Production Strategy for Challenging Deepwater Field Developments through Flow Assurance

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Agenda

- Flow Assurance in Challenging Deepwater Development
- Engineering Strategy and Role of Flow Assurance
- Optimised Solution through Integrated Approach
- Conclusions

Introduction

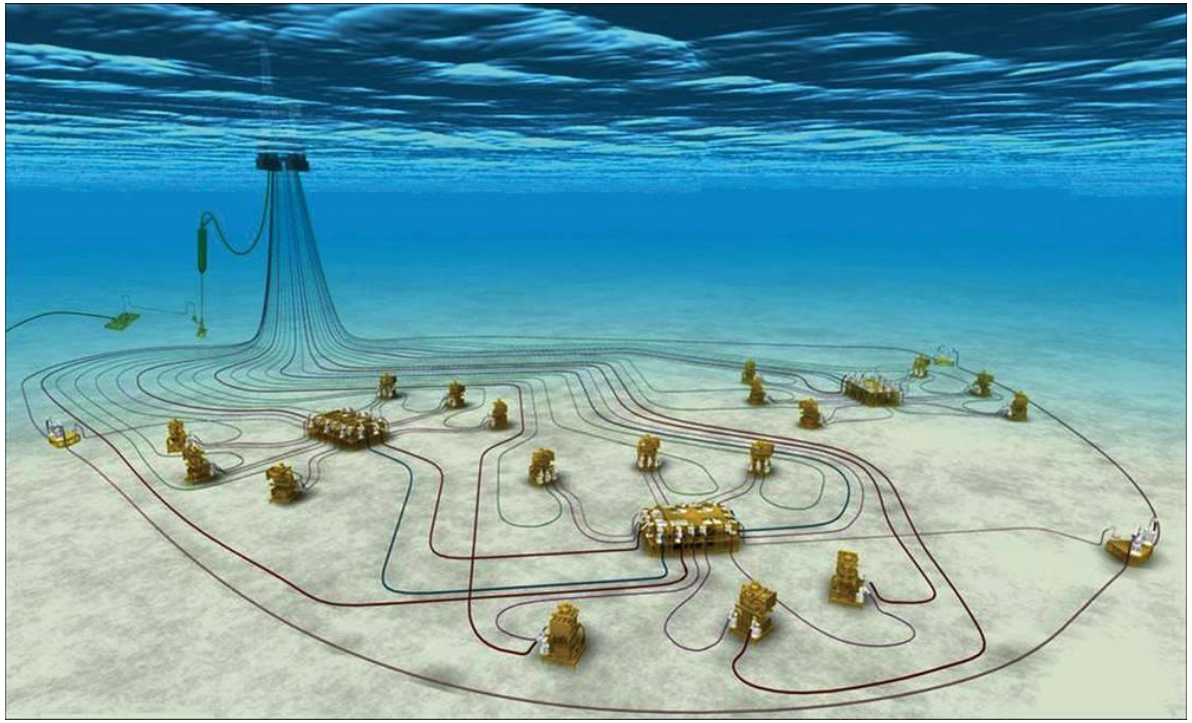
- Traditionally early flow assurance is conducted in isolation with no involvement of installation considerations and is handed over to EPCI Contractor which has limited input on design optimisations

- However, working together with T&I can achieve competitive solution from practical standpoint

- Not integrating with key interfaces from the early phase may create issues in achieving viable operability and trigger costly re-design at late stage

Introduction

- Some large scale field layouts can be complex
- Several pipeline sizes
- For a complex field architecture, it can be a difficult task to provide a competitive solution considering the various vessel requirements
- Aim to simplify subsea architecture



(Picture: Petrobras)

Challenge

- Floating Liquefied Natural Gas (FLNG) FEED project in West Africa
- Gas Production from deep water reservoir at depth of 1800 m
- Reservoirs have low temperatures (35 – 45 °C)
- Particularly low temperatures downstream of subsea choke due to high pressure reservoirs
- One of the main project drivers is reduced cost

Strategy

- EPCI Contractor optimised engineering solution with low CAPEX
- Installation is driving the design through utilisation of existing assets
- Optimise the engineering design to suit contractor's capabilities, ***ensuring*** engineering integrity is maintained throughout

Lay Vessel North Ocean 105

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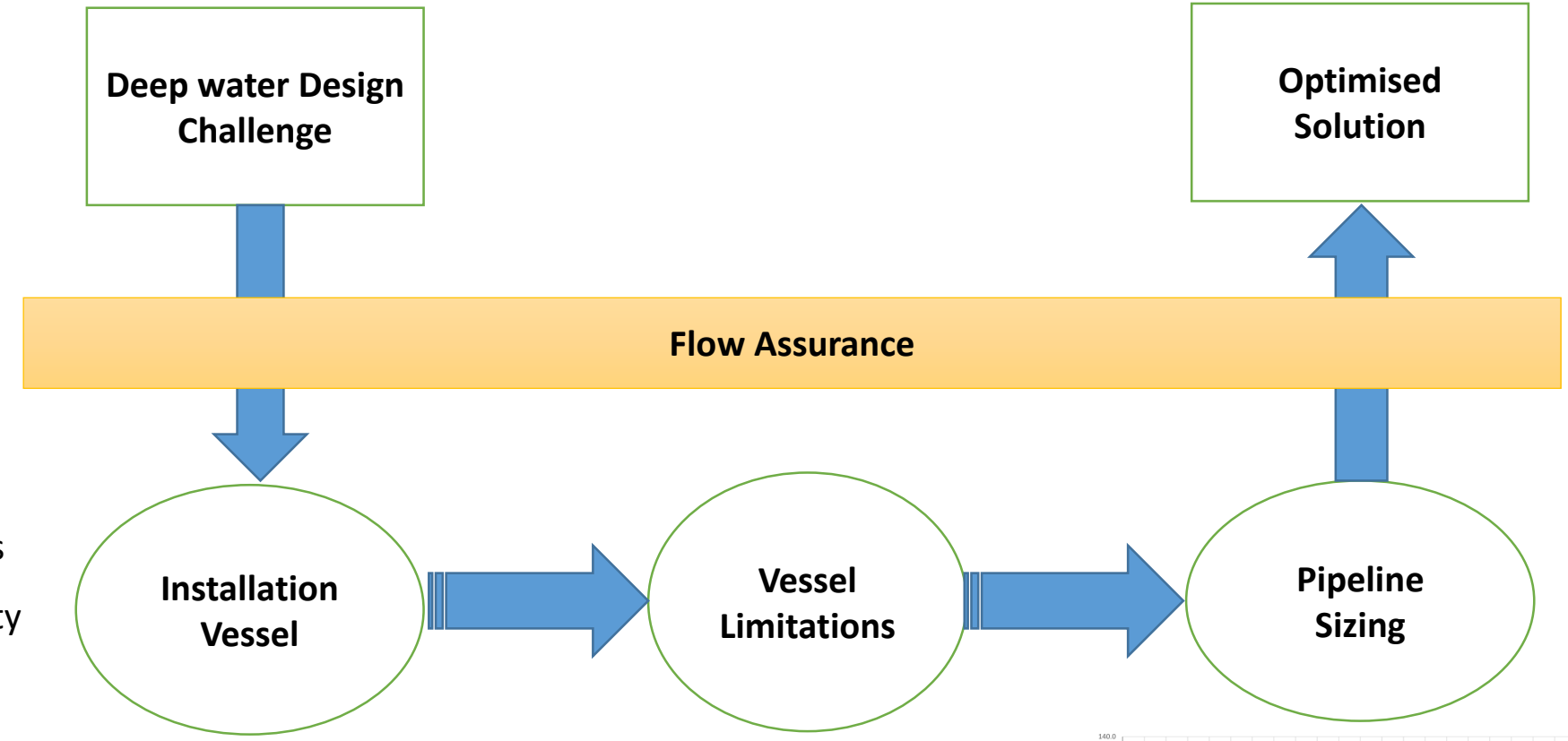
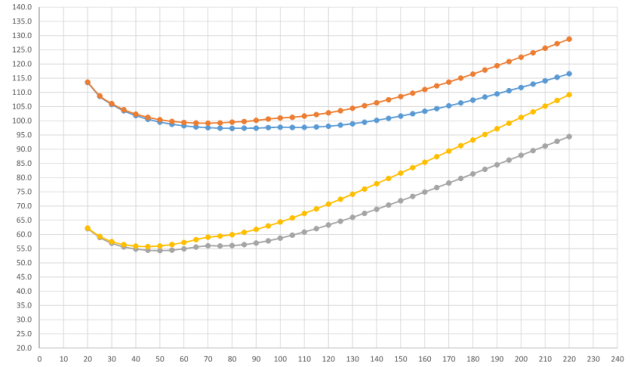
Strategy



- Optimise
  Installation Trips
- Vessel availability

Ensure deliverability and adherence to design Limits

- Pipelay capability



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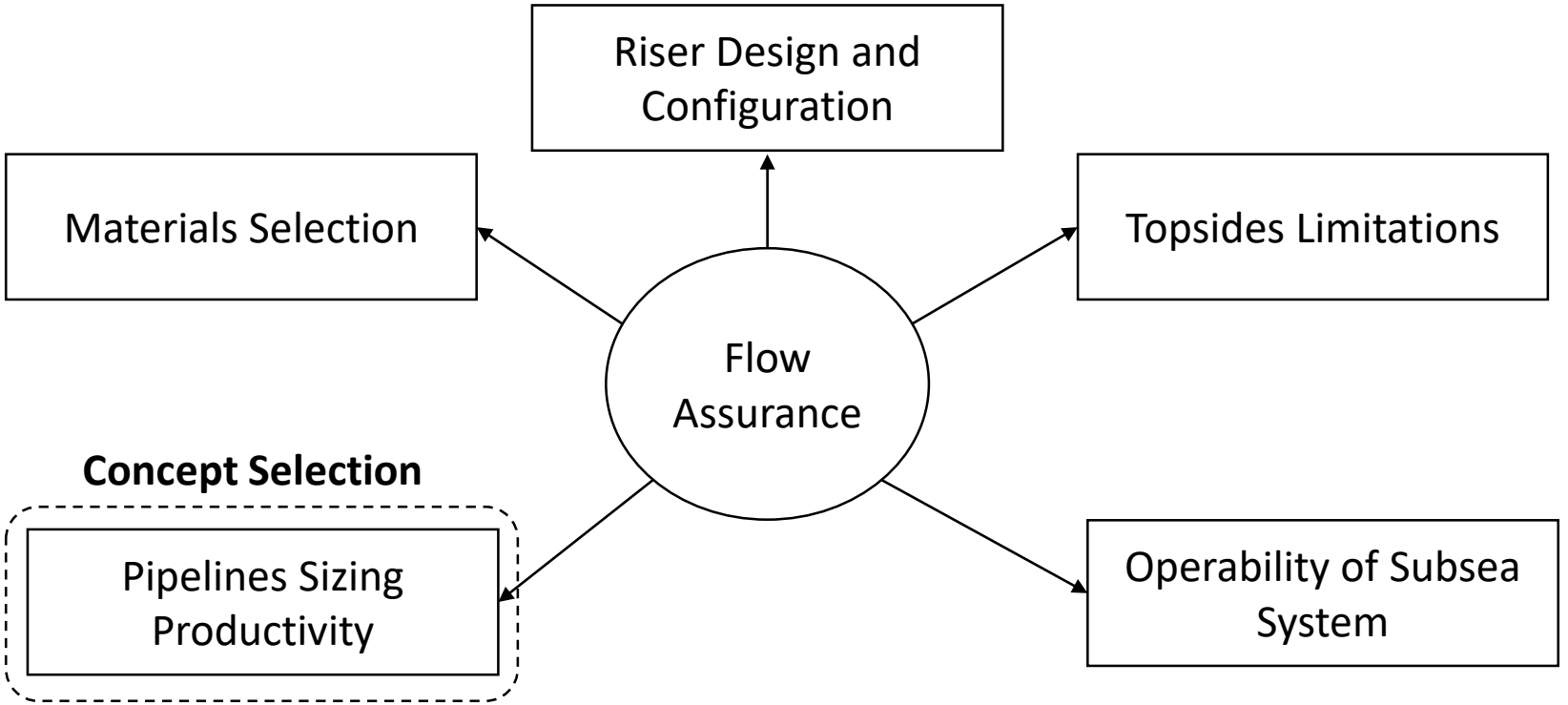
Flow Assurance Role – Subsea System Optimisation

- Flow assurance is central to the interfaces with the various engineering teams
- What can be achieved for EPCI contractors when given that central role



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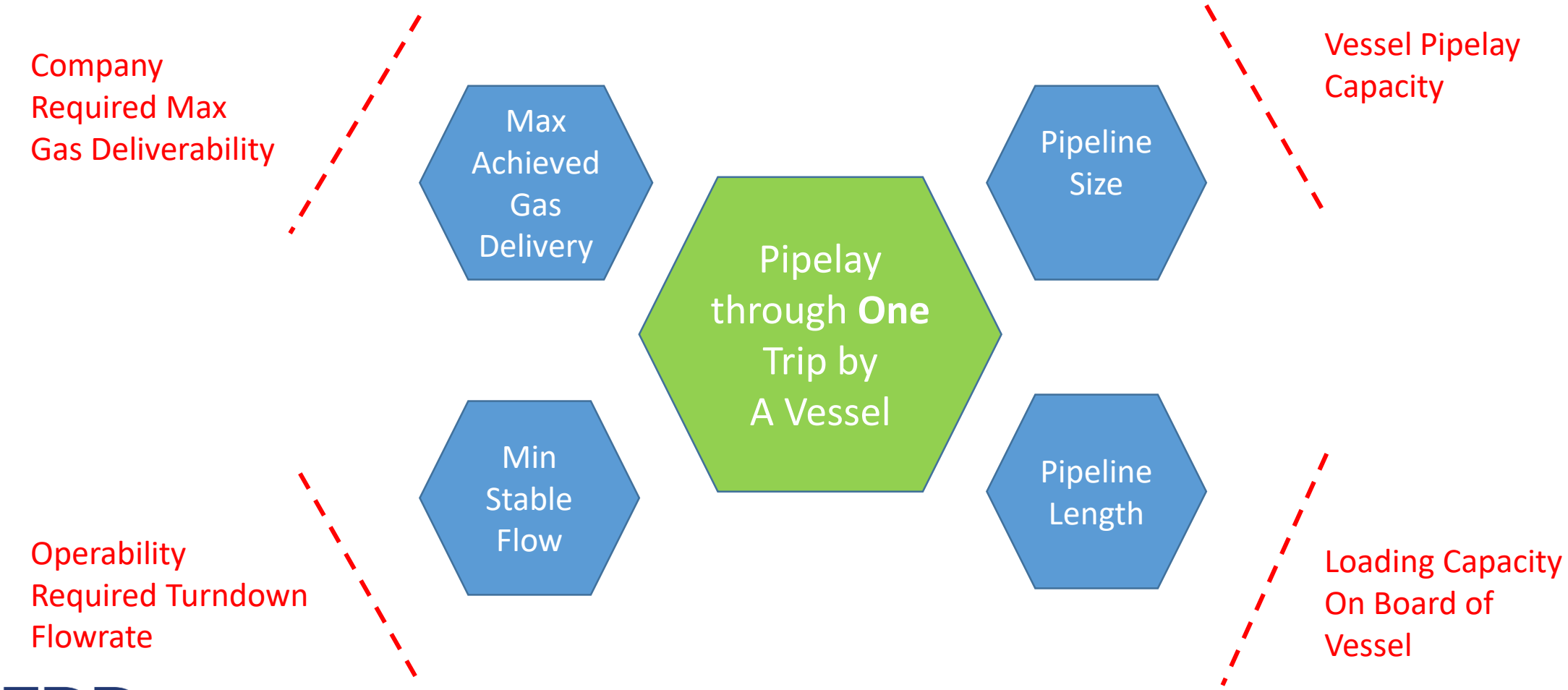
Flow Assurance Role – Subsea System Optimisation

- **Concept Selection – Pipeline Sizing and Productivity:** Avoid retrospective re-design - Ensure hydrates mitigations are in-built
- **Topsides limitations:** Isolation from the topside limitations may lead to significant re-work
- **Riser design and Configuration:** Simple configuration/design adjustments to accommodate flow assurance concerns lead to improved design and reduced cost
- **Materials Selection**: efficient interfaces lead to recommend materials and operating scenarios that are inline with each other from early on
- **Operability of the subsea system:** Operating scenarios that test the actual subsea system limits with the topside boundaries accounted for

Optimised Solution



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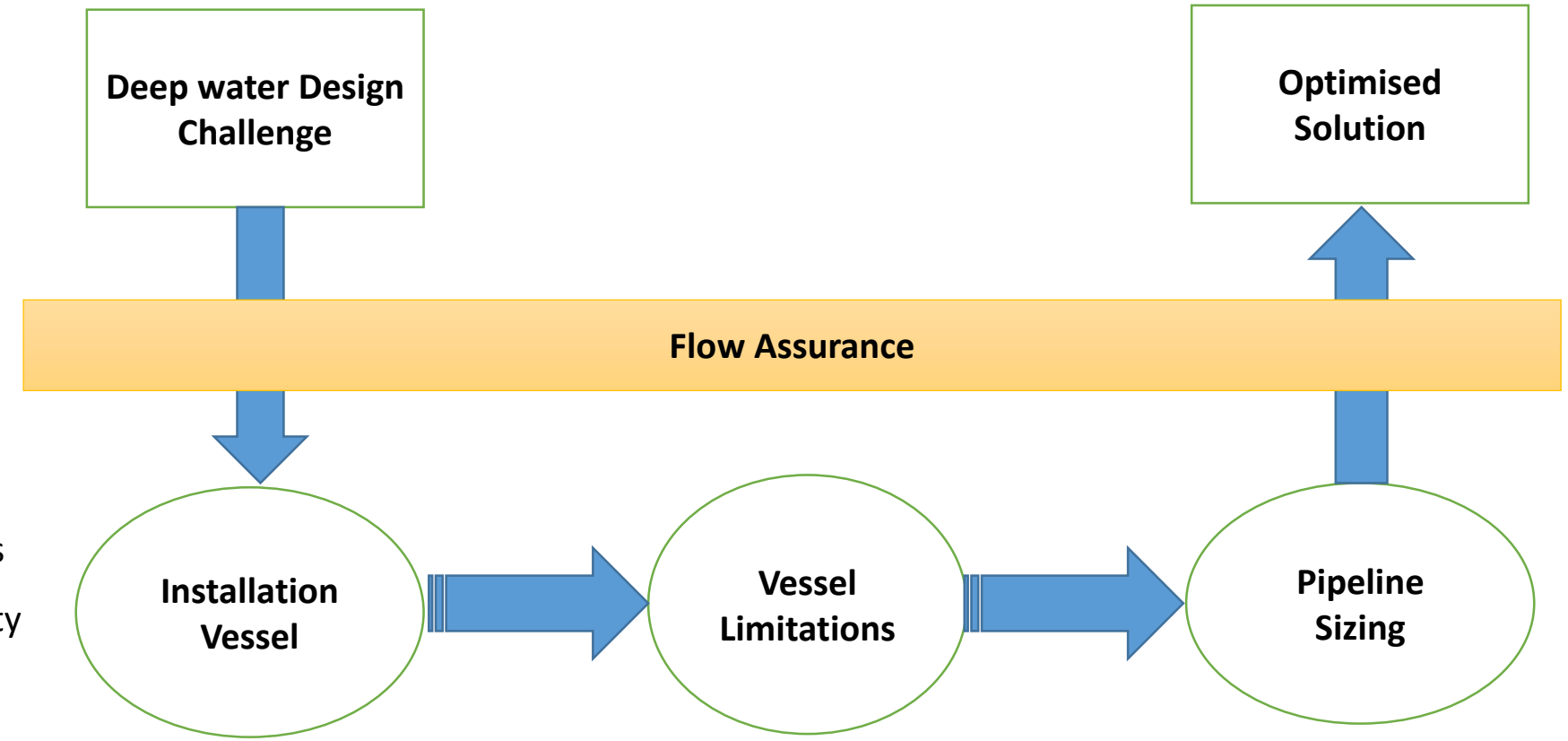
Areas of Further Optimisation

- Managing the risk of hydrate formation by balancing between expected risk and extreme conservatism in design
- Innovative thermal solutions, e.g. Electric Trace Heating
- Involve flow assurance at the route definition and bathymetry selection stage

Strategy



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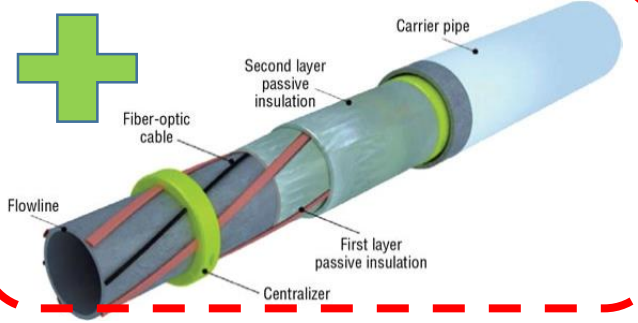
Ensure deliverability and adherence to design Limits

New Solutions

e.g. ETH-PiP

(Ref. Technip – www.offshore-mag.com)



- Pipelay capability

Pipeline Route

Bathymetry Design

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Conclusions

- Flow assurance is an integral part of field optimisation from concept, Pre-FEED/FEED and EPCI phases to achieve turn key solution for deep water field development.
- It is important to engage with subsurface and mid-stream at early phase of development
- Working within the integrated team will avoid redesign and ensure efficient operability.
- FA can ensure production strategy while optimising the subsea architecture which can be more feasible to install with available fleets in the market.
- Considerable savings in design, installation, commissioning and operability of the subsea system can be achieved for clients