Public Executive Summary

Title: Subsea Processing System Integration Engineering

Name of Offeror: General Electric (GE) Global Research

Project Manager: Don Richardson
Principal Investigator: Christopher Wolfe

Additional participants: General Electric (GE) VetcoGray

Solicitation Number: RFP2007DW1901 (07121-1901)

Project Start Date: December 3, 2008
Project End Date: July 31, 2011

Total Estimated Cost:	$ 1,511,448.00
RPSEA Maximum Share:	$ 1,200,000.00
GE Cost Share:	$ 311,448.00

Goal

The goal of this project is to develop and validate a Subsea Processing Simulator capable of predicting the performance of subsea processing systems over the range of conditions and fluid compositions found in the Gulf of Mexico. The intention is to provide a simulator that can be used as an industry standard to predict the in situ performance of compact separation components and systems over their productive field life.

Background

As existing oil and gas fields become depleted and energy demand continues to rise, hydrocarbon production is moving toward increasingly challenging environments, including deep and ultra-deep water. For this reason, subsea processing systems that can operate at extreme depths and pressures (up to 3000 m and > 300 bar) are becoming increasingly important. On-site, sub-sea processing and separation of multi-phase flow streams can increase production rates, extend field life, and make otherwise marginal fields economically viable.

Despite assertions by equipment suppliers that compact subsea processing systems are ready to deploy, operating engineers remain less certain of that readiness and have particular concerns about separator performance under harsh conditions. The objective of this project is to develop a physics-based subsea processing simulator that can be used by equipment suppliers and facility engineers to make reliable predictions of sub-sea separator performance over a specified range of operating conditions.

The simulator developed in this project will be based on robust analytical models for compact separation devices operating in a subsea multi-phase flow environment. The project will be carried out

by first compiling a library of analytical models of separator components; then developing an integrated processing simulator; and finally by laboratory testing to validate the simulator and its component analytical models.

The project will be carried out by GE Global Research and GE VetcoGray. The teaming arrangement is intended to combine GE VetcoGray's experience with subsea processing and GE Global Research's experience with developing and testing numerical simulators. The project team will develop a simulation model with four tiers: 1) component model library; 2) separator; 3) separation system; and 4) statistical performance. The simulator will be validated at the component and simulator levels in an existing GE multiphase flow test loop that will be optimized for this project.

Deliverables for this project will include: 1) a preliminary version of the Subsea Processing Simulator; 2) a report on the laboratory testing plan; and 3) a report on the simulator testing results. The Subsea Processing Simulator will be comprised of the simulator code and all supporting documentation on its theoretical basis and recommended methodologies.

Potential Impacts

This project is intended to result in a simulator that can be used by industry to predict with confidence the performance of subsea processing systems and components prior to their deployment. This will allow for quicker and more widespread deployment of subsea processing systems, in particular in deep water environments. Currently, the technology exists to perform hydrocarbon processing, separating, compressing, and pumping on the sea floor, but the technology is under-utilized because operators lack technical certainty concerning system designs and outcomes.

Confidence in subsea processing will be developed by allowing manufacturers through simulation to optimize their system designs and determine benefits to operators. Simulation tools will also allow operators to optimize their practices with respect to operation of the subsea processing systems as well as other controls that affect oil and gas production, which will minimize production risks.

Subsea processing systems have the potential to bring deep and ultra-deep oil and gas production to market faster while extending the life of existing fields, particularly in harsh environments. In addition, subsea separation and pumping can cut topside facility costs and allow for development of marginal fields using existing infrastructure.

In the near term, more widespread utilization of subsea processing systems is likely to result in increased production in deep and ultra-deep fields in the Gulf of Mexico. Over the long term, acceptance and deployment of subsea processing systems should bring more domestic oil and gas production to market, while extending field life and making marginal fields economically viable. Increased domestic oil and gas production will result in increased tax revenues, royalties, and regional economic benefits.

Contact Information: Don Richardson (drichardson@rpsea.org)