



WOOD GROUP
KENNY

FLNG Riser Design Challenges

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Safety &
Assurance

Relationships

Social
Responsibility

People

Innovation

Financial
Responsibility

Integrity

The Challenges



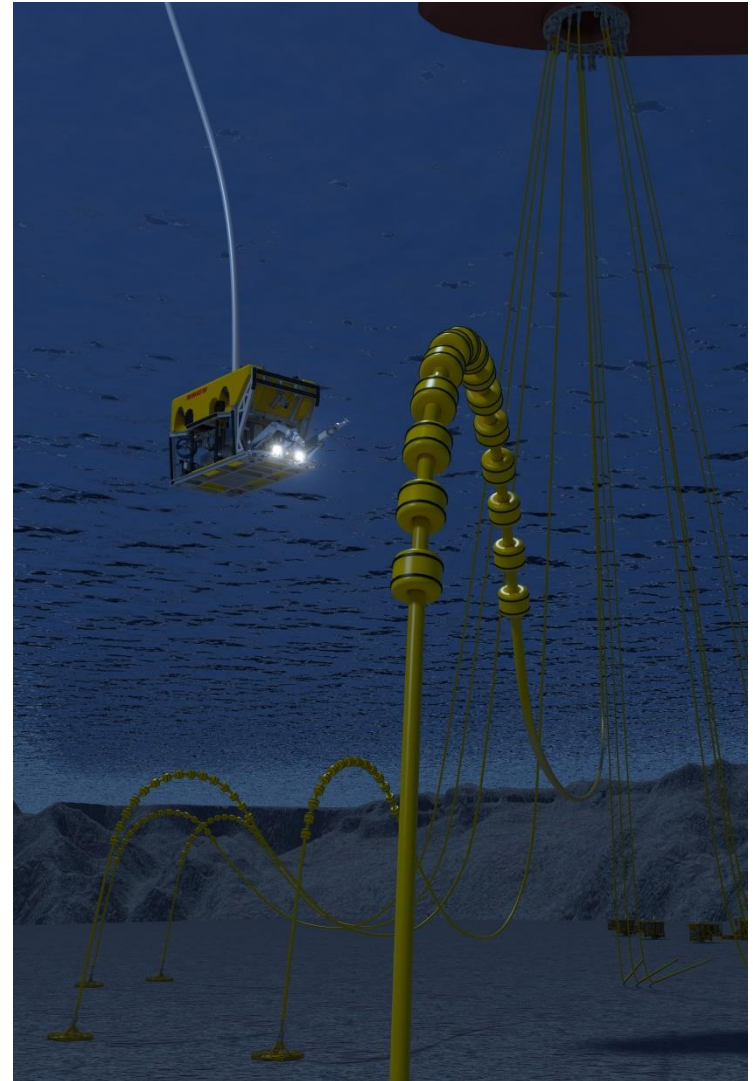
Riser Design

- Field life up to 40 years
- Subsea System uptime up to 98%
- Turret Moored
- Cyclonic Metocean Conditions
- Water Depths 200 m – 500 m
- HP/HT production fluid
- 10" – 12" ID pipe (Production)



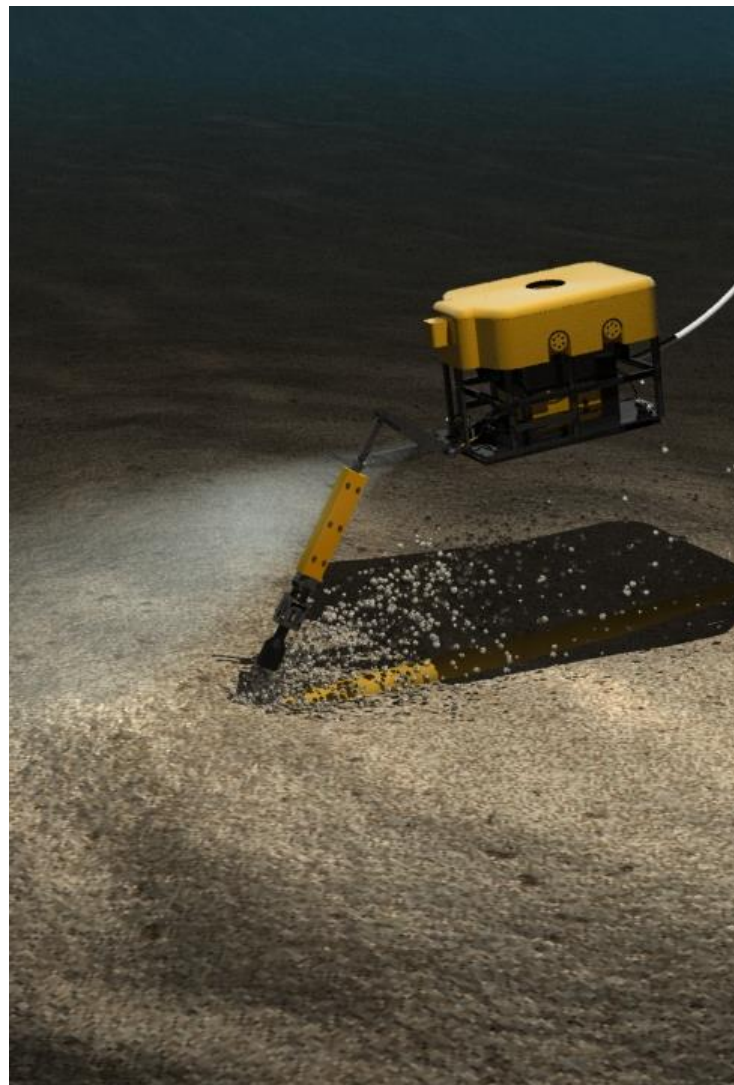
Design Life

- Design for full field life or planned replacement?
- Traditional flexible riser design life 20 – 25 years
- Flexible riser system service life drivers:
 - Fatigue in metallic components, e.g. armour layers, end fitting, bend stiffener steel matrix
 - Polymer ageing, internal and external sheath
 - Integrity of strength/wear tapes
 - Ancillary equipment service life



System Uptime

- Minimise need for (unplanned) intervention
- Disconnection during cyclones becomes impractical, due to lengthy disconnection and reconnection
- Ensure component reliability
- Achieved through:
 - Proactive integrity management
 - Planned replacement
 - Carefully consider system redundancy



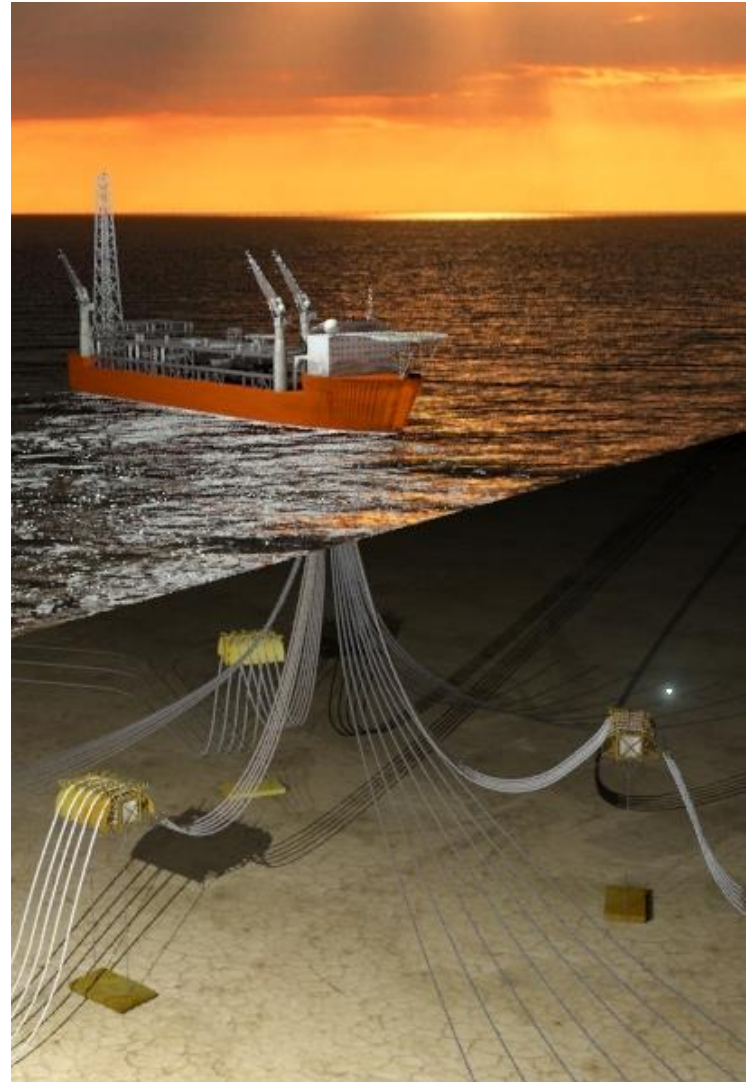
Cross-Section

- Design pressure typically 300+ bar
 - Approaching the current qualification limit for 10" – 12" ID flexible pipe
- Design temperature typically 120°C to 130°C
 - Approaching the current qualification limit for polymer materials
- Moderately deep water depths (250m to 500m)
 - Collapse resistance becomes important
- Combination of functional requirements pushes the envelope of technology



Environment

- Typical operating conditions are 1yr to 10yr non-cyclonic
- Extreme conditions typically 100yr cyclone
- Survival conditions up to 10,000yr cyclone
- Operational constraints, e.g. filling with water/MEG, are not desirable in order to maximise up-time.

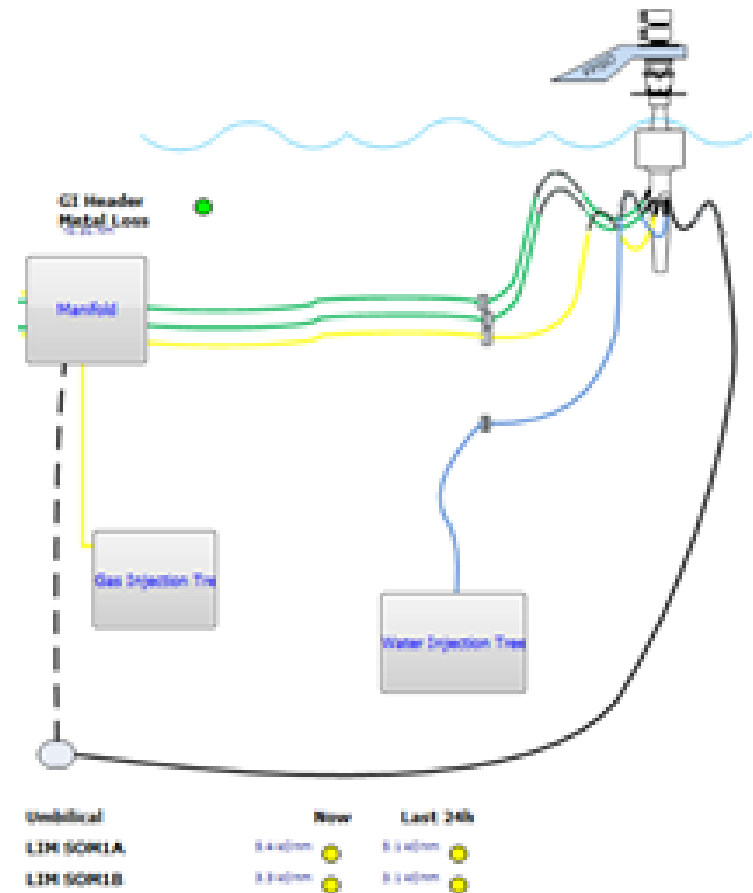


The Solution



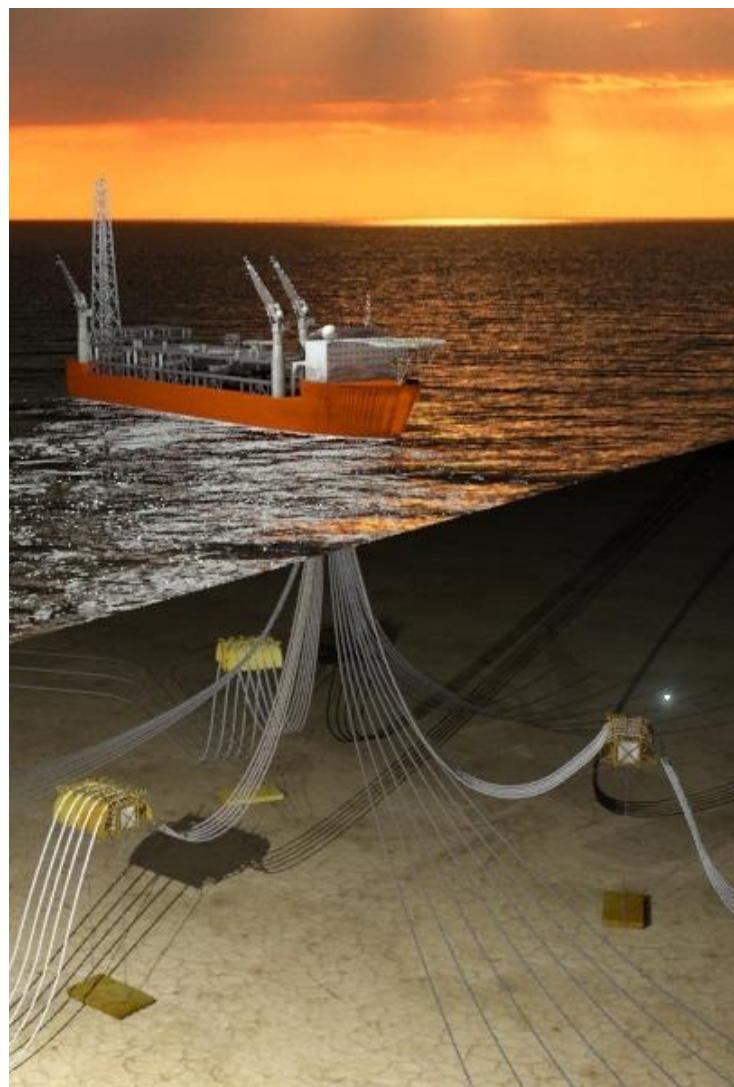
Integrity Management

- IM is a long term investment: small increase in CAPEX, large OPEX saving
- Implementing IM in the early design process
- Understanding how and why riser systems fail to target IM measures
- Allows proactive rather than reactive intervention if required



Riser System Design

- Individual challenges do not present a step in technology. The difficulty is the combination of challenges
- No Silver Bullet
- Holistic system design approach is required
- Relying on experience and understanding of all aspects of riser system design
- Incremental Technology Development



Questions?

