Intervention & Abandonment

Well Access Solution, Simplified

- **Jack-up/Lift Boat Intervention & Abandonment:** Complete riser-based well access package, including all hardware, engineering and rig integration.
- **Floating Vessel Intervention & Abandonment:** Intervention riser systems, special joints and interface equipment.
- **Current and Legacy Subsea Interfaces:** Connectors and TRT's for all tree types - custom abandonment options available.
- **Riser-based Solutions:** Broaden intervention scope and de-risk complex campaigns with 4-1/2" to 20" ID riser ready from stock.
- **AQC-SR and AQC-CW Riser Connectors:** Inspectable, fatigue-resistant, and fully qualified to ISO 13628-7 and API 17G, with extensive testing to meet multi-service operational requirements.
- **Simplified Surface and Subsea Pressure Control Equipment**: Safer, smoother well access with enhanced uptime for jack-up and lift boat intervention and abandonment.
- **Subsea Wellhead and Tree Handling**: Integrated tools and rig systems for running and recovery.
- **HPHT, CO_2 and Sour Service Qualified:** Field-proven reliability in extreme environments.

Aquaterra ENERGY | INTELLIGENTLY ENGINEERED

Unlocking Subsea Potential from Jack-Up and Lift Boats

Over 60% of the world's subsea wells lie in water depths shallower than 130 metres — yet many operators still assume deep water vessels are required. Jack-up rigs and lift boats equipped with an intervention and abandonment well access package can safely and efficiently access the majority of these wells.

Looking ahead, more than half of all new subsea tree installations forecast over the next decade are expected to be in these accessible water depths (Source: Wood Mackenzie).

With over three decades of proven performance, jack-up and lift boat deployed riser-based subsea intervention and abandonment is a cost-effective, low-risk, and operationally flexible alternative to LWIV (Light Well Intervention Vessel) wire through water options that do not always cover project uncertainties, like riser-based well access does. Aquaterra Energy's complete Well Access Solution makes this possible — providing everything from subsea CWOR (Completion Workover Riser), legacy connectors and agnostic TRT systems, subsea pressure control equipment, hardware and rig integration, to full engineering analysis and operational assurance.

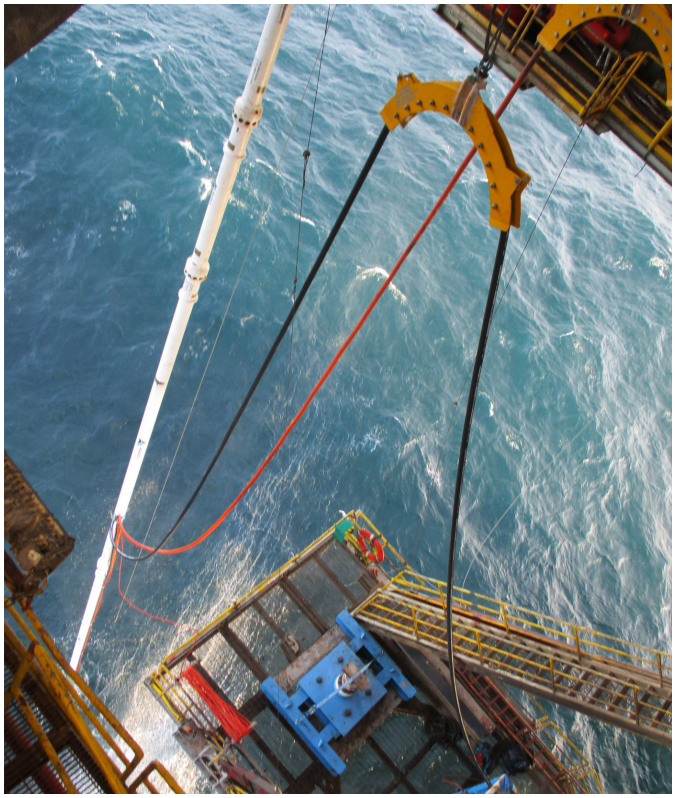
Fast Return on Investment

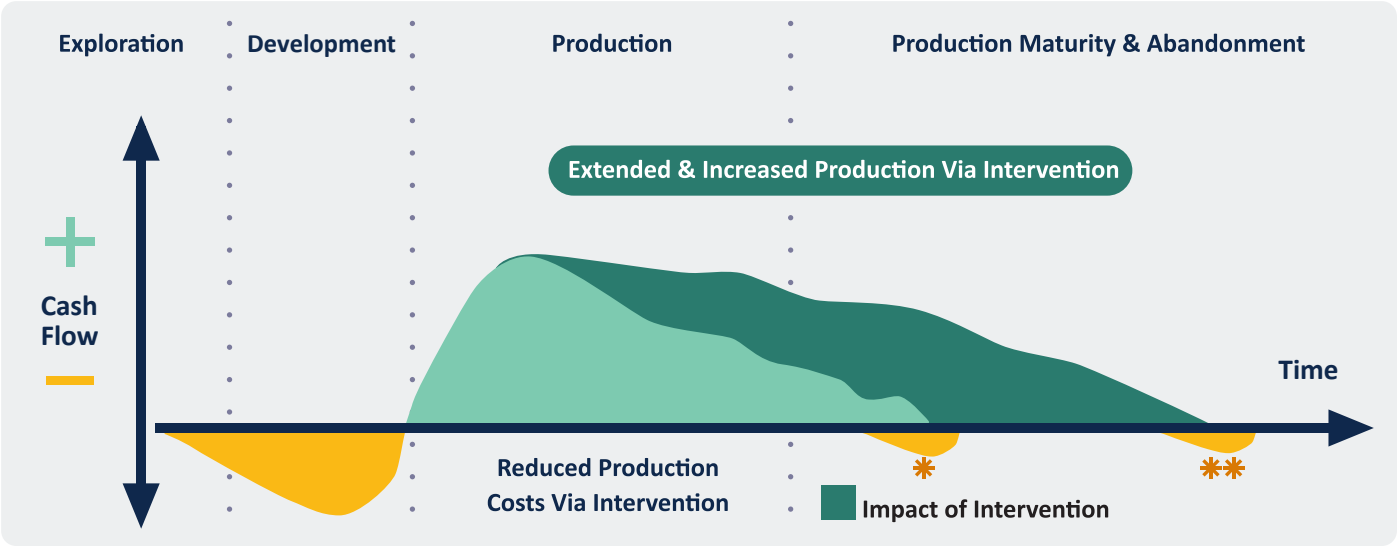
Intervention and abandonment are among the lowest-cost ways to add barrels of oil equivalent (BOE) and unlock value in mature assets, or remove liability from balance sheets.

In the North Sea, the average cost of well intervention for increased recovery is around £12/BOE, compared with over £20/BOE to find and develop new reserves, with an almost instantaneous return on investment.

Where Light Well Intervention Vessels (LWIVs) are constrained by water depth or down-hole uncertainty, **riser-based well access solutions** provide a more robust approach. These systems enable the full suite of intervention and abandonment tooling while reducing execution risk (NSTA Wells Insight Data).

> **"over half of all existing and planned subsea tree installations are within jack-up–accessible depths"**
> (NSTA Wells Insight Data)





* Abandonment Phase without Intervention
** Delay of abandonment phase due to impact of intervention

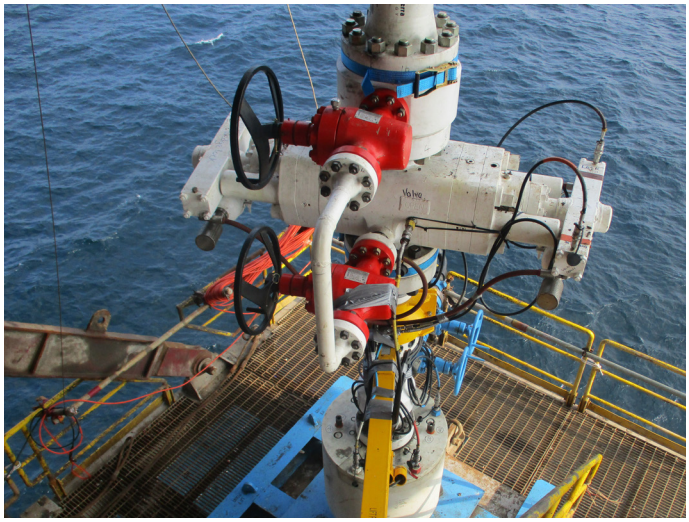
Your Complete Seabed to Surface Well Access Partner

Aquaterra Energy's Well Access Solution provides a fully integrated system for subsea intervention and abandonment operations from jack-up rigs and lift boats between the seabed and surface. The system is riser-based, supporting a full range of intervention, snubbing and abandonment services through bore ranging from 4-½" to 20" ID. The system combines robust hardware, specialist rig integration, and advanced analysis into one fully managed package; ensuring that every interface, load path, and operating condition is accounted for before offshore execution.

At the heart of the solution is the **Subsea High-Pressure (HP) intervention, abandonment, and snubbing Riser System**, designed to create a structurally sound, pressure-retaining conduit between the subsea wellhead or tree and the surface intervention pressure control equipment

Key Components Include:

- **Subsea connectors:** Provide a secure mechanical and pressure-retaining interface with the subsea tree or wellhead. 13-5/8", 18-3/4", Collet, Torus II, H4, legacy connectors, and custom-built interfaces are available.
- **Agnostic TRT interface:** Concentric or eccentric production bore and annular access, configurable to suit various interfaces.
- **Subsea closure device:** Shear and shut in subsea.
- **Annular and displacement subsea valves and lines:** Full well access and subsea closure.
- **Stress & tension joint:** Absorbs bending loads and enhances fatigue performance in the high-stress zone near the seabed and surface.
- **Intermediate and pup joints:** Allow flexible riser configuration for varying water depths and rig elevations.
- **Special and tooling joints:** Integration of AQC-SR and AQC-CW stress, tension, wear and other joints into consumable threaded and coupled intermediate CWOR joints for extended service life and hand make-up.
- **Tensioning tables and tension rings**: Intervention riser drill floor support, floating vessel swivel tension rings.
- **Subsea tree and wellhead handling:** Engineering, tooling, rig modification and hardware.
- **Tensioning, lateral support and BOP connectors:** Engineering, tooling and hardware.
- **Lift boat intervention deck:** Retrofit deck systems to enable riser-based intervention from lift boats.



Offshore Analysis

Offshore intervention demands a clear understanding of how well access systems behave under real-world environmental and operational conditions. Our Offshore Analysis service provides that assurance, delivering detailed insight into system performance from vessel to wellhead across both shallow and deepwater environments.

By analysing critical scenarios such as running, retrieval, hang-off and operational disconnects, we help operators define safe operating limits, reduce offshore risk and ensure reliable, compliant operations.

Operating Envelopes

We develop clear operating envelopes that define safe working limits for wave height, current profiles and vessel motions. This gives operators full visibility of environmental constraints, supports confident decision-making offshore, and helps minimise unplanned downtime.

Watch Circles

Our watch circle analysis defines safe vessel positioning relative to the well, including drift-off, drive-off and disconnection criteria. This ensures effective station keeping and safe clearances in both shallow and deepwater operations.

Strength & Stability Analysis

We assess system performance under a full range of operational conditions, including running, hang-off, connected and standby states.

This includes:

- Strength and stability assessment.
- Fatigue life evaluation and hotspot identification.
- Joint rotation and stress checks.
- Validation of system behaviour under vessel motion and metocean loading.

These studies support long-term integrity, reduce failure risk, and enable efficient campaign planning.

Riser & Landing String Analysis

Our engineers perform detailed analysis of intervention risers and landing strings, including:

- Riser running, tensioning and handling.
- Vortex-Induced Vibration (VIV) screening.
- Fatigue and strength assessment of landing strings.
- Verification against ISO 13628-7 and API 17G.

This ensures structural integrity, reduces equipment modification risk, and supports faster, more cost-effective offshore operations.

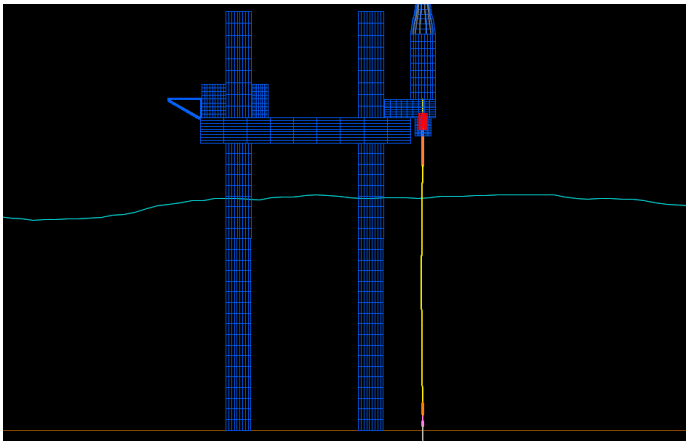
Metocean, Well & System Compatibility

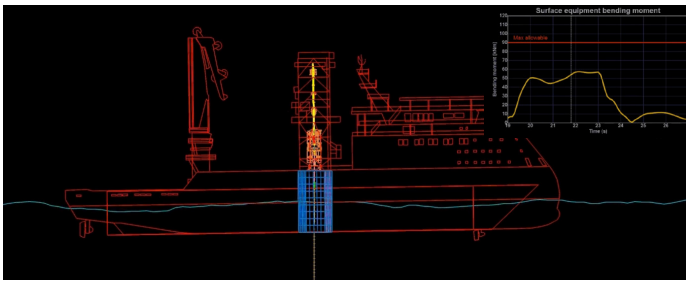
We assess environmental and operational compatibility across the full system, including:

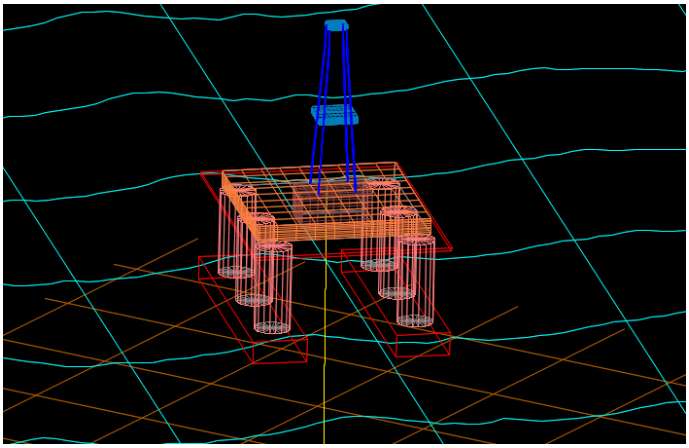
- Metocean and geotechnical inputs.
- Tieback and re-entry analysis.
- IWOCS and subsea/surface interface compatibility.
- Well control, temperature and NACE compliance.

Delivering Confidence Offshore

Our Offshore Analysis services provide operators with the clarity and assurance needed to plan and execute intervention campaigns safely and efficiently. By combining detailed engineering, practical operational insight and compliance with international standards, we help reduce risk, minimise offshore uncertainty and support reliable performance across both shallow and deepwater environments.

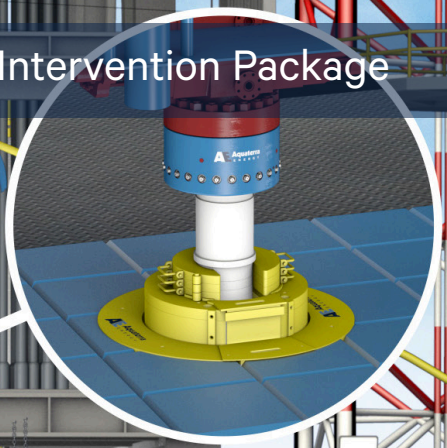


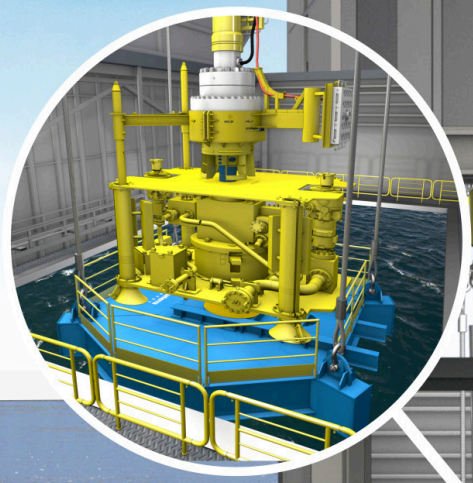




Our Seabed to Surface Jack-Up Subsea Intervention Package

Surface Intervention, Coil Tubing, Slick Line, E Line PCE



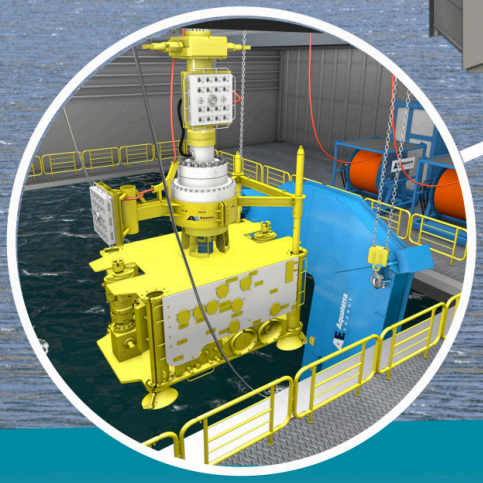


Top Tension Table

CWOR Surface Control Lines

Annular & Displacement Lines

Magic Carpet Intervention & Tree Handling Deck

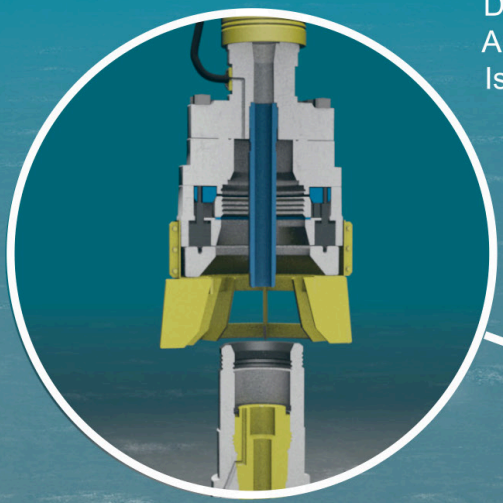


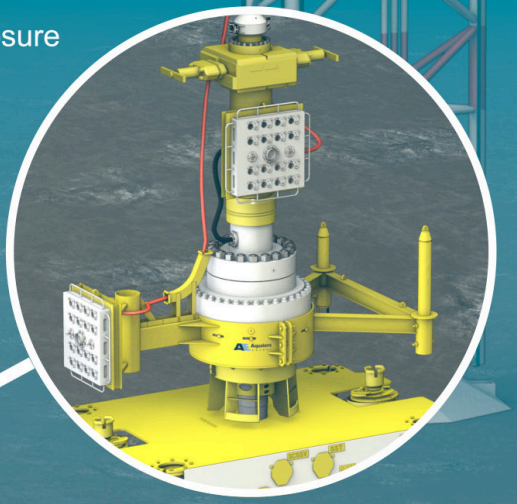
Umbilical & Surface Control Package

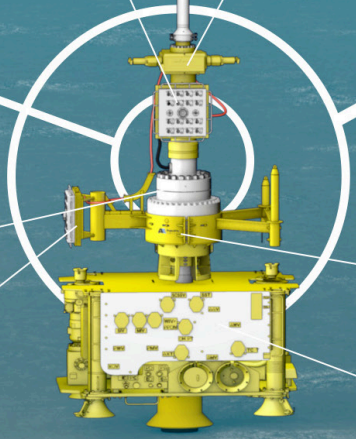
Completion & Workover Riser Joints

Displacement & Annular Subsea Isolation Valves

Subsea Closure Device







Agnostic TRT Tree Interface System

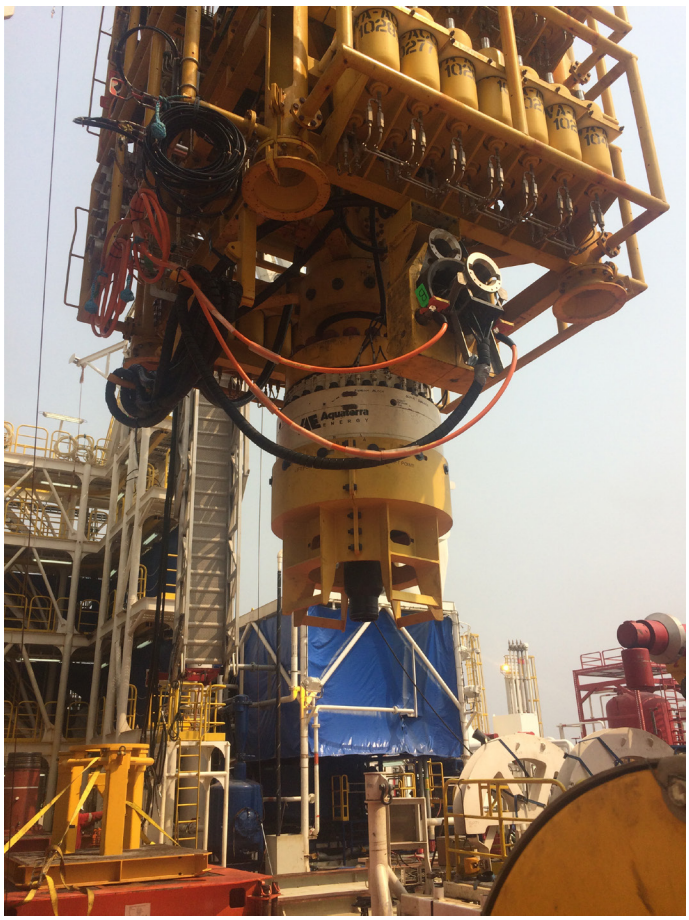
Subsea Hydraulic Connector

Subsea Controls

Systems to Suit 18 3/4" & 13 5/8" Vertical & Horizontal Subsea Trees

Floating Vessel – Scope of Supply

Aquaterra Energy provides key well access interface systems that enable safe, reliable intervention and abandonment operations from floating vessels across deep and shallow water environments. Our scope focuses on the critical subsea and riser interfaces required to access a wide range of subsea trees, wellheads and legacy assets.



Tree Interface Components

We enable access to subsea trees for light well intervention (LWIV), wire-through-water and riser-based operations:

- Bespoke Tubing Hanger Running Tool (TRT) packages, designed to interface with modern and legacy tree architectures.
- Legacy TRT, wellhead and tree connectors – supporting intervention on brownfield and late-life assets.
- Wellhead and tree mandrel connectors
- Annulus and well-bore crossover spools.
- Dual bore and monobore riser spools.
- Tubing hanger stingers and isolation sleeves.

Open Water Riser Systems

Engineered components that manage loads, motion and integrity between the vessel and the subsea well:

- Open water riser systems for floating vessel operations.
- Specialist joints including lower stress joints, upper stress joints, tension joints, cased wear joints, and flanged crossovers.
- Tensioning systems and tension rings to maintain controlled load paths and system stability.

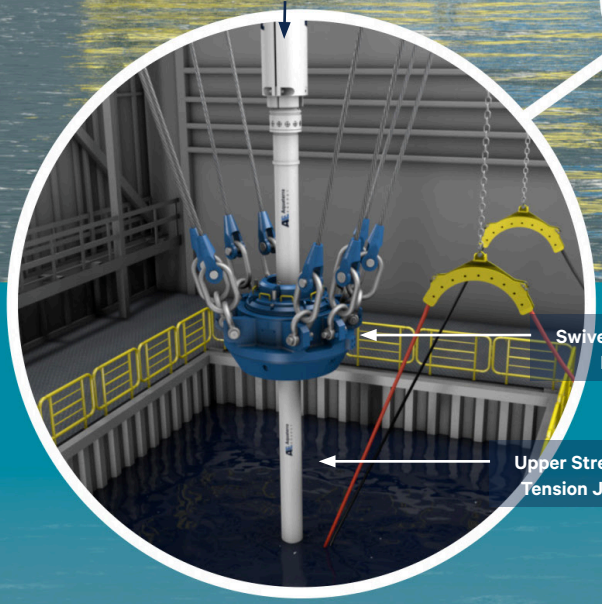
This modular, interface-focused approach allows Aquaterra Energy to support a broad range of floating vessel intervention and abandonment campaigns, providing operators with proven, adaptable solutions for both new and legacy subsea infrastructure.

Watch our Video on Deepwater Intervention Analysis

Floating Vessel Intervention Solutions

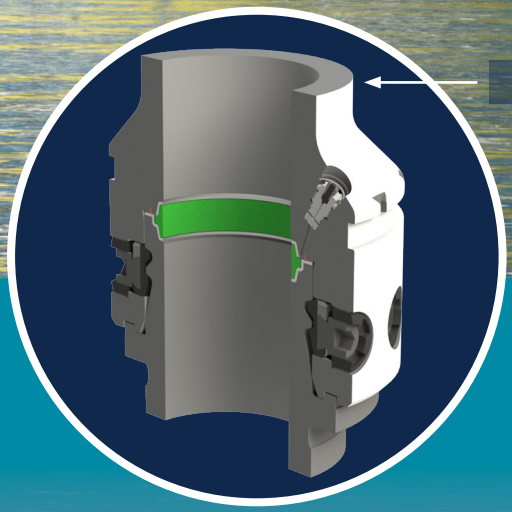
Surface Intervention, Coil Tubing, Slick Line, E Line PCE

Cased Wear Joint



Swivel Tension Ring

Upper Stress / Tension Joint

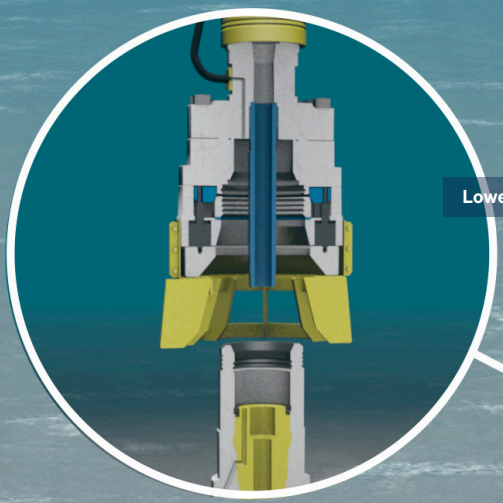


AQC-CW

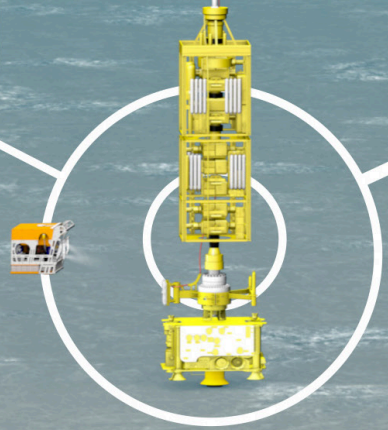
Dual Bore & Mono Bore Completion & Workover Riser Joints

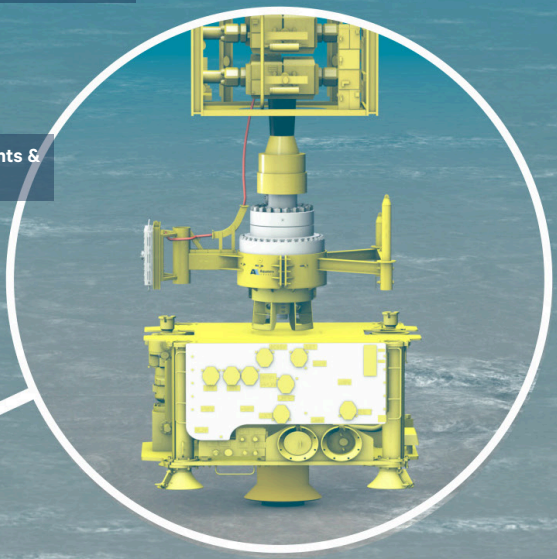
Special Interface Joints & Crossovers

Lower Stress Joint



Agnostic TRT Tree Interface System





Subsea Hydraulic Connector & Custom Legacy Connectors

Systems to Suit 18 3/4" & 13 5/8" Vertical & Horizontal Subsea Trees

In-Riser Landing String Solutions

Enabling Full-Lifecycle Well Access

In-riser landing strings offer an alternative to open-water intervention risers, enabling full-lifecycle well access from testing and completion through to intervention and abandonment. Aquaterra Energy's configurable solutions are compatible with major OEM subsea trees and wellheads, delivering a complete subsea-to-surface system supported by field-proven fatigue and strength assessments.

Simplified Landing Strings: Designed for Purpose

In-riser landing string requirements differ significantly between floating semi-submersibles and fixed jack-up rigs, driven primarily by well control philosophy and disconnection risk.

Floating Semi-Submersibles

- Require the ability to shut in, shear, seal and disconnect at any stage of the operation.
- Landing strings must provide dual barriers and emergency disconnection capability.
- Systems include control lines, valves, and multiple functional components.
- Increased complexity, cost, and operational risk.

Jack-Up Rigs

- Fixed to the seabed with no drift-off hazard.
- Use a surface drilling BOP with a subsea high-pressure drilling riser.
- Do not require emergency disconnection or subsea shearing capability.
- Enable simpler, lower-cost landing string designs.

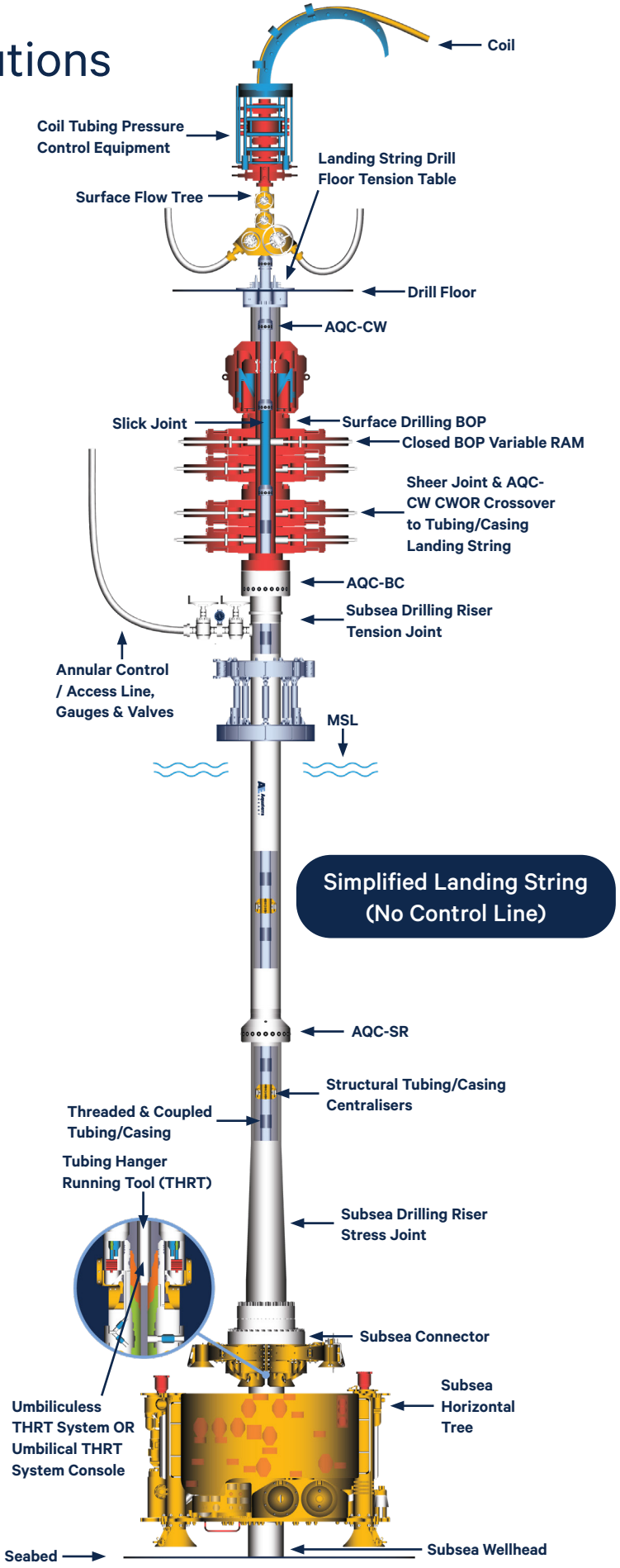
This distinction allows Aquaterra Energy to significantly reduce system complexity and cost for jack-up in-riser operations without compromising on well control and safety offering a complete lifecycle well access solution when combined with our subsea drilling riser systems.

The result is a simplified, purpose-designed solution that delivers:

- Improved barrier integrity and reliability.
- Reduced rental and capital expenditure.
- Faster deployment and reduced rig time.

Simplified Landing Strings (No Control Line)

- Tubing hanger running and pulling.
- Intervention and contingency operations.
- Optimised for jack-up in-riser deployment.



When Additional Complexity is Required

In certain applications, additional functionality is unavoidable. For example, where hydraulic or electrical continuity is required above and below the tubing hanger, or where long tool strings necessitate lubricator work valves.

In these cases, Aquaterra Energy provides controlled, engineered solutions incorporating:

- Hydraulic and electrical flat-pack control lines.
- Ported slick joints.
- Lubricator work valves for extended tool string length.

Associated considerations include additional equipment, installation time and operational risk, all of which are assessed during the design phase to ensure suitability for the specific well and rig.

Control Line Landing Strings

- Hydraulic and Electrical communication above and below the tubing hanger
- Where limitations on SCM functionality are present
- Lubricator work valves for extended tool string length

Landing String Analysis

Our engineers perform detailed analysis of landing strings, including:

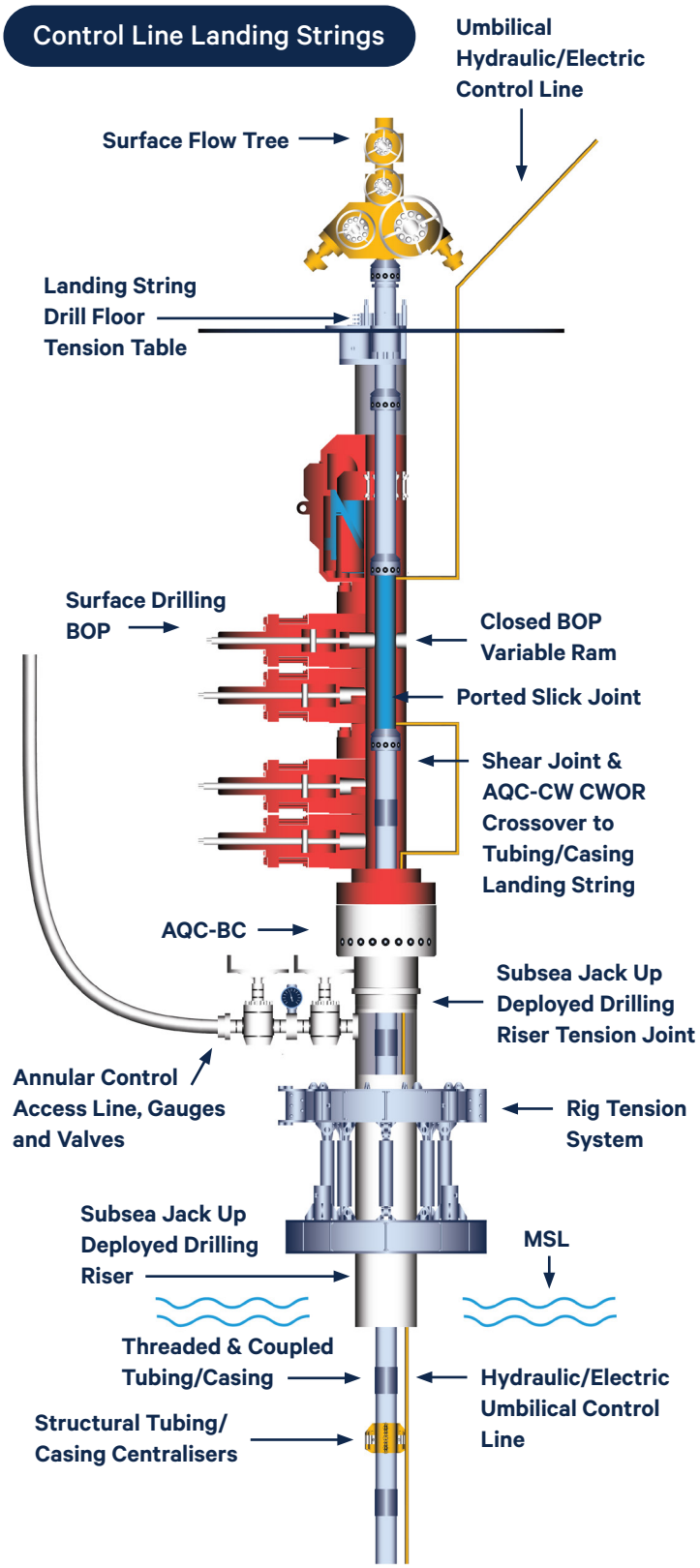
- Running, tensioning and handling.
- Fatigue and strength assessment of landing strings.
- Verification against ISO 13628-7 and API 17G.

In-Riser vs Open Water Intervention

In-riser landing strings enable operations not possible with smaller bore open water intervention risers alone, including:

- Tubing hanger and tubing installation and recovery.
- Internal tree cap installation and removal.
- Full well lifecycle access using the combined drilling riser and landing string.

While many intervention activities can be performed using open water riser systems, in-riser landing strings remain essential where tubing hanger handling or full well access is required.



Engineered for Performance: Riser-Based Well Access System Connectors

Our AQC-SR and AQC-CW Riser Connectors

At the core of our subsea Well Access Solution lie our proprietary patented AQC-SR and AQC-CW connectors — specifically designed and qualified for high-fatigue, high-pressure subsea and surface drilling, intervention, snubbing and abandonment riser-based applications.

Proven across global shallow and deep water basins, they combine exceptional fatigue performance with gas-tight, metal-to-metal sealing and repeatable performance after hundreds of makes and breaks.

The AQC-SR and AQC-CW are designed for long service life, offering a repeatable gas tight seal time after time. They are fully inspectable, measurable, and repairable, with replaceable components that simplify servicing and five-year overhauls.

AQC-SR and AQC-CW Key Features

- Designed and qualified to **ISO 13628-7, API 17G and API 16A** standards.
- **Cross-qualified** for drilling, intervention, snubbing, and abandonment operations.
- Available sizes: 4-1/2” ID to 20” ID, providing full bore access for 18-3/4” and 13-5/8” surface and subsea wellheads, trees, and large crown plug recovery (7-3/8” ID) during intervention.
- Suitable for **HPHT, CO_2, and sour service** qualified applications.
- **Gas-tight metal-to-metal seals** with elastomeric testable seal arrangement, upon make up.
- **Fast make-up** with replaceable and inspectable seal ring for extended service life.
- Preloaded **static connection** designed and **qualified for dynamic loading.**
- Running shoulders enable **fast-riser spider operation** without manual bowl and slips.
- Inspectable, measurable, repairable, and replaceable components for long service life and **repeat make-and-break cycles.**
- **Anti-vibration** dog drive bolt lock.
- **Integral low torque components** eliminate dropped-object risk and improve drill floor red zone safety.

AQC’s are more than just connectors – they deliver assurance of long-term performance, operational efficiency, and repeatable offshore success.

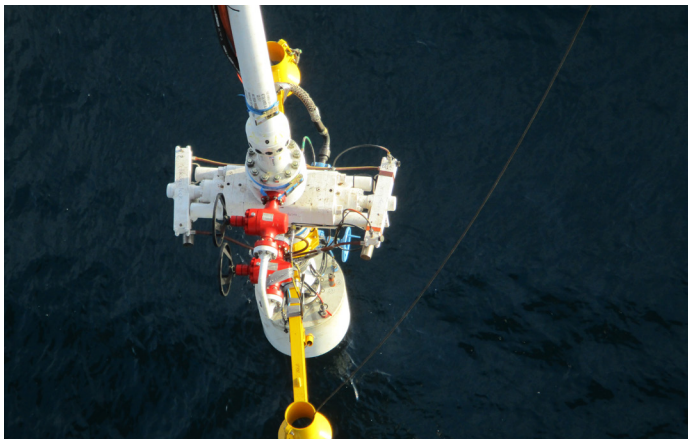
AQC-CW

AQC-SR

Experience Includes:

- Multi-well subsea horizontal tree intervention campaign to increase and to restore oil production offshore Nigeria, extending a brownfield's economic life.
- 7-3/8" ID CWOR system for a subsea multi-well, semisub deployed abandonment campaign offshore Spain (Mediterranean and Atlantic).
- TRT production bore and annular agnostic connector system for LWIV subsea pressure control stack offshore Australia, New Zealand, Brazil and UKCS.
- Abandonment of several, 1960s to 1970s, subsea vertical tree wells requiring legacy and custom-built subsea wellhead connectors offshore Middle East.
- Supply & in-service support of a complete 7-3/8" ID deepwater CWOR system to a LWIV operator.

Aquaterra Energy's subsea intervention, snubbing and abandonment solutions transform what's possible from jack-ups and lift-boats through to semi-submersibles and light well intervention vessels. By combining field-proven riser hardware, robust analysis, and decades of offshore experience, we deliver a complete, field-ready Well Access Solution.



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A proven subsea solution that's been delivering safer, more efficient, and more sustainable offshore results.

Get in touch with our team of engineering experts to discuss our Well Access Solutions for subsea intervention, snubbing and abandonment.

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