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# FPU verification facilitates regulatory compliance

Independent review provides safety assurance on FPU projects.

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From designing and planning a field development to building and operating the associated floating production unit (FPU), operators must consider how best to execute the work safely and efficiently throughout the life cycle of an asset.

## Acting as CVA

Structural integrity and asset maintenance are concerns not only for owners and operators but also for regulatory bodies that issue and enforce requirements aimed at safely developing the field and operating the production unit.

In many operating locations, asset classification (issued by a class society) is the basis for demonstrating compliance with rigid safety standards, but there are areas where regulatory bodies require additional verification activities.

The U.S. Bureau of Safety and Environmental Enforcement (BSEE) requires floating assets in the Gulf of Mexico (GoM) to comply with the Platform Verification Program. Program requirements, delineated in the U.S. Code of Federal Regulations 30 CFR Part 250, stipulate that a certified verification agent (CVA) be engaged to verify design, construction and installation. Class societies acting as CVAs are independent third parties responsible for verifying asset integrity through the course of offshore project development.

ABS has acted on behalf of the U.S. Coast Guard (USCG) in approving offshore facilities under USCG jurisdiction and as a CVA for BSEE. In addition to its work in the GoM, ABS certifies the largest share of FPUs worldwide, including FPSO vessels, spars, tension-leg platforms and semisubmersible production units.

## Verifying the world's largest hull

With its focus on the enormous potential of the deepwater U.S. Outer Continental Shelf in the GoM, Chevron is developing areas in the ultradeep Lower Tertiary Trend. One of these developments, Jack/St. Malo, combines the Walker Ridge Jack and St. Malo oil fields, which hold estimated recoverable resources of more than 500 MMboe. The development consists of subsea centers tied back to an FPU hub.

In November 2013, the *Jack/St. Malo* semisubmersible FPU was mobilized to Walker Ridge 718, where it will work in 2,134 m (7,000 ft) of water for an anticipated 30-year service life.

Operator Chevron nominated ABS as CVA for the design, fabrication and installation of the floater and mooring system. As CVA on the project since 2009, ABS reviewed the FPU for compliance with BSEE requirements, ABS Rules and appropriate codes. Following FEED approvals, ABS carried out classification and statutory approvals as well as fabrication and installation surveys. The *Jack/St. Malo* FPU will receive the floating offshore installation notation under ABS class.

*Jack/St. Malo* is a GVA 33000 design floating semisubmersible hull. At 56,000 mt, the hull is the world's largest to date. It is characterized by a lower hull consisting of a quadrangular pontoon and four columns and an upper hull consisting of a deck box. The production facilities and living quarters are located on the upper hull. The FPU will be permanently moored using a chain-polyester rope-chain configuration, anchored to the seafloor with suction piles.

## Deepwater megaprojects

**Chevron selected ABS to deliver project planning and advice including FEED support for the Chevron Jack/St. Malo Project in 2009 and subsequently to class and serve as CVA for the *Jack/St. Malo* semisubmersible and Big Foot extended tension-leg projects.**

**ABS has classed and served as the design, fabrication and installation CVA for the Chevron-operated *Blind Faith* semisubmersible (2005 to 2008) and the Chevron Tahiti truss spar (2004 to 2009), both major assets in the deepwater GoM.** ■

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**In November 2013 the *Jack/St. Malo* FPU set sail from the Kiewit Offshore Services integration yard in Ingleside, Texas, on its way to Walker Ridge 718 in the deepwater GoM, where it will be stationed in 2,134 m of water for 30 years. (Source: Chevron Corp.)**

The deck box hull will support the topsides production facility configured into modules fabricated and lifted independently. The topsides modules will house production, compression and power generation equipment, with provisions for future production, water injection and additional power systems.

The semisubmersible is designed to support subsea well tiebacks only—no dry tree wells will be located on the unit; therefore, no drilling or workover capabilities will be housed on the FPU. Produced oil and gas will be exported via individual risers and pipelines.

## Steps to verification

According to the requirements of BSEE's Platform Verification Program, the CVA verifies the design, construction and installation of the structures, moorings and foundations of the FPU. For *Jack/St. Malo*, the structural design was reviewed to verify that the integrity of the hull met the requirements outlined in applicable industry standards and complied with the ABS *Rules for Building and Classing Mobile Offshore Drilling Units*. Where these rules were not applicable due to the characteristics of the hull, the ABS *Rules for Building and Classing Floating Production Installations* as specified for the project were applied. The hull and topsides modules were reviewed to verify that structural integrity will be maintained within acceptable and prescribed limits, withstanding loading and environmental conditions that the unit will be subject to during its operational life.

Material selection and designation are part of the structural design. Designers determine the material required for each structural member based on the stresses applied, corrosion characteristics, weldability, material availability, the number of scantlings required and other important factors. The CVA reviews the material specifications and the material application charts to verify that proper material is designated for each structural element. Field surveyors review the welding details and procedures as well as design-related weld inspection criteria in accordance with the AWS Structural Welding Code—AWS D1.1—or other applicable codes and standards.

During construction, ABS field surveyors in the hull fabrication yard in South Korea and at the topsides fabrication facility in Texas verified material traceability and dimensional control among other construction aspects. Material and welding testing, such as nondestructive examination (NDE), were applied to verify

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## Environmental criteria

**The *Jack/St. Malo* floating offshore unit design was based on site-specific conditions that originated from oceanographic and meteorological studies of the intended site. The acting CVA reviewed the oceanographic and meteorological studies to establish the validity of the data and methods used to derive the environmental criteria as well as verify compliance with the applicable industry standards.**

**Important data such as wave, wind and current characteristics and directionality were used in the global performance analysis for the *Jack/St. Malo* design. Loop and eddy currents also were considered in the design conditions.** ■

compliance with project requirements.

Once the topsides modules were built and verified, they were lifted onto the hull at the integration yard. Surveyors attended the integration operations and verified adherence to the design drawings by reviewing fabrication considerations such as welding procedures, NDE and dimensional control.

Mooring analyses, developed by the designer using the environmental criteria for the installation site, also were reviewed by the CVA to verify that the foundation was designed to withstand the design loads in accordance with project requirements. Criteria included wave height, wind loads, air gap and soil characteristics.

Because offshore installation is part of the Platform Verification Program, field surveyors onboard the installation vessel witnessed the installation of foundation piles, hull and mooring lines.

Stability characteristics also were verified to confirm the determination of the lightship weight and the location of the center of gravity in accordance with USCG requirements, and compartments were assessed for watertight integrity.

### Asset integrity management tool

In addition to meeting regulatory requirements, verification activities serve as an asset integrity management tool. Reviewing design documentation confirms the operational requirements on which the FPU design is based, and this activity sets the foundation for the entire verification process. Verifying that fabrication processes are properly implemented and materials are correctly applied during fabrication gives the operator confidence that the unit is built in accordance with the design basis.

Verification activities, added to a life-cycle survey program that verifies compliance with defined criteria, are essential to managing asset integrity throughout the service life of an FPU. And verification information frequently is used to develop maintenance programs that can be applied to preserve the integrity of the unit, maximize life expectancy and minimize nonproductive time resulting from unplanned repairs and remedial work.

### Toward first oil

Megaprojects like Jack/St. Malo demand an integrated approach to understanding the project as a whole, with collaboration and communication critical to project success. As independent third parties working closely with regulatory agencies such as BSEE and the USCG as well as operators and the offshore industry, classification societies are an integral part of the verification process for reviewing FPU design, fabrication and installation.

ABS's verification activities on the *Jack/St. Malo* FPU have proven that early engagement and continuous involvement of a CVA throughout the scope of a project are essential to the successful completion of the Platform Verification Program, resulting in a regulatory-compliant unit.

First oil is anticipated from Jack/St. Malo in 2014. E&P

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