encouraged to select sites very carefully. For example, one strategy is to select sites where similar formations can be drilled that have distinct remote sensing properties over short lateral distances. At least one hole should be drilled where there is a well-developed bottom simulating reflector. However, it is important to drill reference sites. At each site the entire section should be examined in detail from the surface to at least 200 m below the theoretical base of gas hydrate. The development of new tools and techniques may be vital to the success of gas hydrate research. Thus, proponents are encouraged to advance existing and try new techniques, deploy experimental tools, and develop new technologies.

Appropriate Targets for Individual Legs To accomplish these objectives we recommend at least a three leg program. A minimum of three legs are required because of the diverse nature of the geologic settings in which gas hydrate occurs. Examining the gas hydrate occurrence in diverse settings is the only way to provide a basis for more robust global extrapolations. A range of geologic settings should be considered which include: accretionary margin complexes where there is evidence for high fluid flux and significant methane generation, passive margin sites with definable fluid fluxes and indication of high methane levels, and a region where there is a well-developed petroleum deposits at depth. Specific features within these areas should also be targeted which include: surficial occurrence of gas hydrates, slumping and/or collapse structures, pockmarks, and faults which are active fluid conduits.

Next Proposal Submission Deadline: The next deadline for submitting proposals for ODP legs is October 1, 1998. Information about proposal submission can be obtained at: http://www.joi-odp.org/joi/JOI/JOIintro.htm.

Panel Members: The members of the Gas Hydrate PPG are interested in developing the strongest possible gas hydrate research program. Again we are very willing to advise and assist with the development of hydrate drilling proposals. G. Bohrmann (GEOMAR, Germany) P. Brewer (MBARI, U.S.A.) P. Cochonat (IFREMER, France) T. Collett (USGS, U.S.A.) N. Edwards (U. of Toronto, Canada) M. Hovland (Statoil, Norway) A. Johnson (Chevron, U.S.A.) K. Kvenvolden (USGS, U.S.A.) R. Matsumoto (U. of Tokyo, Japan) C. Paull (UNC-CH, U.S.A.) (Chair) D. Sloan (Colorado School of Mines, U.S.A.) A. Trehu (Oregon State U., U.S.A.) G. Westbrook (U. of Birmingham, U.K.)