FSRU / LNG terminal

Next generation FSU and FSRU's could be breaking with tradition

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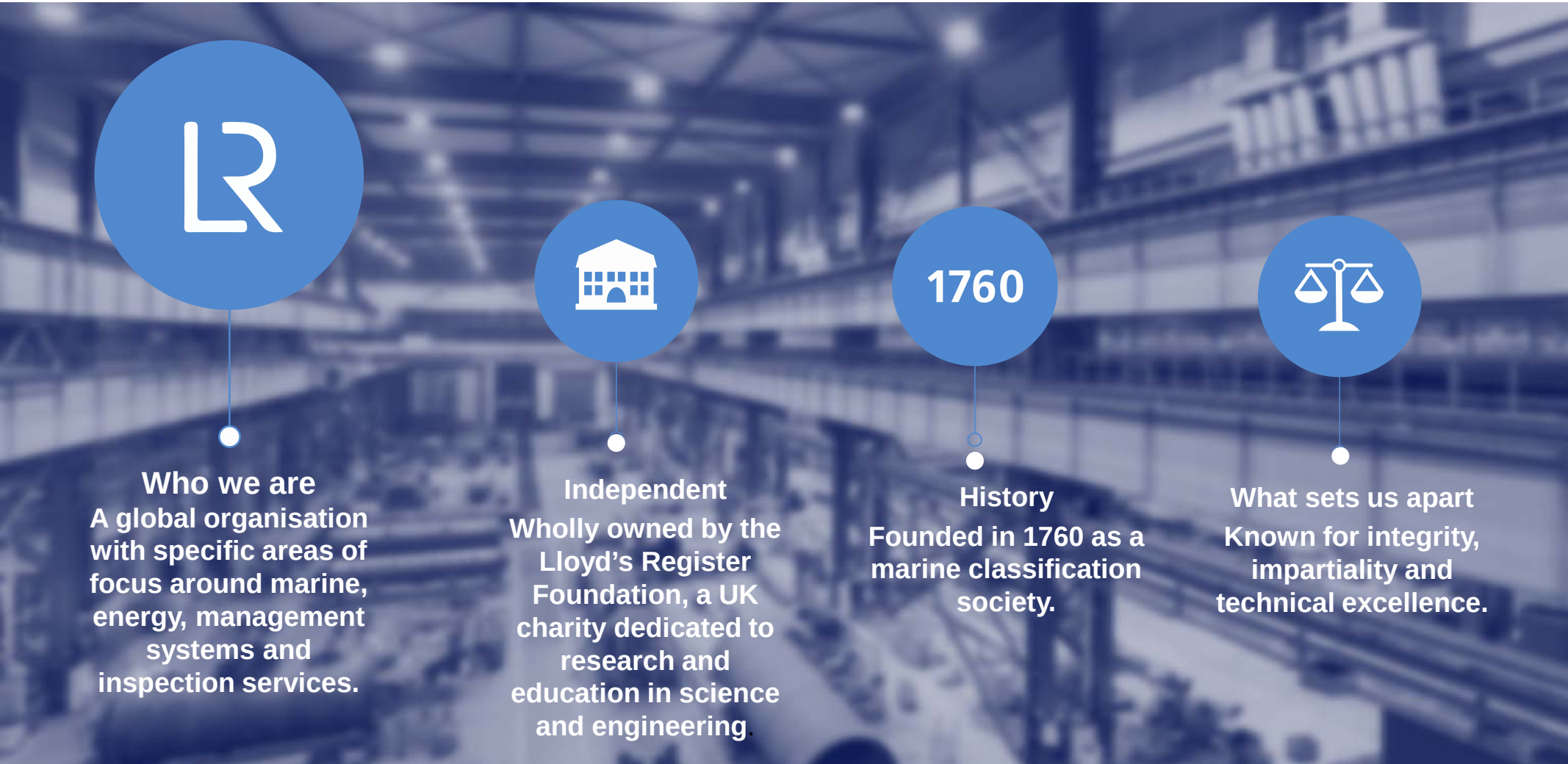
21 November 2019

Lloyd's Register

Introduction – Lloyd's Register



Who we are

A global organisation with specific areas of focus around marine, energy, management systems and inspection services.

Independent

Wholly owned by the Lloyd's Register Foundation, a UK charity dedicated to research and education in science and engineering.

History

Founded in 1760 as a marine classification society.

What sets us apart

Known for integrity, impartiality and technical excellence.

Our experts.

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Offshore Technology Manager

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South Europe Offshore Business Development Manager

Manuel Dominguez-Santisbon
Principal Specialist Process and Refrigeration

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Head of Global O&G Projects

Existing FSRU model

- Maritime approach
- New/Converted Gas ship
- Good track record
- Versatile
- Can easily revert to trading ship

The traditional benefits of the maritime FSRU Concept

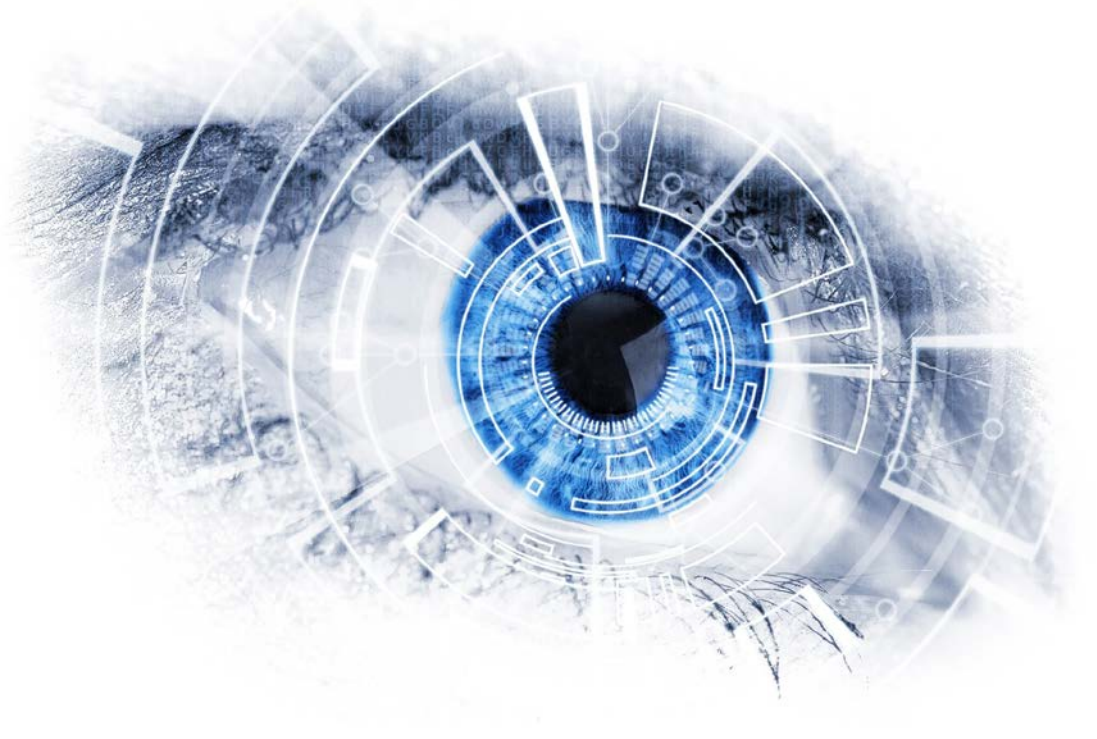
- Gives the ability to provide high pressure gas to be discharged straight from the ship into land-based gas distribution networks
- Does away with the LNG discharge terminal and the land-based gasification & distribution facility
- Circumnavigates any planning constraints and allows natural gas to be provided in locations where safety or environmental considerations are overly strict
- Only a gas pipe landing terminal, having a small footprint, is required to distribute the gas

This fundamentals of this have not changed but the opportunity has grown

The threats of the maritime FSRU Concept

- It is possible that an FSRU provider and operator could go into liquidation
- There is the risk that the project may not be approved by the local authorities due to the low local content because the vessel was built in a foreign shipyard.
- High cost of developing port infrastructure.
- Defined storage and regassification capacity - no N2 balancing
- Offshore located FSRUs sensitive to weather windows – not an issue with inshore

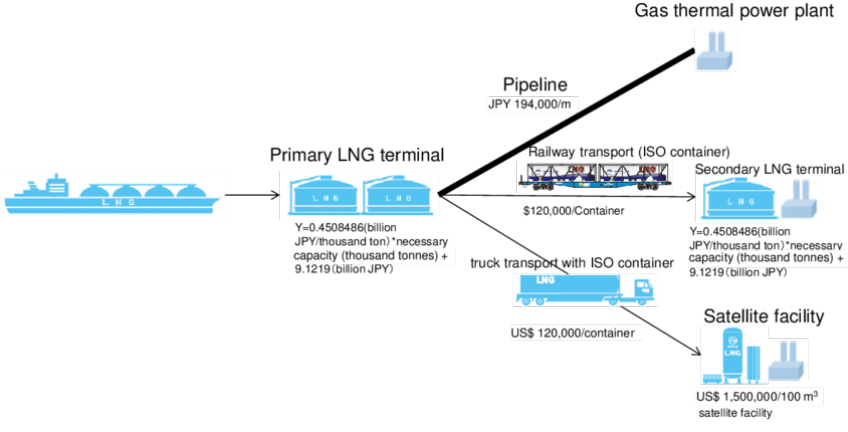
The FSRU and LNG terminal - a new lens



What's new?

- Modern concepts are taking credit for long contracts that ensures facilities can located on one site for **20 plus years**.

- The new LNG chain stakeholders are not just thinking about FSU's and FSRU's, but they look at the wider picture around floating export terminals and the associated infrastructure. These developers do not always come with a marine LNG background and are hence looking at these projects - which are more than floating elements through a new lens.



The question is what this new lens looks like, what do we recognised and what is new?

Current opportunities

- If your contract requires you to be on station for 20 years – why build a ship with propulsion, steering and navigation equipment that then needs to be maintained and keep in compliant with the maritime regulatory framework

- The Opex cost is significantly reduced by eliminating the ship function of the facility, the need for sea going personnel can also be eliminated

Non of the technology is new

Related LNG projects demonstrating new approaches

- Caribbean FLNG, barge type FSRU and power plant , Canadian LNG export terminals

Current opportunities

- Regulatory framework for maritime FSRUs :
  - ✓ Class rules- 5 yearly space entry requirements
  - ✓ IMO IGC/IGF Codes
  - ✓ Marpol and BWMC (as applicable)
  - ✓ SOLAS, STCW, ISM/ISPS/MLC Codes

- The "*Petrochem*" approach for barge installations at fixed location.
  O&G HSE approach, Major Hazard, SECEs: a goal based and risk focused regulatory framework.

Different schemes can be applied for permanently moored facilities

Inspection and Survey

Concept

Viability Consultation

We can help you understand the benefits and potential challenges of applying an RBI scheme in your operational environment

Plan

Planning Consultation

We can assist you in developing your complete RBI Plan with all necessary data, components, failure threats, limit states, criticality matrix and inspection plans

Inspect

Inspection Enactment

We provide operational integrity and inspection management activities necessary for you to satisfy both the RBI Plan and your own quality procedures.

Review

Classification Service

For LR Classification we will map and hold surveys and audits in line with your RBI plan. This will ensure compliance with LR's Rules and also harmonise with your statutory requirements.

Current opportunities

- Main 2T engine cost : 10-12m$
- Aux, navigational, LSA equipment: 5-6m$
- Up to 28 maritime crew member: 40k$/month
- Maintenance/inspection/consumable cost
- Insurance cost
- Cost of installing 50% regassification train redundancy for the larger units can be $10-15 million

Conclusion

- Is a ship type concept best approach? – why pay for an engine and marine equip you do not use?

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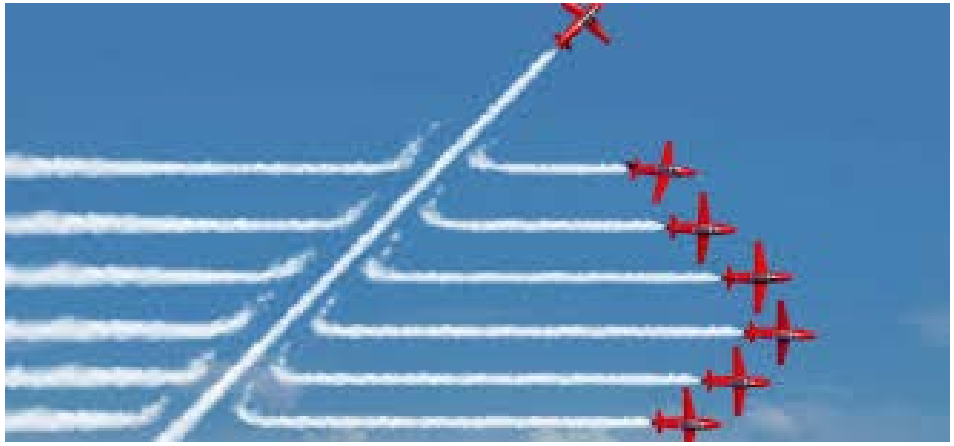
Disruptive thinking has only just begun



Change is happening faster and on a greater scale.

In the face of changing supply dynamics, in a low-price and cost control era, Oil&Gas Companies are relying on advanced technology and innovative solution to refine profitability.

Oil&Gas Companies are in the process of reinventing themselves.

Are you ready to change your engineering and product development process?

Thank you for your attention

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