Oil and Gas Production in Deepwater

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Oil and gas production in deepwater has become increasingly important for supplying world energy demand. Oil and gas operations are routinely active at depths well over 1,000 meters and have been for several years. Although only some of the known deepwater basins in the world have been explored, oil and gas companies have already found over 40 billion barrels of oil at these depths. Geoscientists predict that future exploration will identify well over 100 billion barrels. As activities have increased over the past five years, there is a growing need for the development and use of new technologies that can be standardized into methodologies deemed appropriate to gauge potential environmental impacts within sensitive deepwater habitats.

Challenges specific to deepwater environmental assessments arise from highly variable international regulatory guidelines and challenging technical issues. At such depths and in deepwater tracts with multiple operators, issues such as area-wide and cumulative impacts, lack of pre-existing data, and the need for precise navigation, site relocation, and overall sampling design strategies that are appropriate for deepwater environs are of primary concern. Deepwater environmental strategies and investigations should be designed to answer the following questions:

- Can I pool my resources with other operators to develop strategic environmental assessments for the region or should I go it alone (i.e., regional assessment versus blockwide)?
- How do I locate and engage regulators and other stakeholders in the process?
- What are the specific environmental characteristics at risk from my operations?
- What is a valid “baseline” against which any effects should be assessed and how can those baseline data be acquired?
- What effects can I expect and how can these effects from my operations be measured, efficiently, safely and remotely?
- What sampling and observational approaches are available and cost-effective to measure these effects?
- What are the type, magnitude, and duration of any effects?
- How do I archive and maintain valuable information and data to help answer future questions?
- How do I convey information to stakeholders?

To answer these questions, energy companies need a clear understanding of the evolving regulatory climate, the relationship of data from other locations relevant to the area of interest, the ecosystems at risk, and assessment tools appropriate for deepwater environments. Additionally, developing and maintaining consistent methodologies throughout the environmental management program improve efficiency, quality, and usefulness of information.

Key Strategic Questions to be addressed early in the process include:

- How will the Environmental & Social Impact Assessment (ESIA) be developed and results communicated?

- Who are the stakeholders that must be engaged and understand the results? Can I involve these stakeholders early and productively?
- To what extent should the overall development plan include environmental and/or laboratory infrastructure capacity building?
- What is the relative amount of effort and resources to be paid to environmental versus social issues and impact assessment?
- To what extent can remotely operated and automated control and monitoring technologies be used?

Key Technical Issues

- Physical and Oceanographic Features: Dissolved oxygen levels, organic enrichment, complex topography, and geological features (mud volcanoes, thermal vents) can differ substantially from shallow water habitats and can drive unique sediment and biota systems.
- Chemical Baseline and Impact Data: Measurements must have low enough detection limits to characterize ambient concentrations and must be selective for the chemical inputs being assessed. Analytes of interest should include those necessary to separate impacts from other sources. Chemical tracers unique to the discharge or accidental release should be measured.
- Deepwater Biota: Both discrete sampling and photographic imagery (benthic camera systems) can be paired to collect valuable data. Photo imagery can be intense for relatively low cost and, when supplemented by discrete samples, provide visual confirmation of laboratory data that are easy for non-technical stakeholders to grasp.
- Invertebrate Toxicity: Testing should rely on local organisms representative of the community at risk from exploration and production activities. Use of shallow-water test protocols can be amended to address unique deepwater environments. Physical and biological factors unrelated to discharge activities must be identified, quantified and mitigated in order to separate non-discharge- from discharge-related impacts.
- Deepwater Assessment Tools: Many areas are topographically complex and require specialized equipment and techniques for data collection. Often deepwater areas are under-characterized simply because field data collection costs to deploy and retrieve sampling equipment at great depths are high. Use of multiple sampling devices on single deployments; smaller, depth-protected remote data acquisition systems; rapid video assessments; and real-time sediment profile photography are potential methodologies and strategies. The goal of developing and selecting these tools is to reduce field time for procuring high-quality data that effectively support reliable environmental management.

A sound understanding of deepwater ecosystems coupled with the use of appropriate data collection and analytical techniques will support scientifically defensible studies with the requisite power to differentiate operational impacts from those occurring in a highly variable natural environment. High-quality information carefully collected, organized and processed provides the fundamental connection between complex scientific activities and stakeholder concerns.

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