

INSURANCE CAPACITY FOR FLNG – WHAT ARE THE RISKS?

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- Introduction
 - Insurance Market
- Study: Insurance of a Generic FLNG Project
 - Including Risk Engineering Overview
- Conclusions

Why Insurance?

- Risk Management
 - Risk Control
 - Self-insurance
 - Insurance
- Objective: Allocate expenditure across the three categories so that

“Total Cost of Risk is minimised”

- Self-insurance and Insurance Loss Layers

Upper Risk Layer:

Very Low Frequency, High Severity

Middle Risk Layer:

Moderate Frequency, Moderate Severity

Lower Risk Layer:

High Frequency, Low Severity

The Insurance Market



The Insurance Market

- Insurance market for upstream energy risks currently at its most competitive level since the late 1990s
- An influx of capital into the insurance market has increased capacity
- Several demand-related factors have come into play
- These have combined to force premiums downwards

Long term and increasing trend towards too much capacity chasing too little business...

The FLNG Capacity Challenge

Construction Insurance Capacity Requirements



Small Scale

up to 1 mtpa ~ USD 1 bn



Conversion / Mid Scale

up to 2 mtpa ~ USD 1 – 3 bn



Large Scale

up to 4 mtpa ~ USD 5 - 7 bn

The FLNG Capacity Challenge

Key Factors for Underwriters

- Near shore / offshore?
- Technology: Small scale (modular) versus conventional technology?
- Wells or pipeline feed system?
- Cyclone risk (yard and at field)?
- Accumulation risk with subsea (OEE)?
- Conversion versus new build FLNG
- Associated condensate and LPG production?
- Oil company or contractor scheme?
- Political risk?

FLNG INSURANCE

STUDY OF GENERIC LARGE SCALE FLNG
CONSTRUCTION INSURANCE

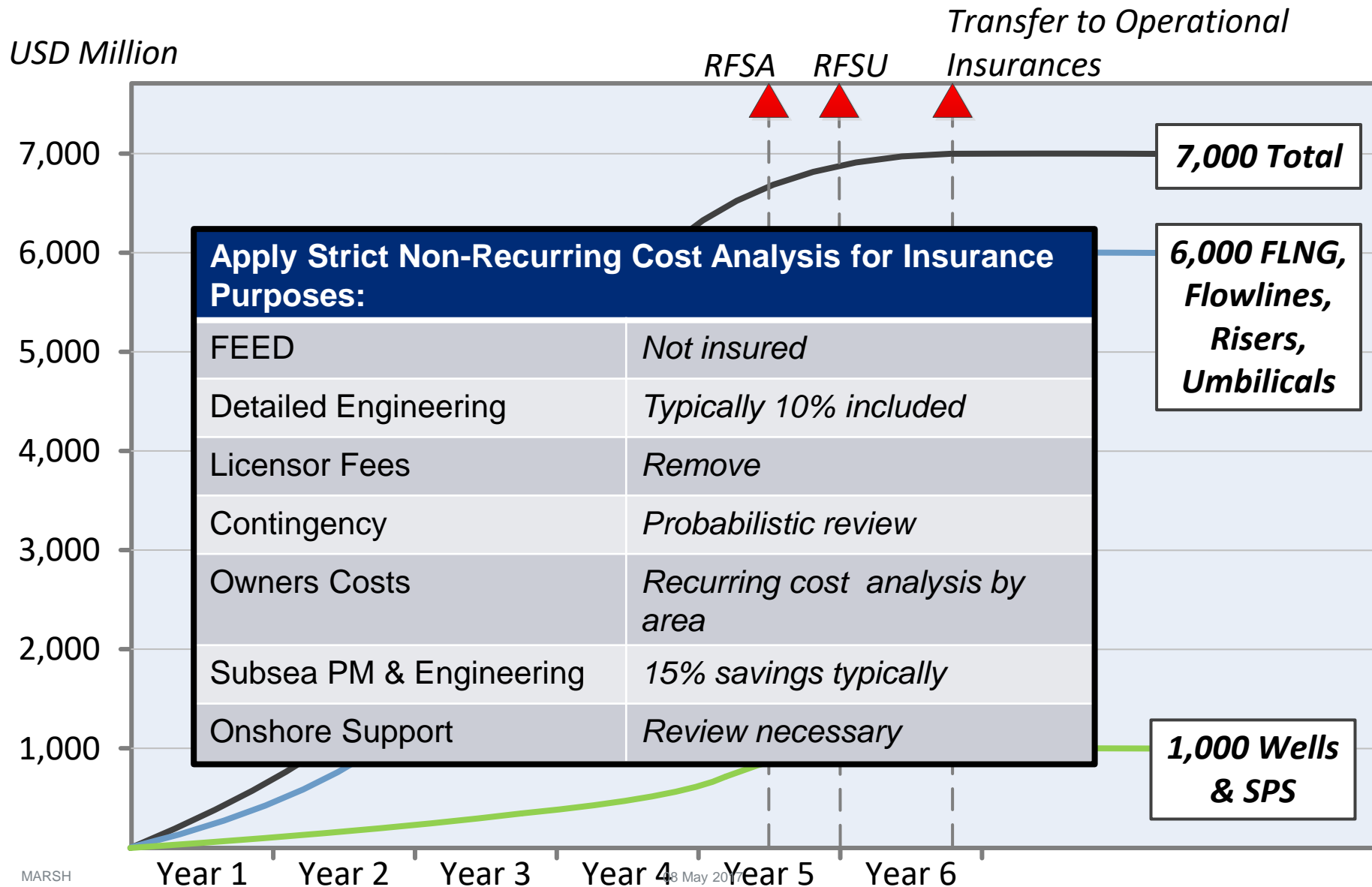
Placement of Insurance for FLNG Construction

Project Summary

- 3.2 mtpa FLNG
- Overall Project Costs USD 7.0 bn, split:
 - USD 6.0 bn FLNG (vessel, risers, flowlines,)
 - USD 1.0 bn subsea (drilling & completions, SPS, umbilicals)
- No allowance in the above for non-recurring costs - insurable values may reduce
- JV interests:
 - Operator 30% (will insure in commercial market)
 - Partner 1 25% (will not insure in commercial market)
 - Partner 2 20% (will not insure in commercial market)
 - Partner 3 15% (commercial market - prefers for Japanese markets)
 - Partner 4 10% (commercial market - prefers Korean markets)

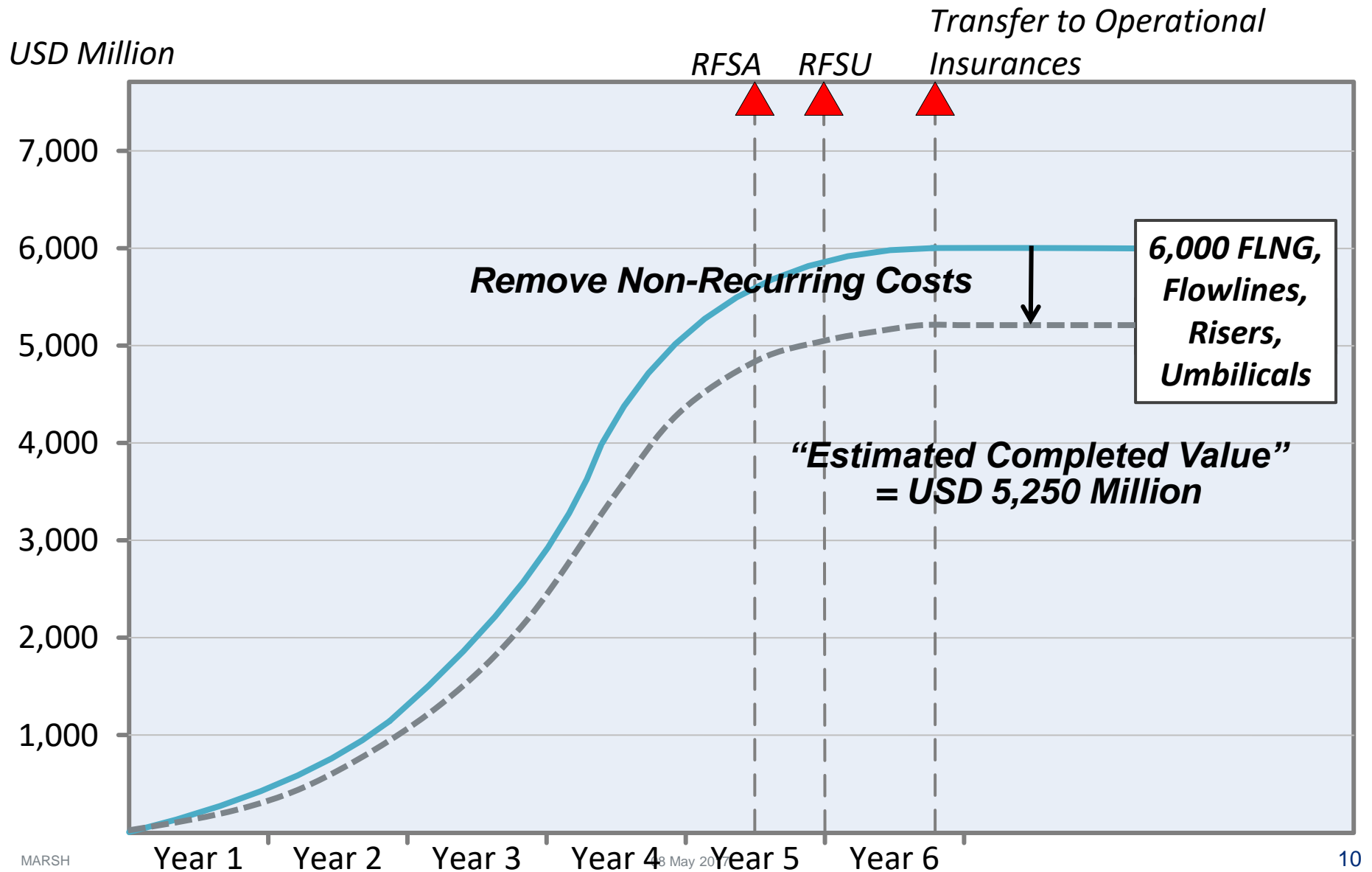
Project Costs

Cost Build-Up Over Time

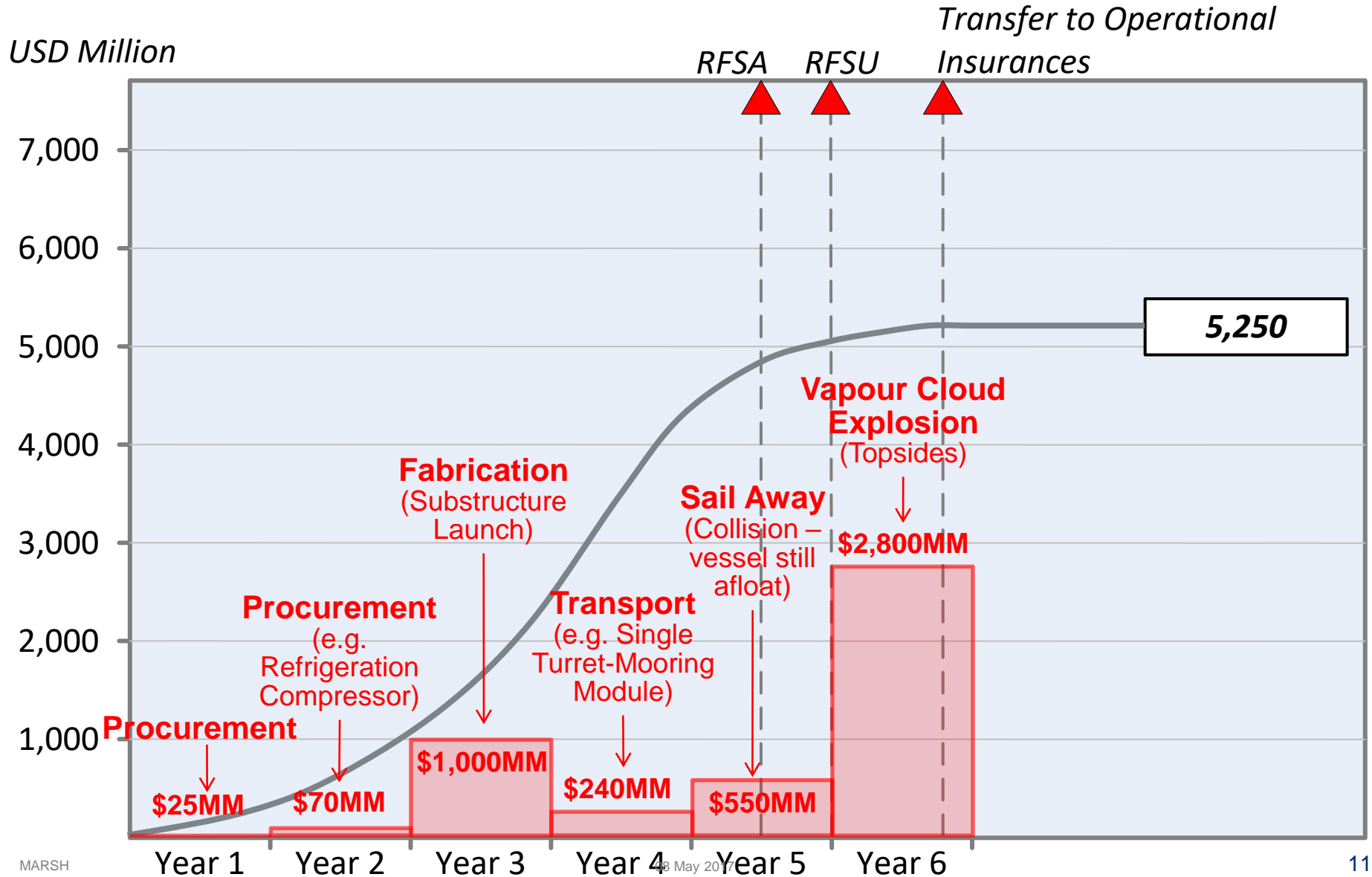


Project Costs

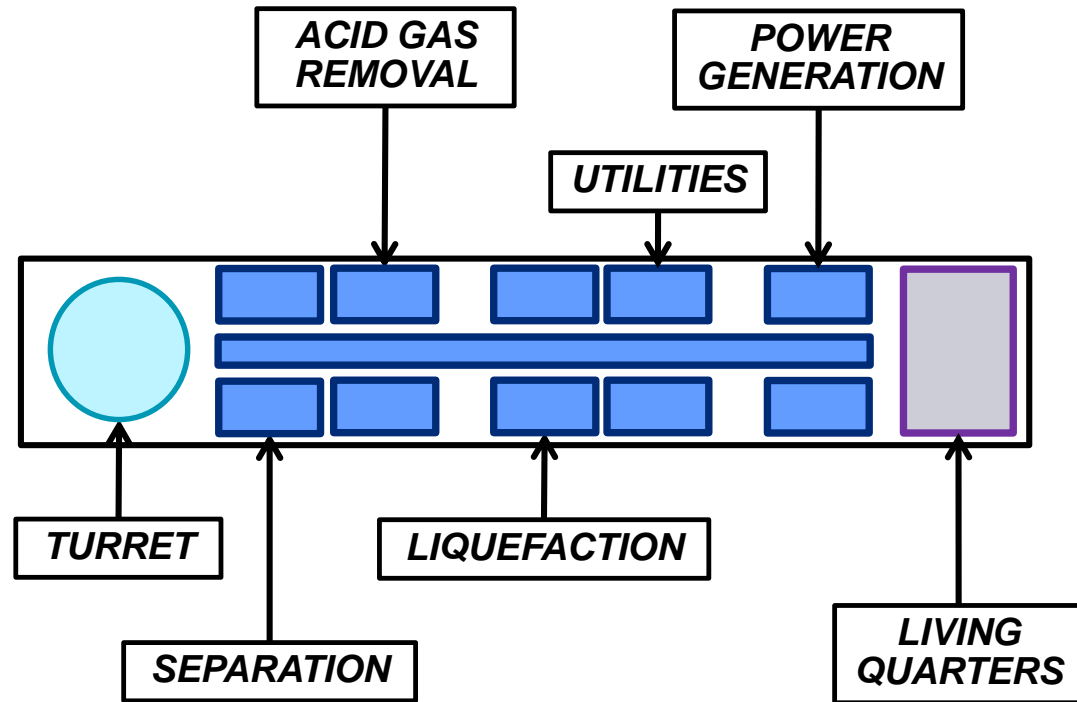
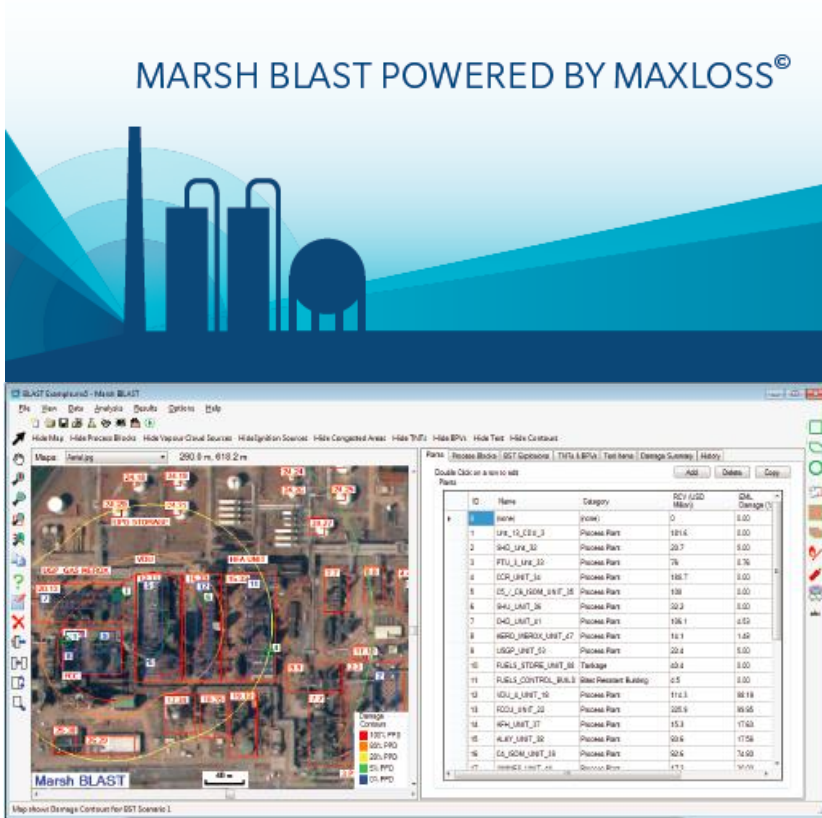
Cost Build-Up Over Time



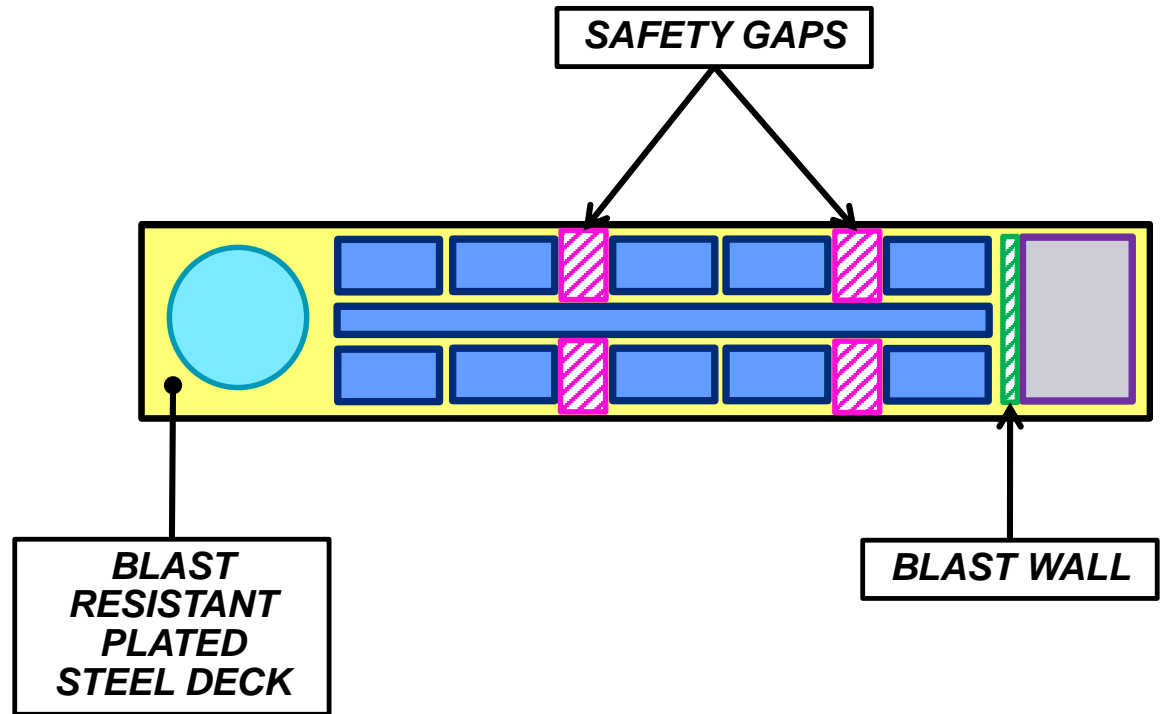
Loss Estimates Phasing



Vapour Cloud Explosion Topsides – During Start-Up

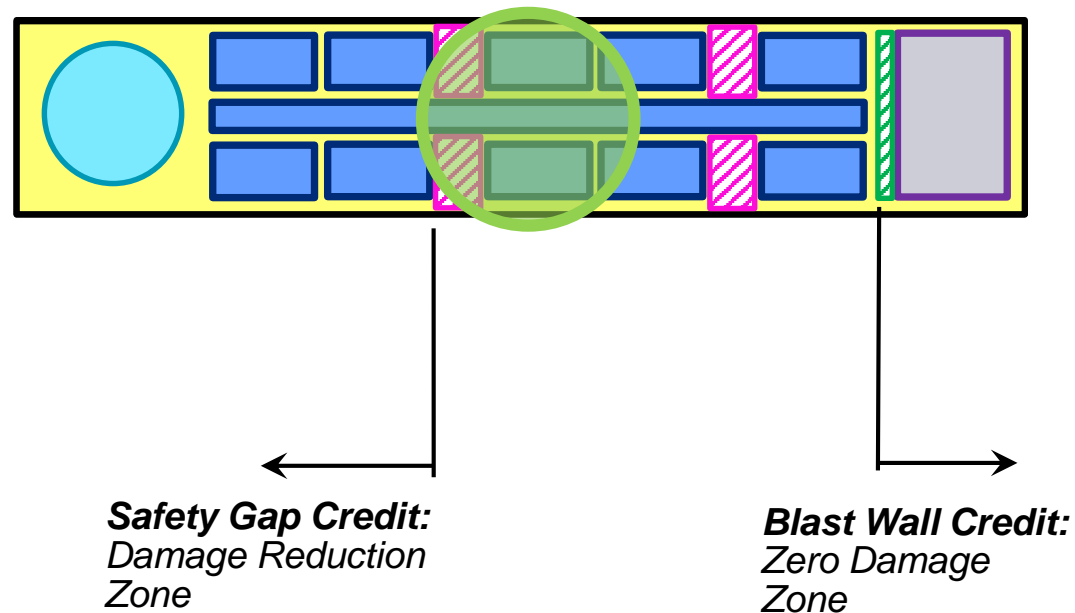


Vapour Cloud Explosion Topsides – During Start-Up

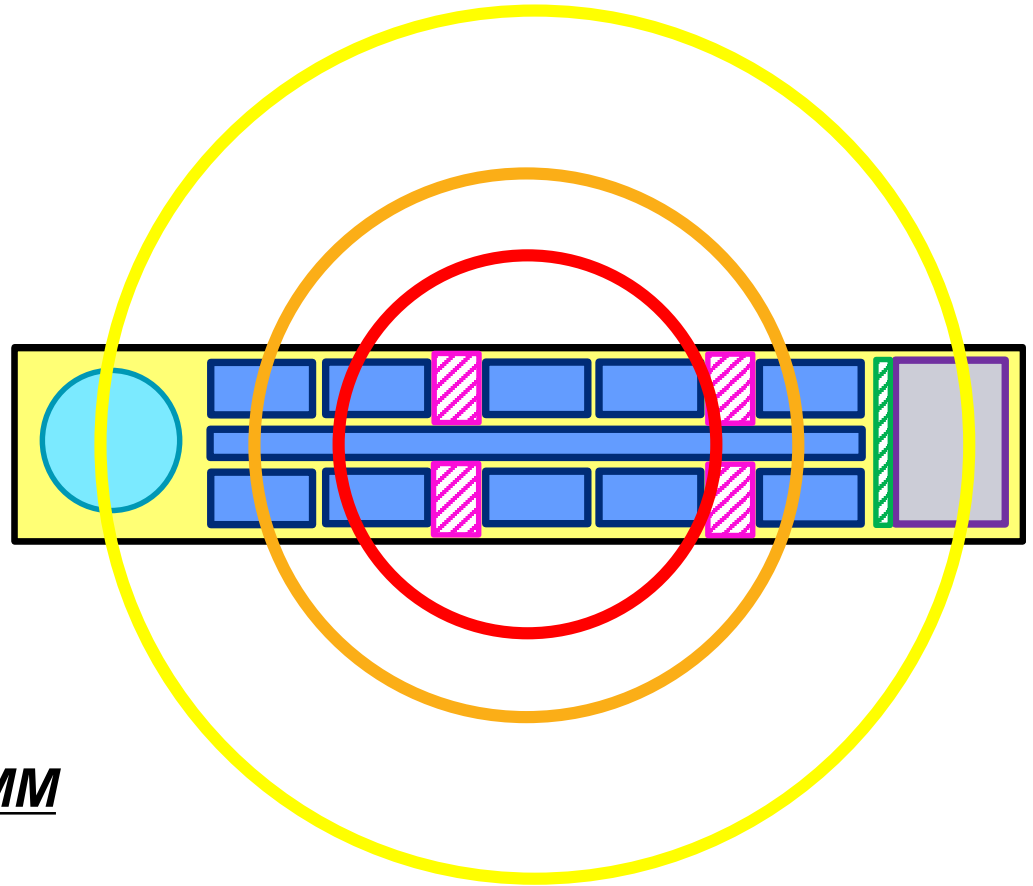


Vapour Cloud Explosion Topsides – During Start-Up

- VCE Source
 - *Mixed refrigerant (methane, ethane, propane)*
 - *7 tonne cloud mass*
- Mitigation
 - *Safety Gaps*
 - *Blast Wall*



Vapour Cloud Explosion Topsides – During Start-Up



- VCE Loss Estimate: **USD 2,800MM**

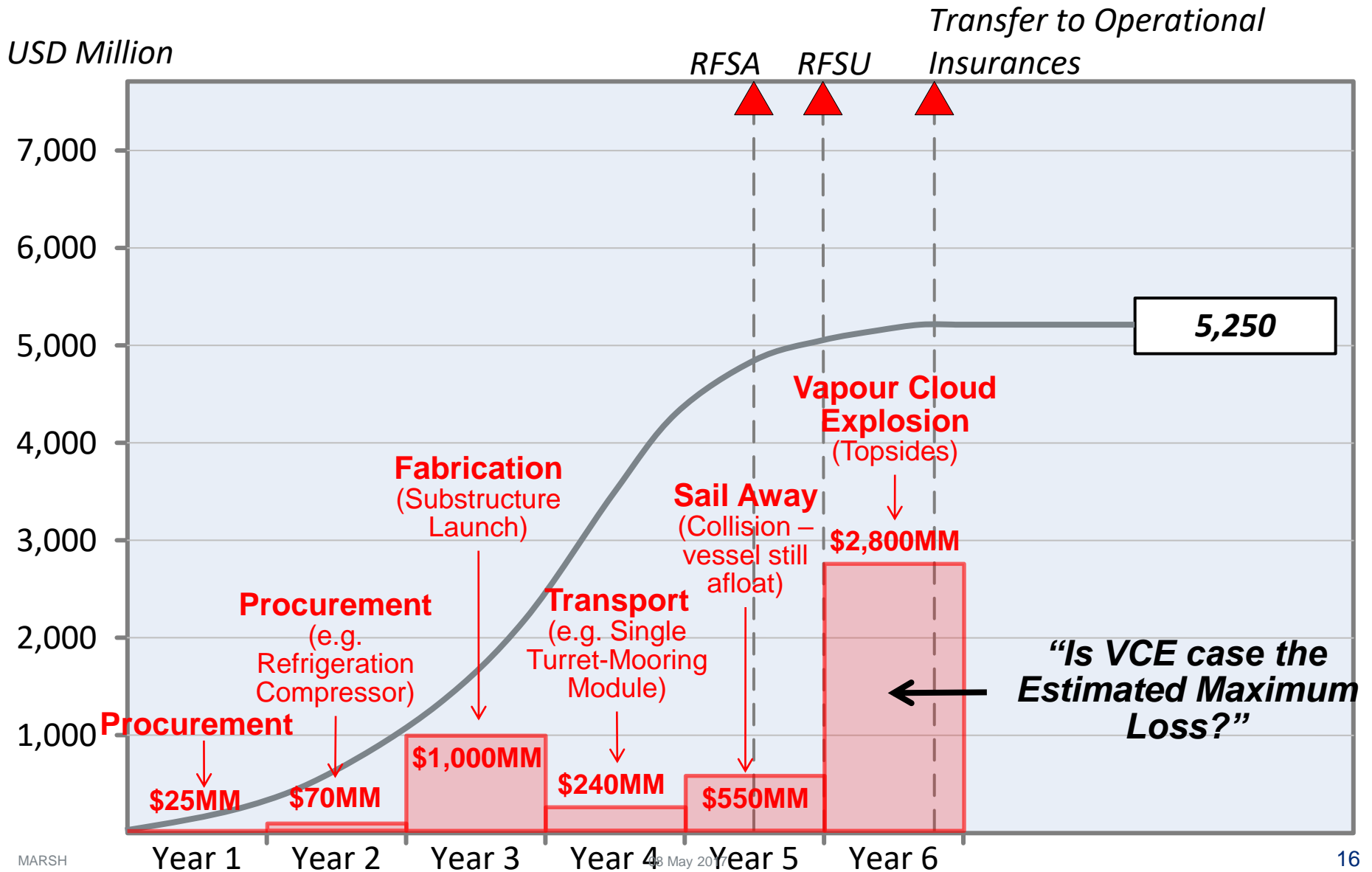
Includes:

- *Tow (back to / from Yard)*
- *Debris removal, etc.*
- *Upstream allowance*
- *Onshore commissioning & HUC*

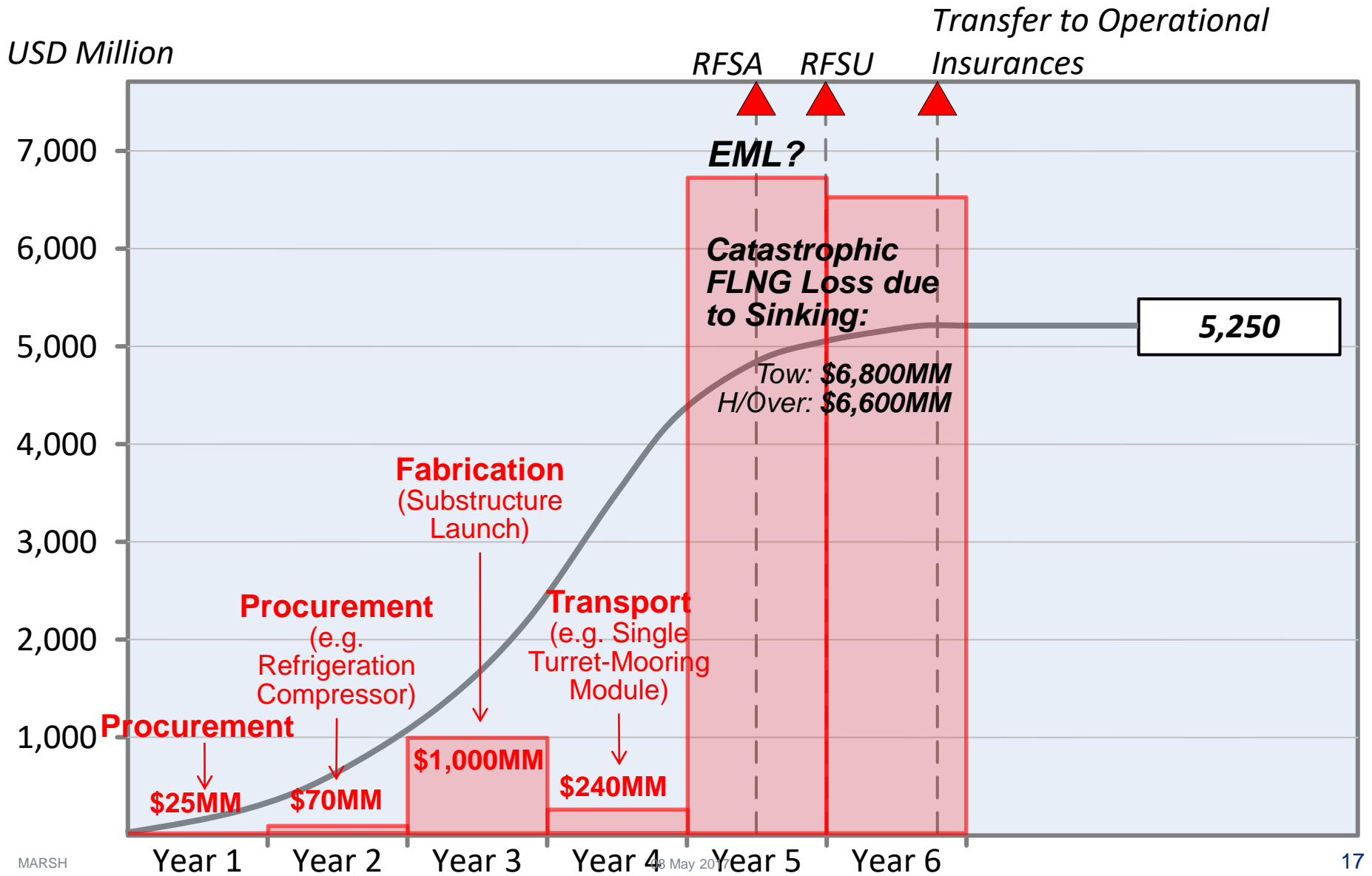
Process Plant
Damage Contours:

- 100%
- 80%
- 20%

Estimated Maximum Loss



Estimated Maximum Loss



FPSOs

Interesting Incidents / Losses



P-34

2002: Electrical Failure



Cidade de São Mateus

2015: Gas Explosion



Maersk Gryphon

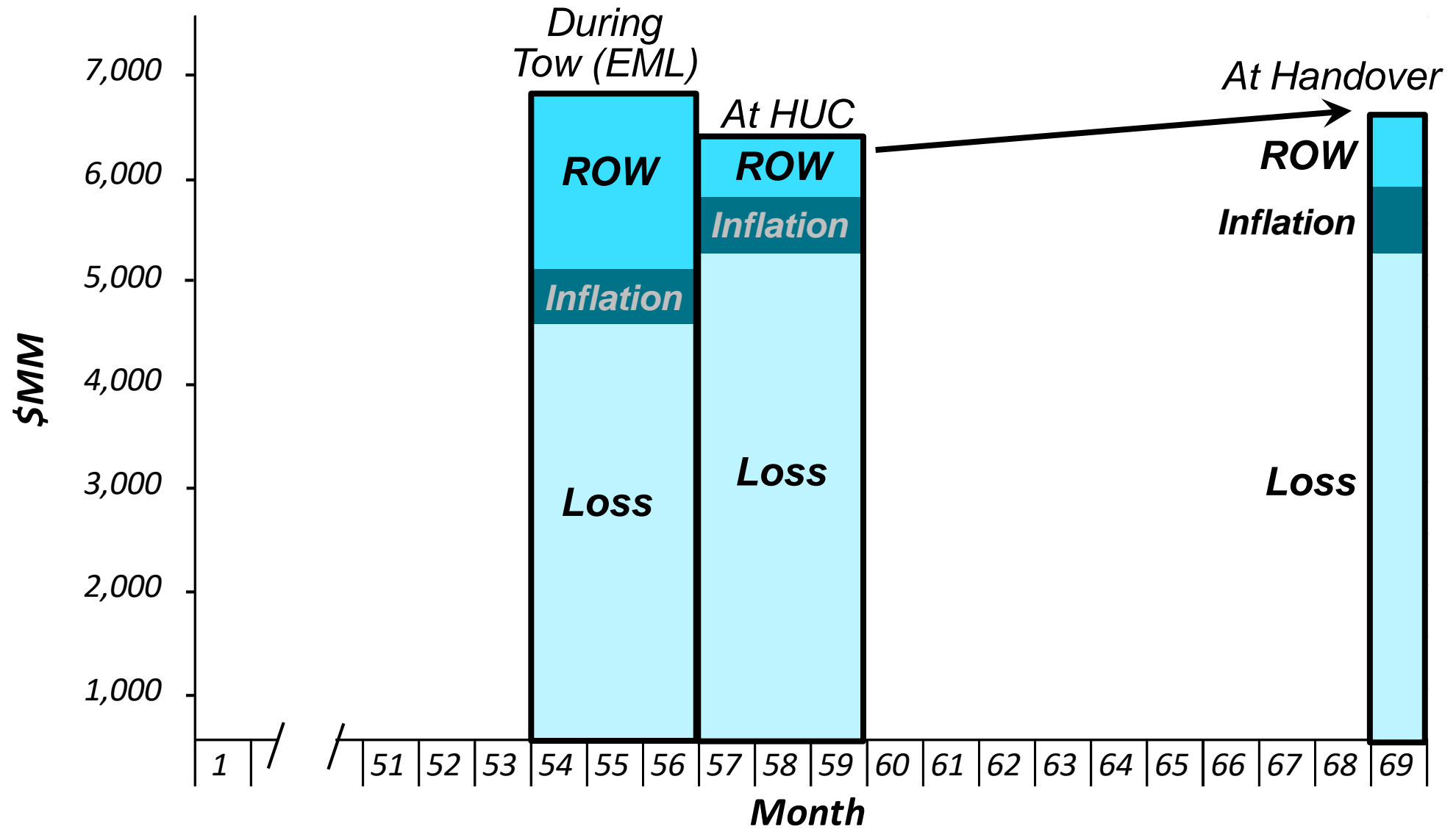
2011: Loss of Station and Heading

MARSH

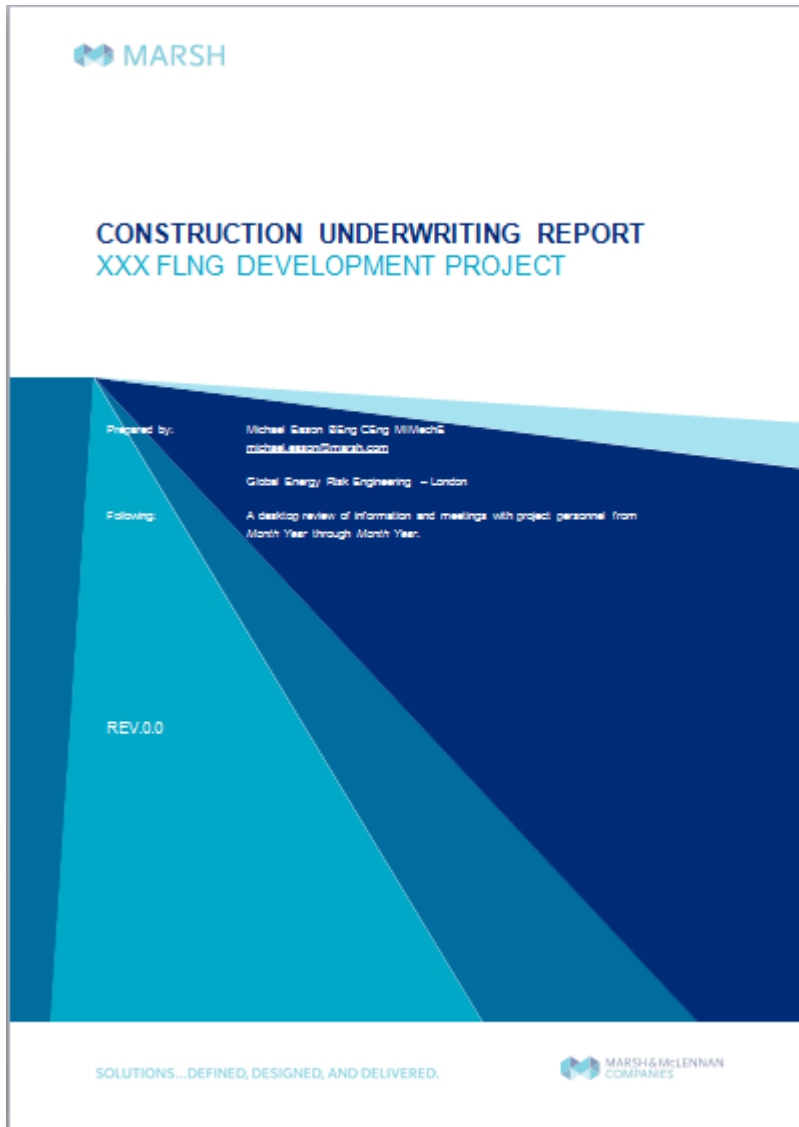


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Catastrophic FLNG Loss – Sinking



FLNG Risk Engineering Report



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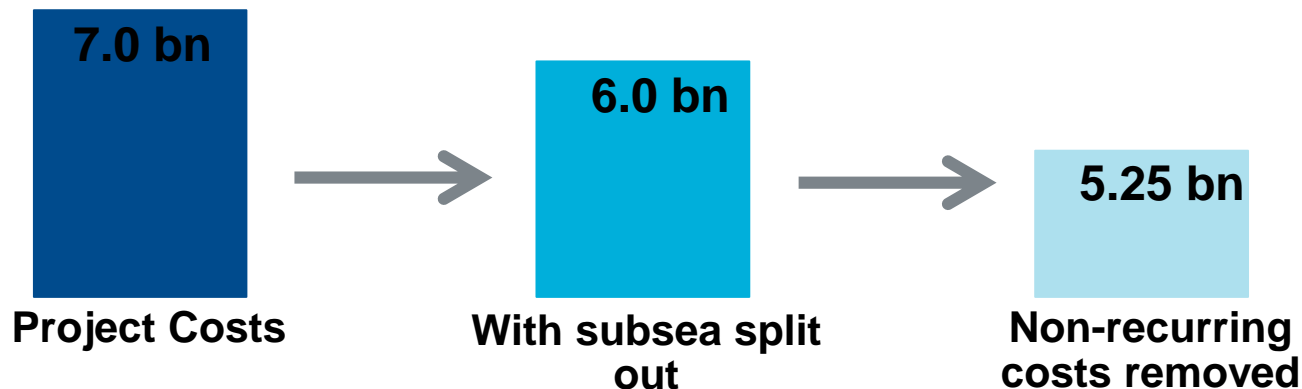
1. Executive Summary
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 - Layout and Construction
 - Control and Safety Systems
 - Emergency Control
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Offshore Construction Market Capacity and Placement Strategies for Mega Projects

The capacity challenge - initial reactions

Strategy is to make the Project Costs more “manageable” and to optimise the proposal to the insurance market

- Present FLNG vessel and subsea systems as separate scheduled items (limited “clash” risk) – immediately reduces peak capacity target from USD 7.0 bn to USD 6 bn
- Risk engineering review to analyse recurring/non-recurring costs to ensure correct sum insured (also reduces capacity required)



Offshore Construction Market Capacity and Placement Strategies for Mega Projects

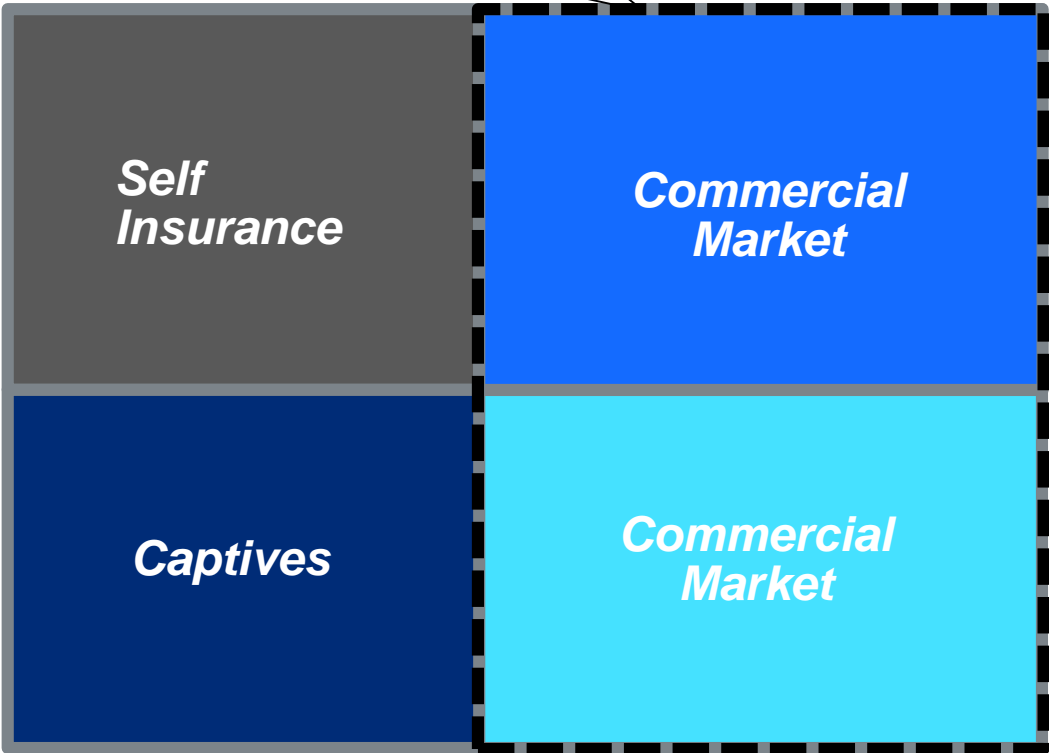
The capacity challenge: market analysis

Commercial market capacity

- Marsh January 2017 estimate is USD 5.5 bn of A- rating or better
- Up from 2016 estimate of USD 4.5bn
- Assumes “every dollar, every underwriter”
- Less than operational capacity due to long-term nature of projects, and some carriers not writing construction at all
- **To maximise the capacity that can be secured for any project, the programme structure must be matched to the risk appetite of the individual underwriters and the risk profile of the project**

Placement of Insurance for Generic FLNG Construction

Uses only USD 3.2 bn of USD 5.5 bn total capacity



*Partners 1 & 2
45%*

*Operator and
Partners 3 & 4
55%*

**USD 5.8 bn
(Total loss - EML)**

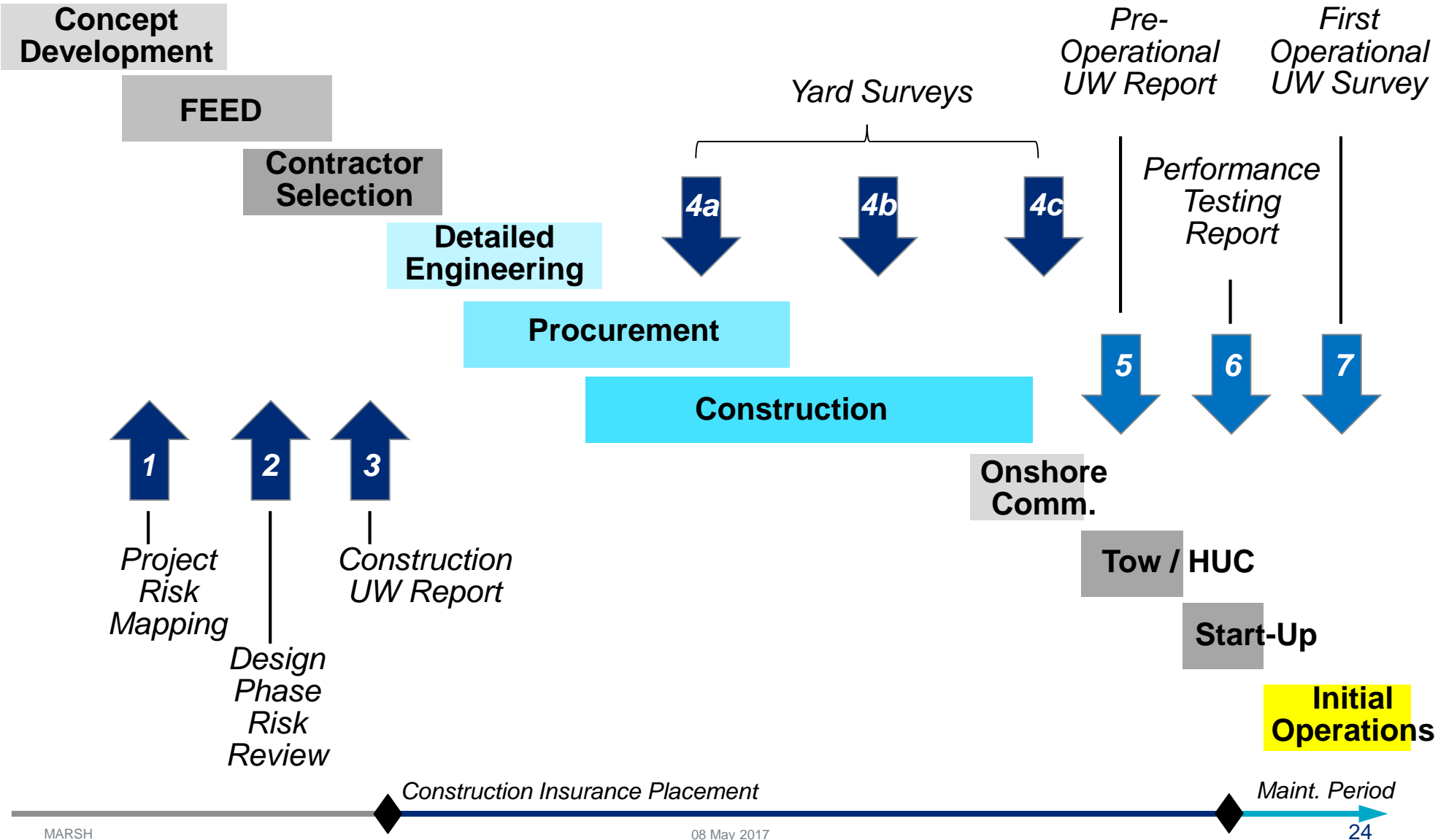


*Wait to place
Excess of
USD 2.8 bn ?*

**USD 2.8 bn
(VCE - non sinking)**

FLNG Insurance Risk Engineering

The Seven Project Touch Points



Conclusion

- So far, strong market support for FLNG technology
- Three FLNG projects have come to the insurance market:
 - Two “mega value”
 - One “large value”
- Commercial market capacity has increased to USD 5.5 bn
- Mega Project FLNG with ECV USD 9.5bn and significant captive involvement / self-insurance is at the limit of conventional market capacity
- Securing maximum capacity at reasonable cost requires a strategy that combines:
 - Programme structure that optimises the capacity usage of every underwriter
 - Optimum presentation of project through Risk Engineering



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