CONCEPT FIFTH-GENERATION SEMI-SUBMERSIBLE

Ironmark XG-1 Concept Brochure

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Important notice

The Ironmark XG-1 has not been built. Construction has not been sanctioned by the board, no shipyard slot has been reserved, no long-lead equipment has been ordered, and the unit is not available for charter, sale, partnership or any other commercial arrangement under any circumstances. Every figure in this document is a design intent produced by analysis, simulation or sub-scale testing. None of it has been demonstrated by a floating unit.

This document is published because the engineering questions the concept raises are more useful in the open than in a drawer, and because we would rather be argued with early.

1. The organising idea

A modern fourth-generation semi-submersible carries around sixty-eight people. Roughly a third of them are there because pipe has to be handled by hand at some point in the well. Everything else follows from that: the accommodation block, the lifeboat capacity, the galley, the sewage plant, the fresh water plant, the deck area to carry all of it, the displacement to float the deck, and the fuel to hold that displacement on station.

If no person is required on the drill floor at any point in the well, all of those things shrink together. A thirty-two person core crew is not a manning saving; it is a different hull. The Ironmark XG-1 is an attempt to find out how much different.

2. Design intent

Parameter	Ironmark XG-1	Typical Gen-4 semi	Basis
Core crew	32	68	Manning study, unverified
Total berths	54	120	Layout model
Water depth capability	10,000 ft	7,500 ft	Station keeping analysis
Drilling depth below mudline	35,000 ft	30,000 ft	Hookload and riser analysis
Variable deck load	9,200 t	7,000 t	Weight model, class review pending
Hookload capacity	2,500 kip	2,000 kip	Derrick design
BOP	20,000 psi subsea, dual pod	15,000 psi	Design review stage 2
Riser	Composite-titanium hybrid	Steel	Coupon testing only
Installed power	42 MW diesel-electric	48 MW	Load study
Energy storage	12 MWh battery	None typical	Bench validated
Blackout ride-through	18 minutes	0–2 minutes	Simulation
Fuel consumption, drilling	38 t/day	62 t/day	Model, unverified
Transit speed	8.4 kn	7.0 kn	Resistance model
Design life	30 years	25 years	Fatigue analysis

3. Systems

3.1 Ironhand robotic pipe handling

A fully enclosed robotic tubular handling system that makes and breaks every connection, racks every stand and runs every casing joint without a person entering the drill floor envelope. The floor is physically interlocked: opening it stops the sequence. The system exists as a land test stand and has completed in excess of forty-one thousand tubular cycles with nine mis-stabs and a measured emergency stop response of 0.4 seconds against a 1.0 second requirement.

3.2 Closed-loop managed pressure drilling as the default

The unit is designed to drill every section with a rotating control device and an automated choke in the returns path, rather than treating managed pressure as an optional service. Kick detection becomes volumetric and continuous rather than dependent on a pit gain that a person has to notice. Modelled influx detection threshold is 1.2 barrels.

3.3 Hybrid power and 12 MWh storage

Battery storage sized to carry the peak load of the mud pumps and the drawworks, allowing the generators to run continuously in their efficient band. The secondary benefit is an eighteen-minute blackout ride-through, which converts a drive-off or a blackout on a moored unit from an emergency into an inconvenience. Two cells in the bench test article are currently derated and the cause is not yet fully understood.

3.4 Composite-titanium riser

A hybrid riser string intended to reduce top tension requirement by roughly a third, which is what allows a hull of this displacement to work in 10,000 feet of water. This is the least mature system on the unit. Coupon testing is complete; no full-scale joint has been manufactured or tested. If the joint fails qualification, the concept as drawn does not work and the water depth claim goes with it.

4. Maturity and gates

Gate	Scope	Target	State
G0 Concept select	Hull form and crew model frozen	March 2026	Complete
G1 Design basis	Full design basis issued	August 2026	Complete
G2 Class appraisal	Approval in principle from class society	February 2027	In progress
G3 Riser qualification	Full-scale composite joint built and tested	September 2027	Not started
G4 Sanction decision	Board decision to build or shelve	January 2028	Not started

System	Maturity	Evidence to date
Ironhand robotic floor	96%	Land test stand, 41,200 cycles
Closed-loop MPD	92%	Hardware-in-the-loop verified
Hybrid power and battery	88%	Bench validated, two cells derated
Station keeping and heave compensation	84%	Tank tested at 1:42 scale
Dual-activity drill floor	81%	Digital model only, no hardware
Autonomous tripping control	73%	Shadow mode on two rigs, no control authority

System	Maturity	Evidence to date
Subsea 20k stack interface	67%	Design review stage 2
Composite-titanium riser	54%	Coupon testing only

5. Pre-build monitoring

Xtragate operates a continuously running digital twin of the Ironmark XG-1 from the same operations centre that monitors the physical fleet. The twin drills simulated wells, produces simulated telemetry, raises simulated alarms and exercises the well control sequence against injected influxes. The purpose is not to prove the rig works. It is to find out whether the instrumentation, the alarm philosophy and the crew procedures work, before steel is cut and while changing them is still cheap.

As at the date of issue the twin has completed 214 model runs covering 1,840 simulated drilling hours and 96 injected well control events.

6. What would stop this

- Riser qualification. If the full-scale composite joint fails, the 10,000 ft claim fails with it.
- Class acceptance of a 32-person manning model on a unit of this size. Precedent does not exist.
- The regulatory position on a drill floor with no human presence, which is not settled in any jurisdiction we operate in.
- Battery cell behaviour at scale in a marine environment over a thirty-year design life.
- Commercial reality. A concept rig with no track record is a difficult thing for any operator to accept on a first well, and we would not ask one to.