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FRAZER-NASH CONSULTANCY
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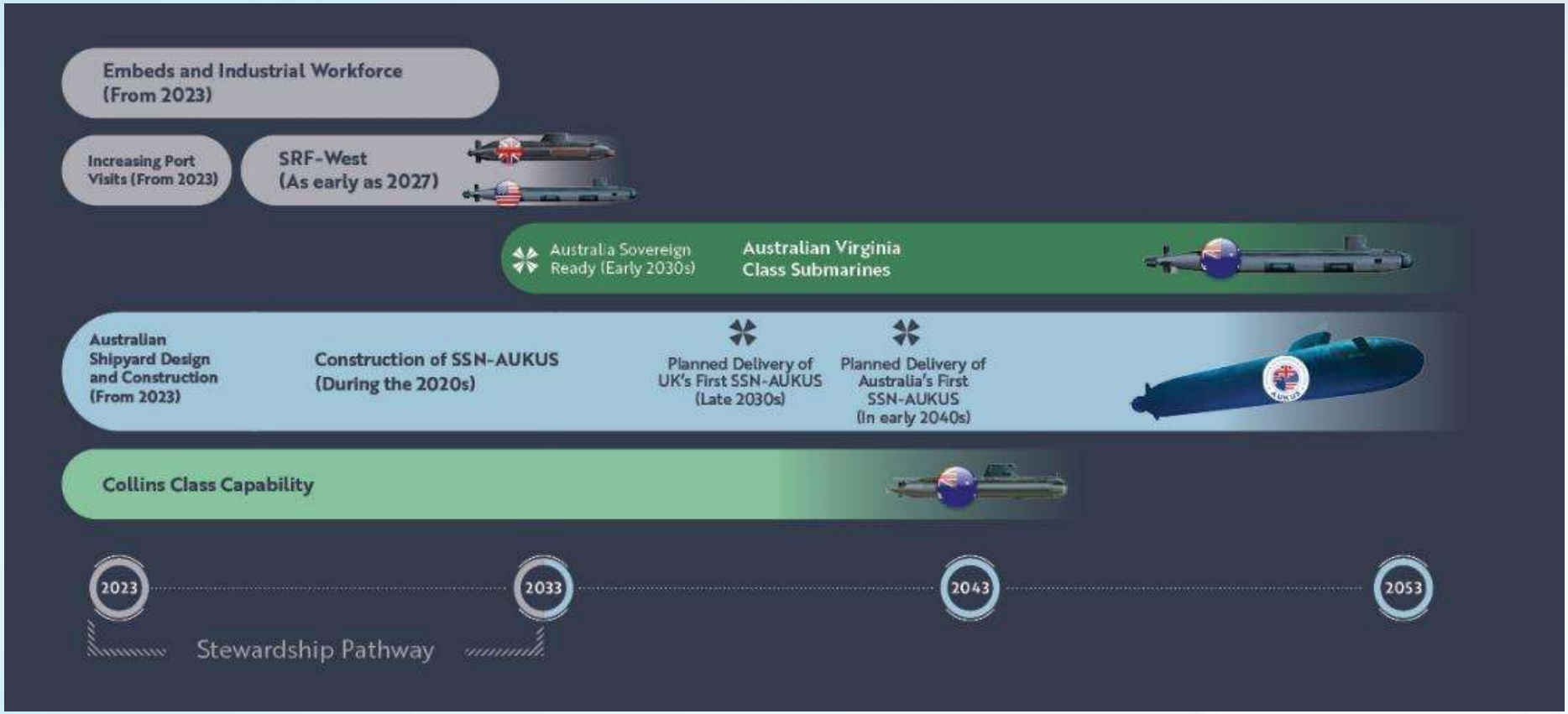
Where the nuclear mindset meets maritime engineering

The Journey



Source: https://www.asa.gov.au/aukus/optimal-pathway

Why is the approach different?

INTERNATIONAL ATOMIC ENERGY AGENCY

The fundamental safety objective is to protect people and the environment from harmful effects of ionizing radiation.

1. **Site evaluation process**
2. **Nuclear safety led design approach**
3. **Safety standards.**

Siting process – PIANC vs IAEA

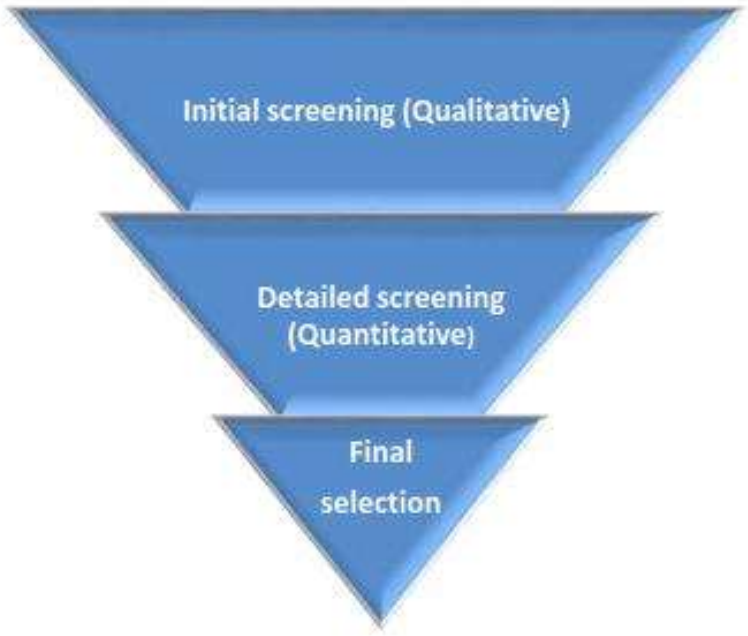


Figure 1.2: Screening process – Qualitative and increasing level of detail

MarCom WG Report n° 185 – 2019
Ports On Greenfield Sites – Guidelines For Site Selection and Masterplanning

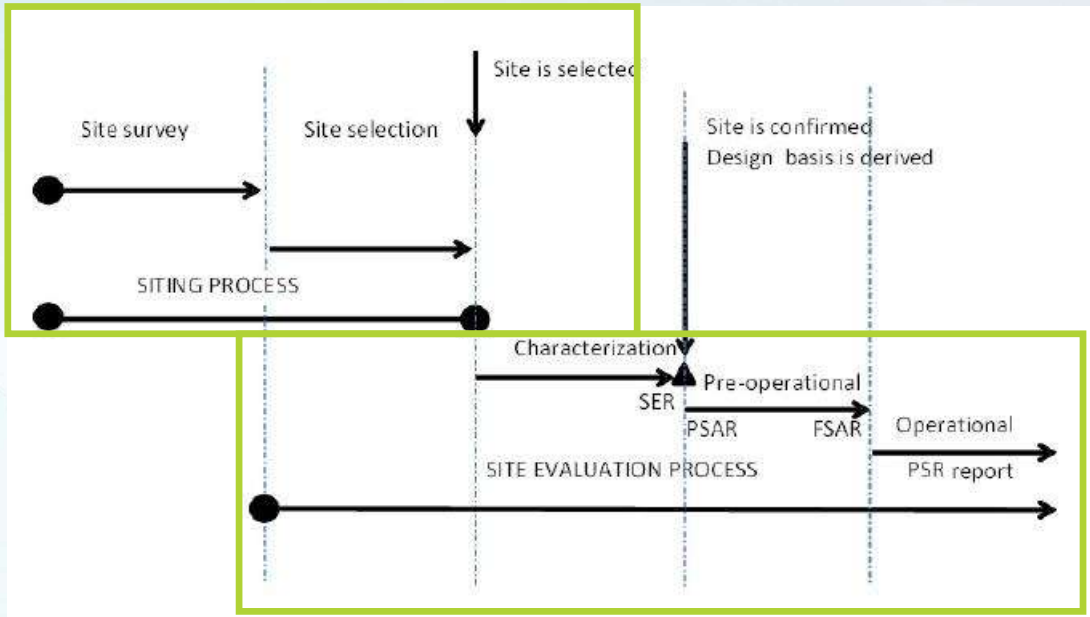


FIG. 2. Outcome of the siting process and site evaluation process for a nuclear installation. FSAR: final safety analysis report; PSAR: preliminary safety analysis report; PSR: periodic safety review; SER: site evaluation report.

IAEA Site Survey and Site Selection for Nuclear Installations – SSG-35

IAEA SSG-35 Assessment Methodology

- IAEA approach represents international best practise.
- A tailored application of IAEA siting criteria considering:
  - Natural hazards
  - Person-made hazards
  - Emergency response feasibility
- Nuclear-Powered Submarine operating considerations also assessed.

Exemplar – IAEA SSG-35 Criteria Screening Process

Earthquake	Ground Vibration [D]
Geotechnical	**Surface Rupture [E]**
	Slope Instability (massive) [E]
	Slope Instability (minor) [D]
	Subsidence [D]
	Liquefaction (massive) [E]
	Liquefaction [D]
Volcanism	**Karst [E]**
	Lava Flow [E]
	Pyroclastic Flow [E]
	Ground Deformation [E]
	Temphra Fall [D]
	Volcanic Gases [D]
	Lahars [E]

Flooding	River [D]
	Dam Break[D]
	Coastal [D]
Meteorological	Tsunami [D]
	Straight Winds [D]
	Tornado [D]
	Tropical Storm [D]
	Precipitation [D]
	Sand / Dust Storm [D]
	Hail [D]
Human Induced Events	Industrial Facilities [D]
	Aircraft Crash (direct) [D]
	Aircraft Crash (indirect) [D]
	Explosion (direct) [D]
	Explosion (indirect) [D]

Feasibility Categories:

- No Issues Identified
- Not exclusionary criteria, but further study required
- Requires additional investigation to confirm engineering solutions exist
- Exclusionary criteria identified

IAEA Screening Criteria:
Exclusionary criteria [E]
Discretionary criteria [D]

Project Lifecycle

Safety Led Design

Site evaluation | Design | Construction | Commissioning | Operation | Decommissioning

Project Inception
- Business Case

Optioneering
- Preferred Option

Detailed Design
- Design and documentation

The Safety Case

"…collection of arguments and evidence in support of the safety of a *facility or activity.*"

Safety Case to provide:

- Body of evidence
- Demonstration/justification of safety
- Single source of truth for design and operation
- Compliance with regulatory requirements

CLAIM (Assertion) – a high level assertion or statement

ARGUMENTS (Reasons) – supports the claim

EVIDENCE – the facts and judgements

Integrated Safety-led Design Process

Safety Led Design

Safety Functional requirement (primary)

Structures systems and components (SSC)

Safety Functional requirement (secondary)

Safety performance requirements

Design justification reports

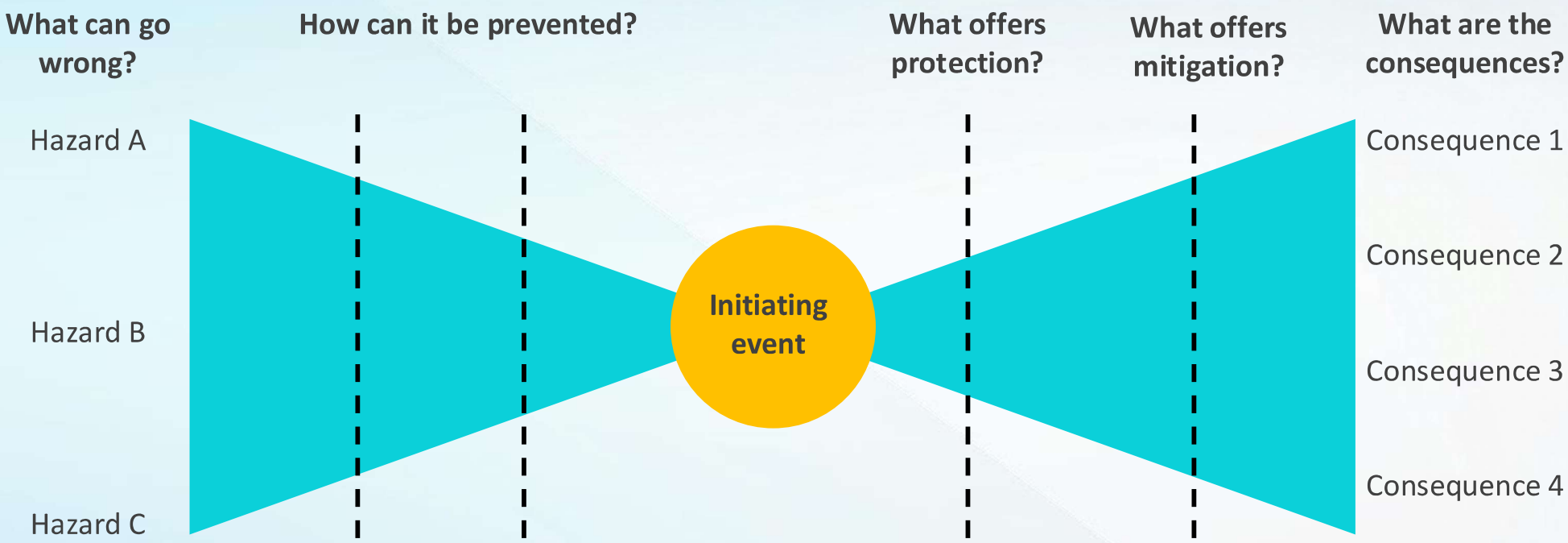
SSC Classification

	Principal means	Significant means	Other means
Category A	Class 1	Class 2	Class 3
Category B	Class 2	Class 3	
Category C	Class 3		

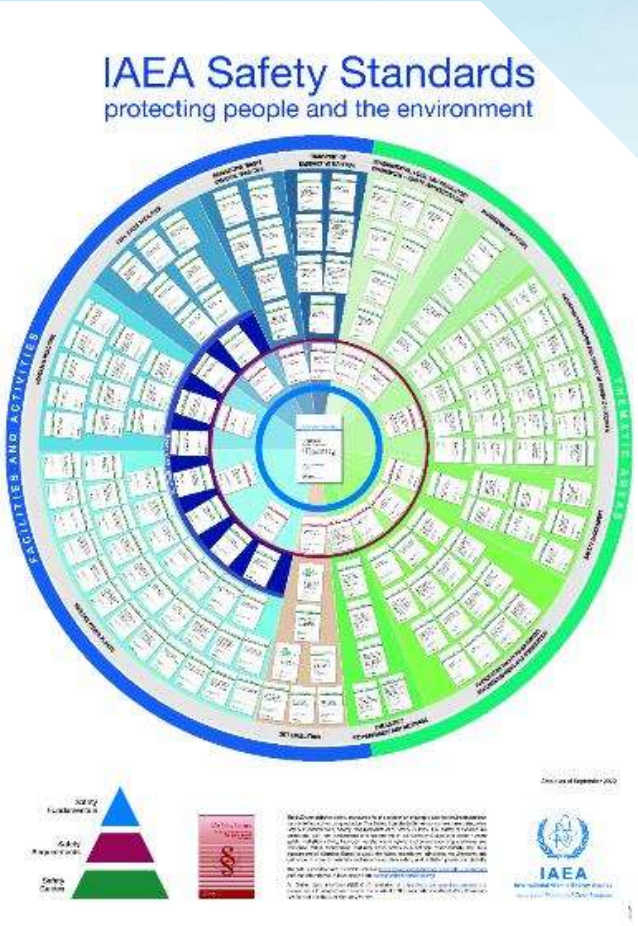
Engineering Schedule

Hazard analysis

Simplest explanation:



Standards and Guidance



bsi.

PIANC
The World Association for Waterborne Transport Infrastructure

STANDARDS Australia

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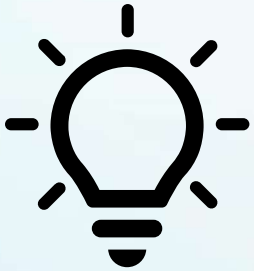
Design Basis Events

Criteria	'Normal' Structures	'Normal' Structures	Nuclear Requirements
Importance Level	2 AS 1170.0	4 AS 1170.0	5 AS 1170.0
Ultimate Limit State ARI (Design Basis Event)	500 years AS 1170.0	2,500 years AS 1170.0	10,000 year Table 3 SSG-67 AS are not applicable
Beyond Design Basis Event	Not applicable	Not applicable	e.g. 1.4 x DBE for seismic



The nuclear mindset

Source: asa.gov.au

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