Public Executive Summary

Title: Deep Sea Hybrid Power System

Name of Offeror: Houston Advanced Research Center

Project Manager: James Pappas
Principal Investigator: Richard Haut

Additional participants: Lawrence Livermore National Laboratory; Naval Facilities Engineering Service Center; Yardney Technical Products; Shell Oil Company; Chevron Oil Corporation; GE

Solicitation Number: RFP2007DW1902 (07121-1902)

Project Start Date: October 31, 2008
Project End Date: October 31, 2010

Total Estimated Cost:	$	600,000.00
RPSEA Maximum Share:	$	480,000.00
HARC Cost Share:	$	120,000.00

Goal

This project will evaluate alternatives and recommend equipment to develop into hybrid energy conversion and storage systems for deep ocean operations. Such power systems would be located on the ocean floor and used to power offshore oil and gas exploration and production operations. The economic development of ultra-deepwater oil and gas resources will require an increased amount of activity to be carried out subsea. A reliable system for local subsea generation and storage of energy that will enable remote subsea operation of drilling and production activities is a prerequisite for lower-cost, all-subsea resource development. This project will deliver a comprehensive analysis of the options available for developing such a system, culminating in a conceptual design for the best option (on economic and technical bases). The system will be a "hybrid" system in the sense that it will combine both energy conversion and storage capabilities. The evaluation will result in an unbiased assessment of alternatives; the logical first step in advancing this technology.

Background

As oil and gas development moves into deeper and deeper water depths, engineers begin to push the limits of current capabilities for delivering the power necessary to drill for and produce hydrocarbons. At increasing depths, the technically and economically viable options for developing resources from surface locations become fewer. Subsea options are already being applied in many areas, but the need to deliver power to operate subsea equipment in ultra-deepwater locations can be a limiting factor. Development of subsea (deep-ocean) hybrid power systems will enable wider access to ultra-deepwater offshore oil and gas resources. Subsea generation of electrical power also has the potential to reduce

carbon output, improving the environmental operating performance of offshore platforms through reduced emissions. However, a comprehensive analysis of the options available for developing such a system has yet to be carried out.

Deliverables for this project will include a series of reports on project tasks as they are completed and a final report integrating the results of the project. The report topics will include:

1. Functional requirements and basis of design for deep sea hybrid power systems.
2. Conceptual designs of alternative deep-ocean hybrid power systems, with generation and storage capability, with sufficient capacity to power drills, pumps, and other sub-surface equipment, with hypothetical requirements of 20,000-100,000 hp (14 to 70 megawatt)
3. Technical evaluation and ranking of conceptual designs, with selection of the best combination of conversion and storage technologies for further development.
4. Conceptual design of an energy conversion module prototype capable of long-term reliable operations at pressures up to 5,000 pounds per square inch, and temperatures approaching the freezing point of water; including a budgetary estimate for the cost of such a system.
5. Conceptual design of an energy storage module prototype capable of operating under the same conditions and including a similar cost estimate.
6. Preliminary Risk Assessment of the selected conceptual hybrid power system.
7. Comparison of the carbon emissions that each alternative power system would provide if deployed.
8. Plan for further development, qualification and commercialization of the hybrid power system.
9. Final report documenting results and findings of this work.

Potential Impacts

The product of this project will be knowledge that can be used to accelerate the development of a hybrid power system that will in turn accelerate development of ultra-deepwater fields that cannot be developed using currently employed combinations of surface and subsea architectures. The resulting benefit will be accelerated production of oil and gas from these ultra-deepwater fields, and the concurrent acceleration of royalties and tax revenues.

Contact Information: James Pappas (jpappas@rpsea.org)