Dublin Offshore

LOAD REDUCTION DEVICE

PRELIMINARY SPECIFICATION

LRD BENEFITS

REDUCED RISK

LONG TERM PERFORMANCE

BESPOKE RESPONSE

LOW TECHNICAL NOVELTY

ESTABLISHED MARINE MATERIALS

ROBUST & SIMPLE DESIGN

The primary goal of the LRD is to reduce the overall risk profile and cost of energy on FOW projects however there are some additional environmental and design benefits which can be considered important by the customer. The LRD can be integrated into a wide range of site conditions, platforms and mooring systems which can result in CAPEX reductions in the mooring system. The LRD benefits across cost, environmental and design performance are summarised as follows:

Cost

- CAPEX and LCOE reduction
- Cost Optimised mooring system
- Risk reduction
- Reduced logistics with moorings BOM
- Increased local content
- Removal of supply bottlenecks

Environment

- Reduced anchor footprint
- Removal of chain thrashing and seabed impact
- Noise reduction
- Reduced site boundaries and permitting requirements
- Improved stakeholder engagement

Design

- Increased use of synthetic rope
- Reduced design driving loads
- Remove line replacement operations
- Bespoke mooring response
- No novel materials
- Full life maintenance free mooring system

By using a simple gravity-based mechanism constructed from well-established and mature materials (steel & concrete) the LRD based mooring will deliver high performance over the full life of the mooring system. The certification process is based on extensive engagement with DNV and is fully defined within existing codes and standards. Early engagement in the FOW project allows for the maximum benefits to be made, such as:

- Mooring system op imisa ion such as move from a catenary to an inclined taut
- Reduced footprint and minimised seabed interference
- Reduced mooring line quan ity
- Smaller chain and anchor
- Removal of chain, clump weights & buoyancy modules from the system
- Smaller installa ion vessels
- Platform mass reduc ion
- Increased Mean Time Between Failure & improved Annual Energy Produc ion.

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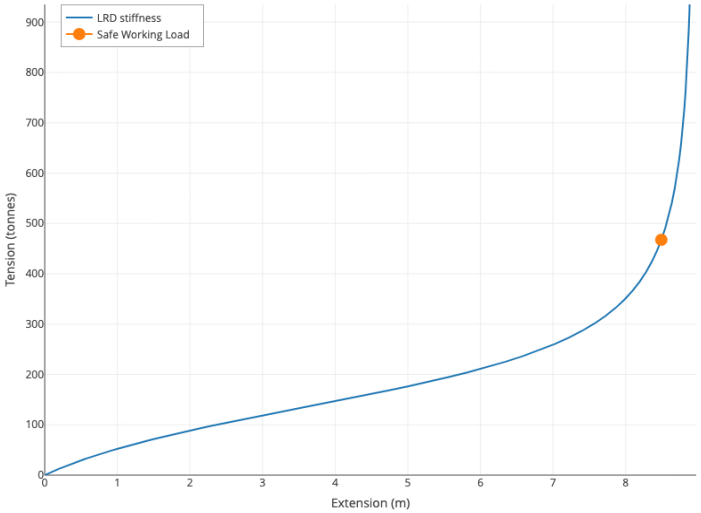
LRD SPECIFICATION

LRD SIZING & PERFORMANCE

not to scale



LRD General Arrangement & Force / Response Curve

PRELIMINARY SPECIFICATION

MBL	820 tonnes
SWL	470 tonnes
Height	17.5m
Elongation at SWL	8.49m
Water Depth Rating (MSL to LRD centre)	100m
Mooring line declination	70deg
Material	Structural Steel, Concrete Ballast, Bearings
Temperature Range	Operation -5° to 40°C, Storage: -20° to 55°C
Mooring Line Interface	D-Shackle or H-link (LTM)
Certification	DNVGL-OS-E301: Position Mooring, DNV-ST-0119 Floating wind turbine structures
Testing	DNVGL-OS-C401
Lifespan	30yrs Subsea Exposure
O&M Inspection Interval	5yrs, following initial development and inspection
Bio Foul Protection	Optional Anti-Foul Protection on Steelwork
Corrosion Protection	Isolated – 30yrs DNVGL-RP-B401

INTEGRATION

Fully Certifiable System

Simplified Bill of Materials

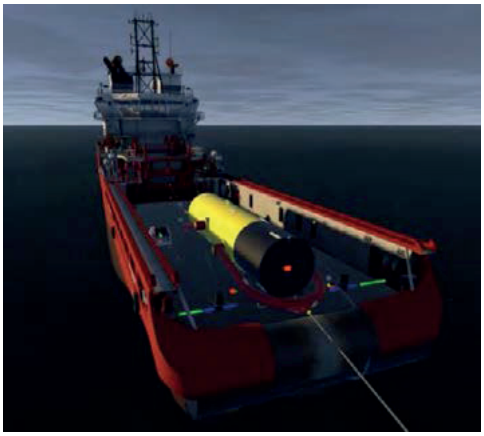
LOCALISED SUPPLY CHAIN

LIFE CYCLE TECHNICAL SUPPORT

MOORING SYSTEM

- LRDs are compa ible with all platforms, mooring configura ions, chain & rope and anchor types.
- Integra ion of the LRD can deliver cost reduc ion not just by reducing loads but by enabling full system opttmisatton. The compliance delivered provides design choices for the mooring designer enabling the use of low-cost, certtfied mooring equipment and addressing potenttal supply chain bottlenecks for heavy mooring equipment. The result is a low-risk, low-cost, locally produced mooring system.
- Cost reduc ion should consider op imisa ion of the full system Bill of Materials versus the baseline statton-keeping system (i.e. reductton in line qty, overall line length, anchor qty and spacing).

MARINE OPERATIONS



- Installa ion of the LRD u ilises the same Anchor Handler Tugs that are used for mooring and floater installatton. Specialist vessels or equipment are not required.
- The LRD is over boarded from the deck via the stern roller in an operatton that is commonly used for anchors.
- Inclusion of the LRD can result in the reduc ion of marine opera ions / installatton cost for the mooring system due to the reduced equipment size and as a result of the significant quanttty of chain and rope removed during the opttmisatton phase.

DELIVERY MODEL

WANT TO KNOW MORE? GET IN TOUCH

This LRD technology overview assumes a working knowledge of LRDs / FOW but please get in touch for our whitepaper, case studies or access to explanatory videos. Read our Frequently Asked Questions at:

www.dublinoffshore.ie/faqs

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LRD SELECTION

- The output analysis from the LRD sizing tool on the Dublin Offshore website is for information only and should not be relied upon other than as an initial guideline.
- The LRD is designed on a site-specific basis in order to optimise the system for the given project location and platform. Dublin Offshore work with mooring designers and project developers to optimise the mooring system with respect to cost and risk.
- Adjustment of the LRD is straightforward owing to simplicity of its design
  - therefore dimensions, arm positions and mass are easily adjusted.

LRD DELIVERY MODEL

- Our delivery model is to work with developers to optimise their mooring systems with the integration of the LRD at the concept phase of the project through early feasibility studies. This concept can be brought through detailed engineering by the mooring designer.
- Dublin Offshore will take responsibility for the design, procurement and delivery of the certified LRD to an agreed handover location with the installation contractor.
- The LRD is fabricated from standard structural steel and concrete ballast delivered to industry-standard tolerances and specification (e.g. DNV-OS-C401). Existing offshore / marine steel fabricators are well placed using existing capabilities – and local supply chain is prioritised.
- Get in touch with the Dublin Offshore team to optimise your mooring system and reduce costs with the inclusion of our technology.