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Good Practice Approach to Risk and Safety Management of Major Rail System Projects

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- Introduction to Union Railway project
- Infrastructure development today
- Project risk factors
- Typical rail project risks
- Principles of risk based safety regulatory regimes
- Safety Cases
- Independent Assurance
- Roles and relationships
- Benefits of Project Assurance

UAE Union Railway

- 1500km double track freight and passenger network across the UAE
- Diesel traction with provision for future electrification
- Design speeds: 120kph (freight), 200kph (passenger)
- Container and/or bulk terminal facilities at 13 locations, 7 at or near ports
- Six tunnels and approximately 300 structures
- Central control facility, maintenance depots and transfer stations
- Implementation schedule 7-8 years

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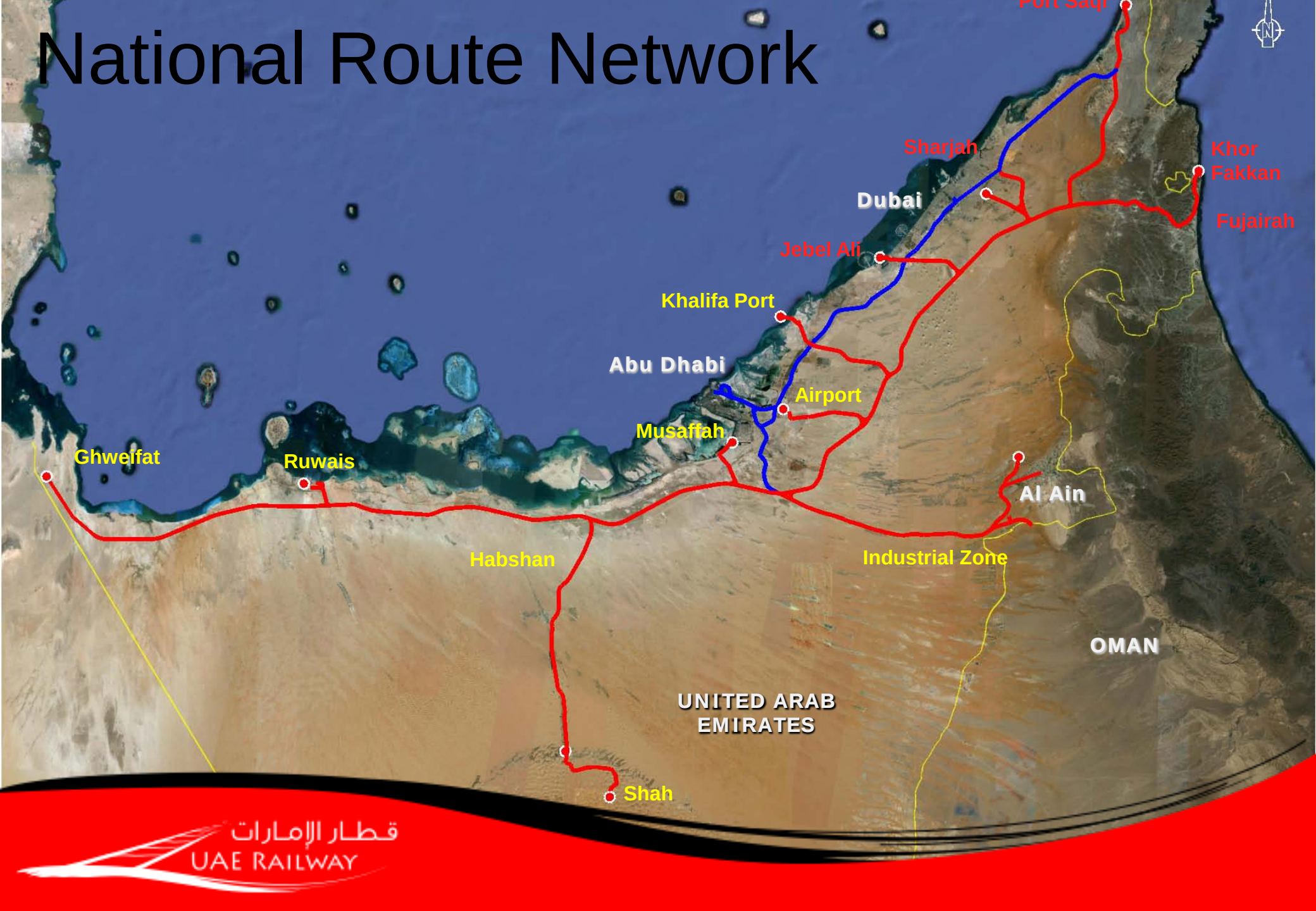
National Route Network



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Union Railway plans to operate various types of train service

Bulk & Container Freight
National & international
Diesel,120 km/h max

High Speed Passenger
Gulf Coast cities
Electric, up to about 350km/h

Passenger
National & international, Diesel, 200km/h

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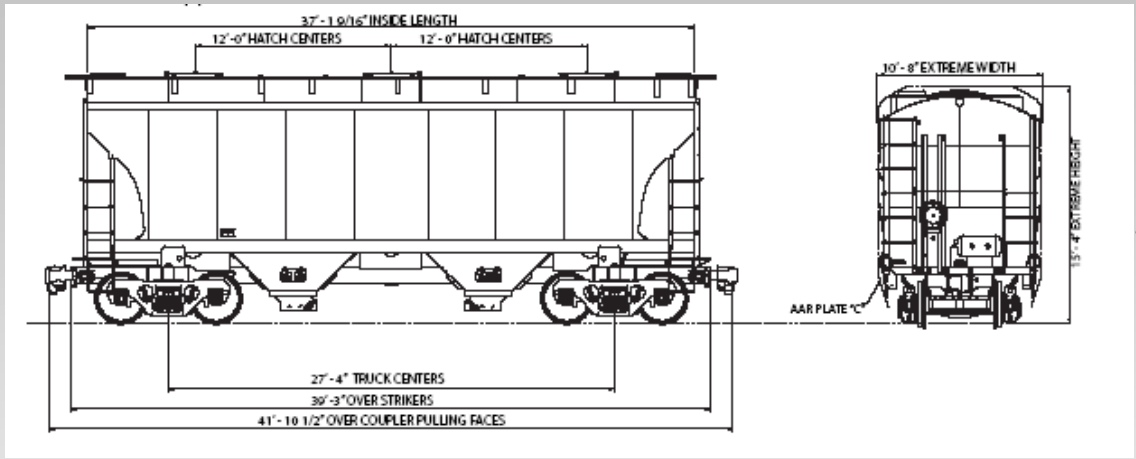
Trains will weigh nearly 15,000 tons and will be more than 1.9km long, with 3 locomotives



Trains of 110 wagons of 130 tonnes (30 tonnes tare) each, running daily from each loading station, can handle the maximum output

Performance has been simulated using data for a modern US 4,400hp Co-Co locomotive design

Maximum axle load will be 32½ tonnes

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Infrastructure Development Today

- Competition for public funds to invest in required infrastructure developments is requiring increasing private participation, which results in:
  - More stakeholders to manage (investment banks, government departments, regulatory bodies, private companies, etc.)
  - Increasing pressure for predictable returns and generation of cash for paybacks
  - Variety of organisational structures to manage the long lifecycles of infrastructure projects

Project Risk Factors

Large investments	Risk of financial liabilities from failure
Long timescales	Risk of technical/financial change over the project lifecycle
Complex systems	Risk to deliver operational performance and safety
Mix of technologies	Risk from integration of diverse sub-systems and systems
Differing regulatory, legal and safety regimes	Risk of unclear or conflicting requirements
Expertise	Risk of few, if any, “organisations” with the capability to deliver all elements

Project Assurance - Purpose

- Ensure Projects are Business Case driven
  - Effective project delivery within time and cost constraints
  - Return on investment over a reasonable period

- Delivery of a system that meets the needs of users and customers
  - Functionality and features
  - Operational performance (Operability, Reliability, Availability, Maintainability, **and Safety**)

- Delivery of a system that can be supported efficiently
  - Lifecycle support
  - Passive provision

Project Risks

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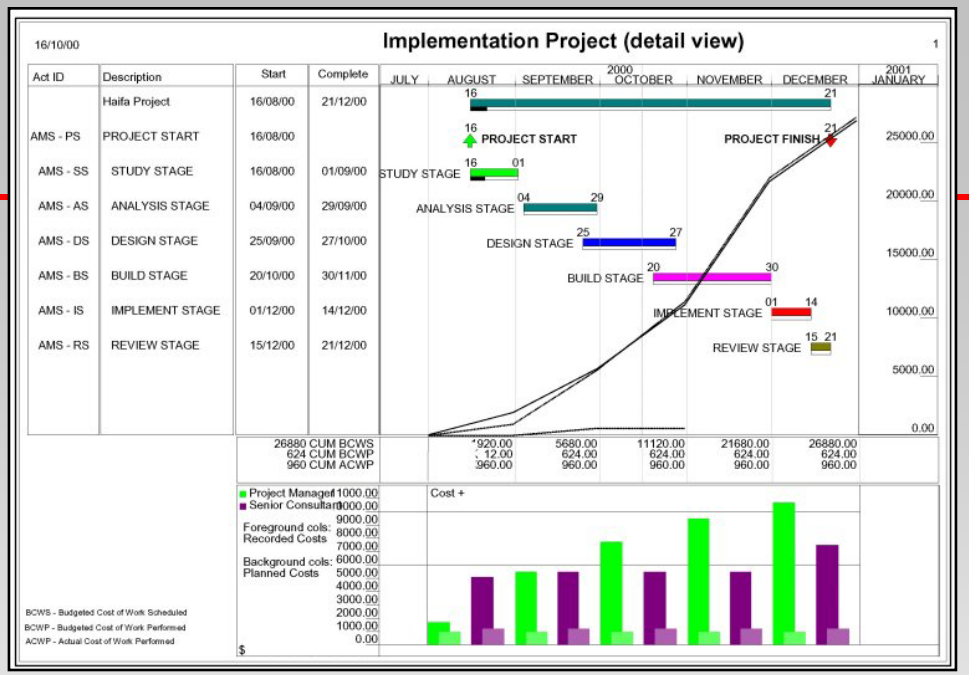
Project Risks

Programme Risk



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Project Risks

Programme Risk

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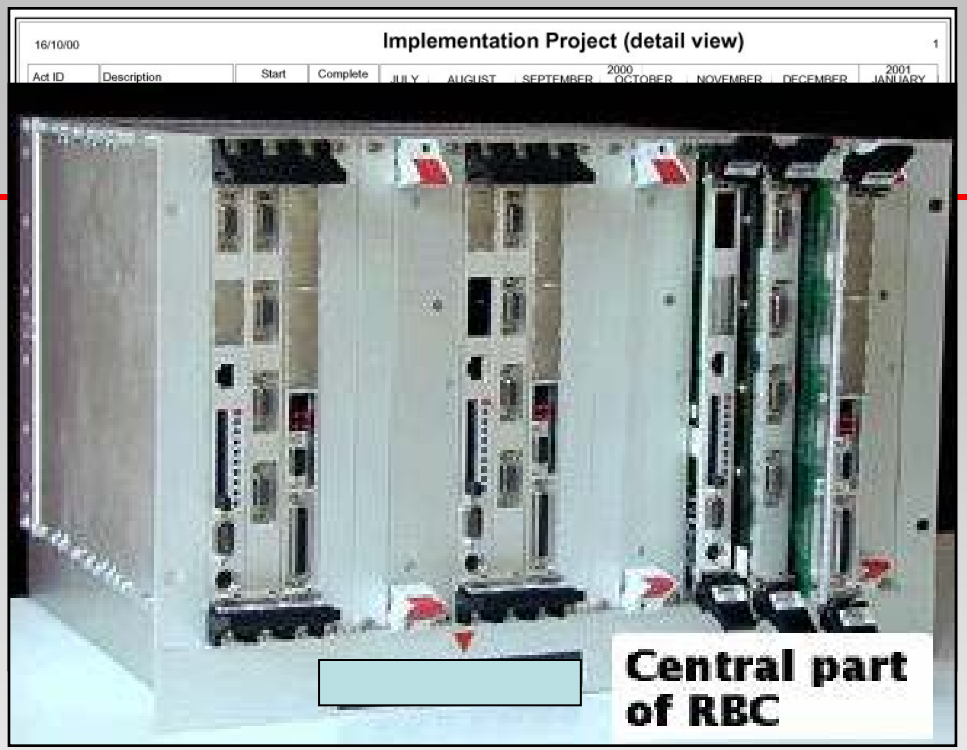
Technology Risk



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Project Risks

Programme Risk

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Technology Risk

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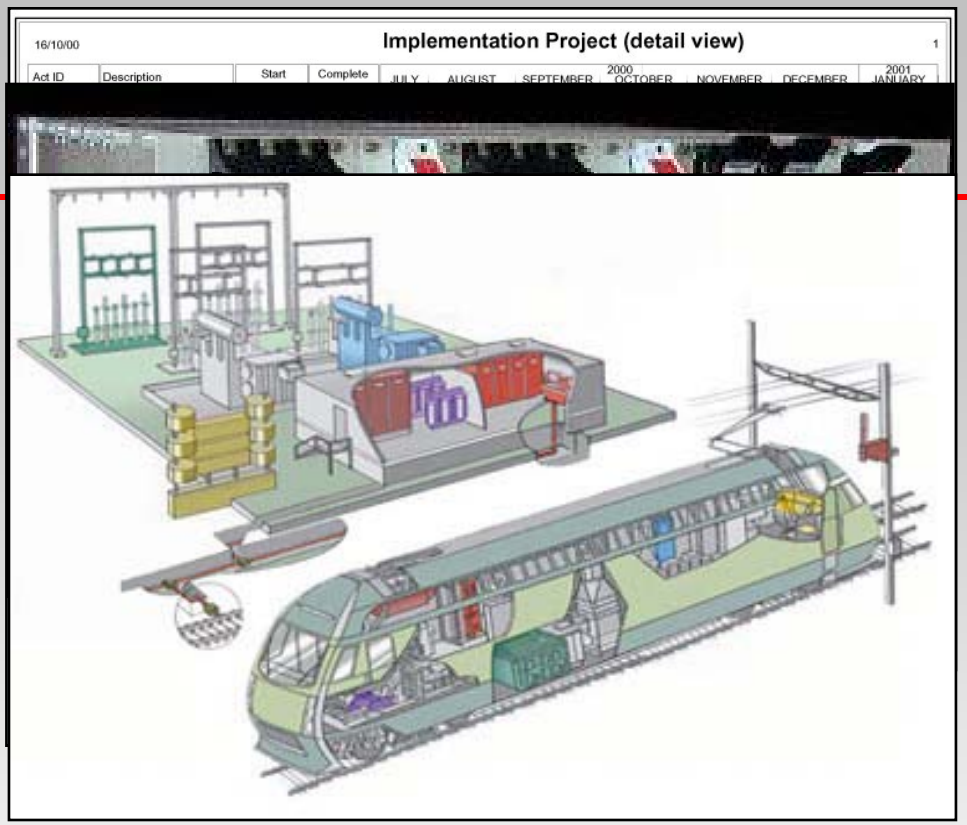
Application Risk



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Project Risks

Programme Risk

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Technology Risk

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Application Risk

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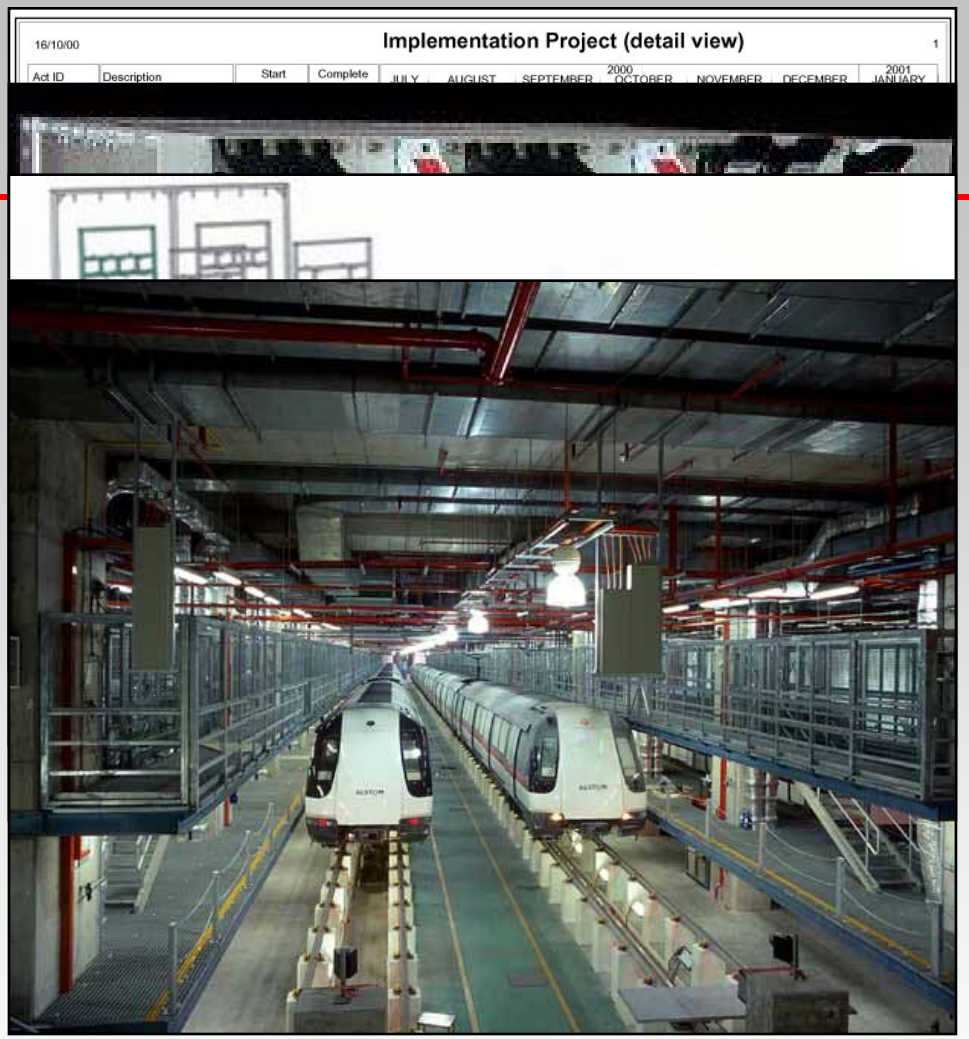
Operability Risk



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Project Risks

Programme Risk

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Technology Risk

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Application Risk

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Operability Risk

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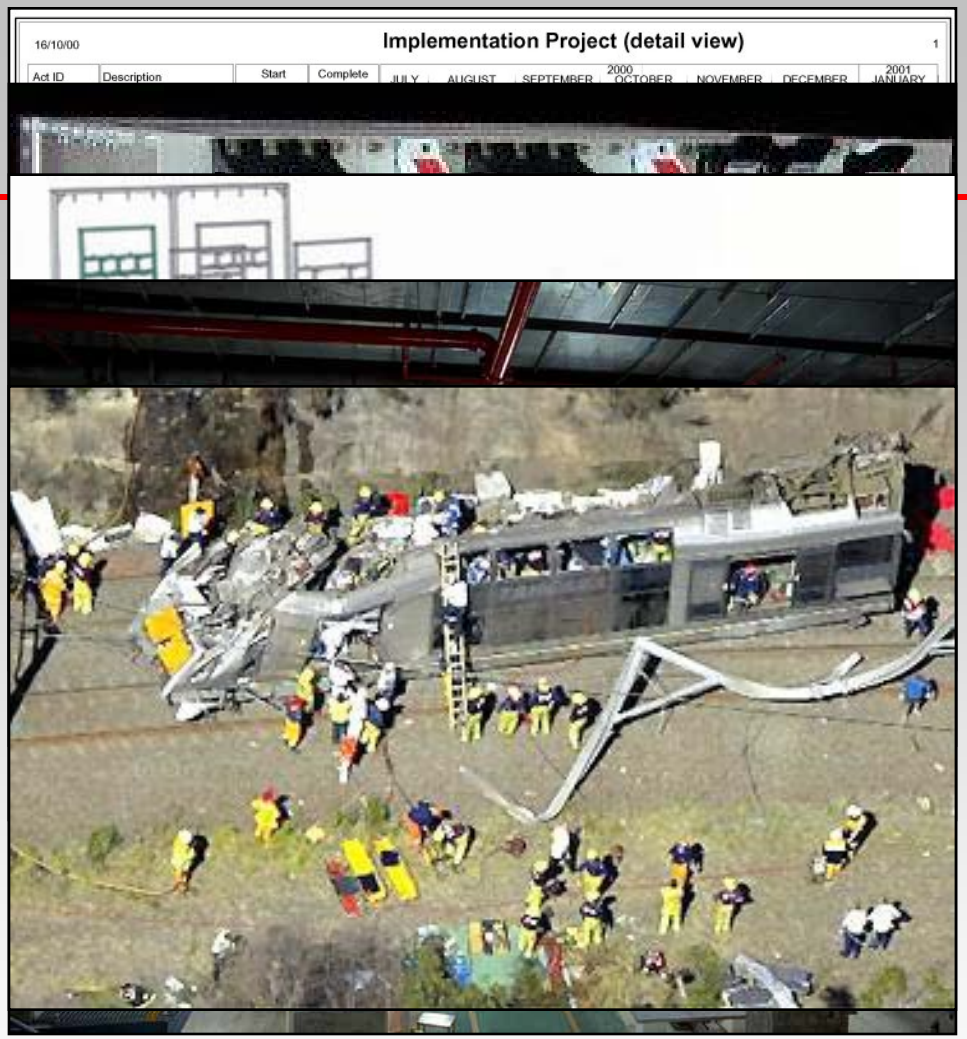
Safety Risk



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Project Risks

Programme Risk

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Technology Risk

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Application Risk

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Operability Risk

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Safety Risk

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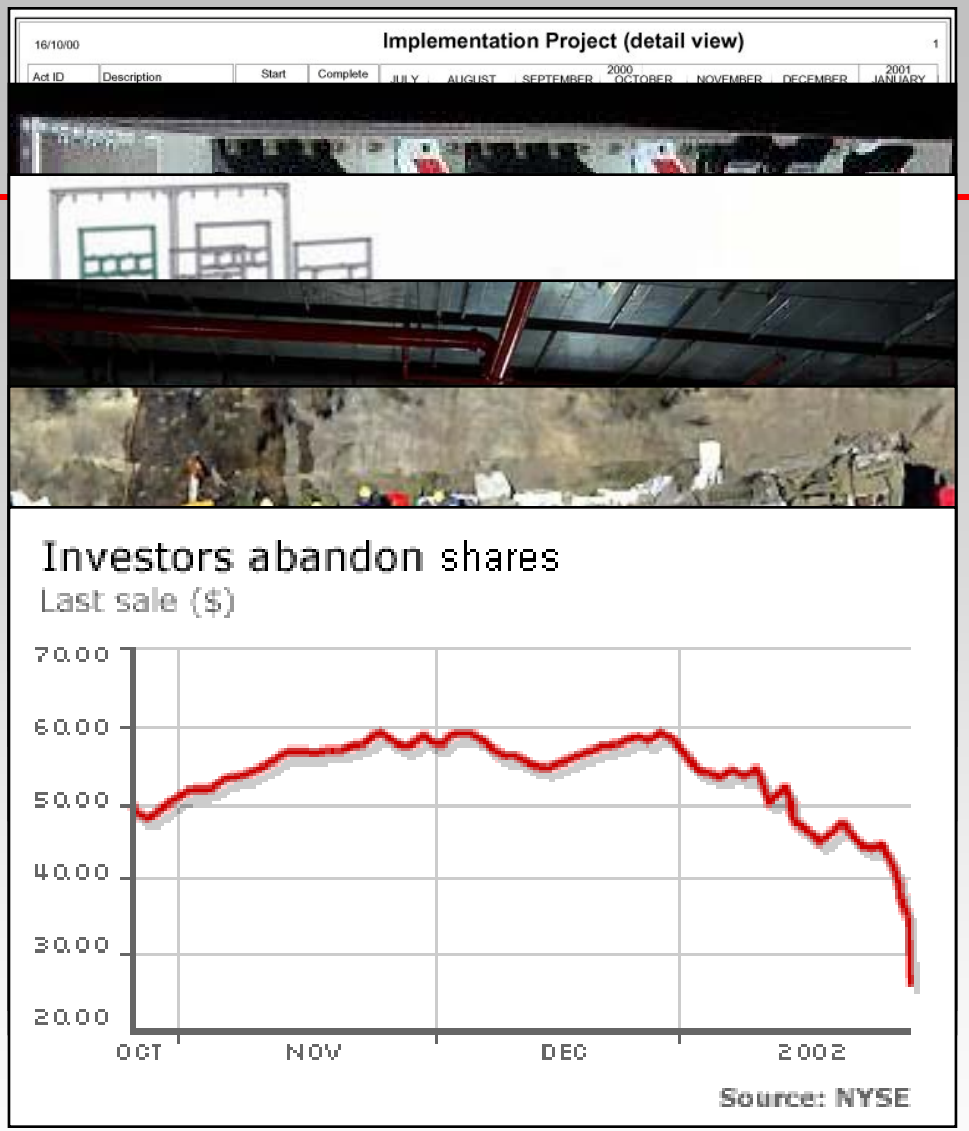
Business Risk



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Risks ‘Iceberg’

Political and Regulatory Risks

Project Development Risks

Environmental Risks

Construction Risks

Traffic and Demand Risk

Operational Risks

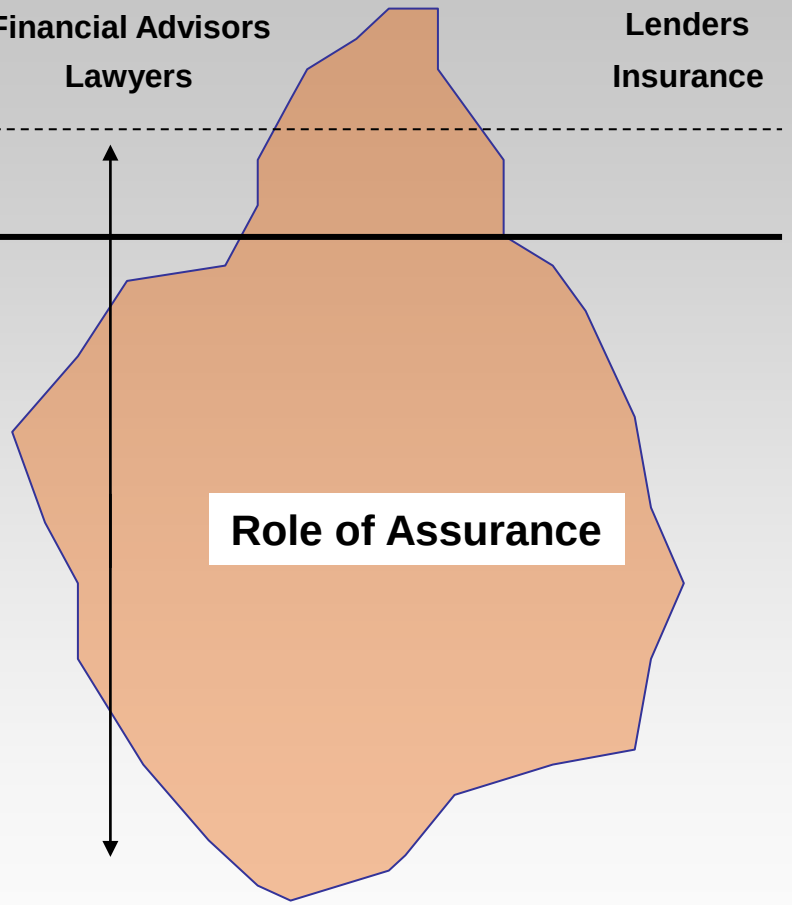
Revenue Risks

Technology and IP Risks

Resource & Expertise Risks

System Integration Risks

Safety and Security Risks



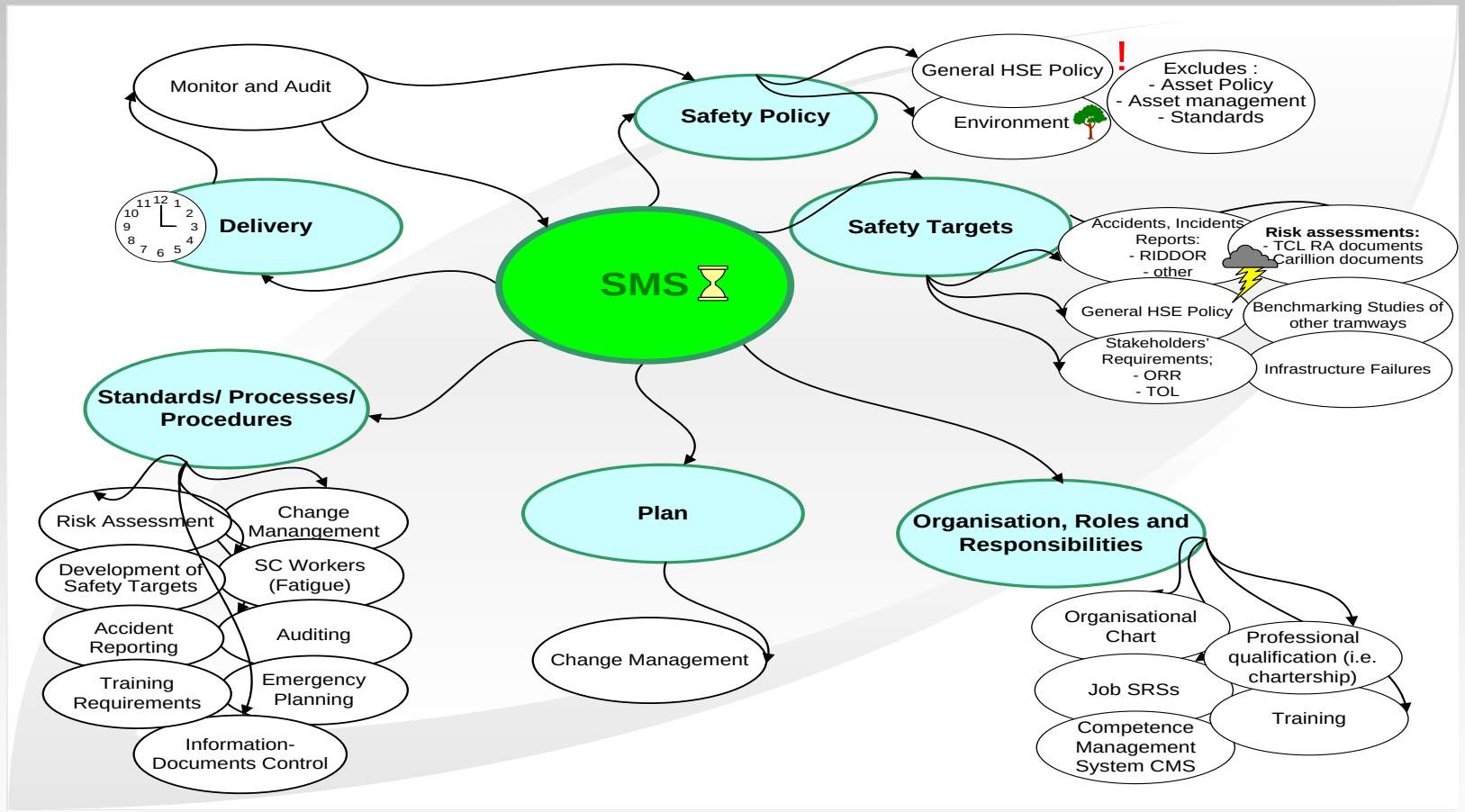
Principles of Risk Based Regimes

- Operators wishing to construct and operate a transport system will be required to submit a ‘safety case’ to the nominated transport regulator for acceptance.
- Regulator is responsible to review the submission, and if it is acceptable, issue a Safety Certificate or Licence.
- Transport operators must proactively demonstrate control of risks
- Transport constructors must demonstrate the safety of future operation during construction and before revenue operation commences.
- Constructors and operators must document the hazards and associated risks, together with measures in place to eliminate and control them.
- Regulator must examine the adequacy of these arrangements and monitor continuing compliance of the operator with their safety and economic responsibilities.

‘Safety Cases’

- Document produced by a transport operator which describes their operations, analyses the hazards and risks from those operations, and explains the control measures such as procedures and managerial systems that the operator has put in place to manage those risks.
- Based around:
  - description of its safety management system (SMS)
  - description of the company’s operations
  - details of systematic risk assessment, including results and analysis of actual accident statistics.
- May be preceded by a (construction) Safety Case prepared by the Contractor, which confirms that the railway has been designed and constructed safely.

SMS elements



Safety Case Principles

- Safety case regime embodies the following principles:
  - Goal-setting framework rather than a wholly prescriptive
  - Organisation that creates the risks, or is affected by risks created by others, has a duty to manage these risks and describe how they are effectively controlled.
  - Control measures should cover design and hardware, systems and procedures, and human factors.
  - Includes test arrangements for managing emergencies and mitigating their consequences.
  - Safety case regime imposes more rigid frameworks on the safety regulator, and requires more positive regulator engagement than other approaches to regulation.

Independent Safety Assessment

- The ISA service sits in a family of services which, together, can be called Independent Assurance.

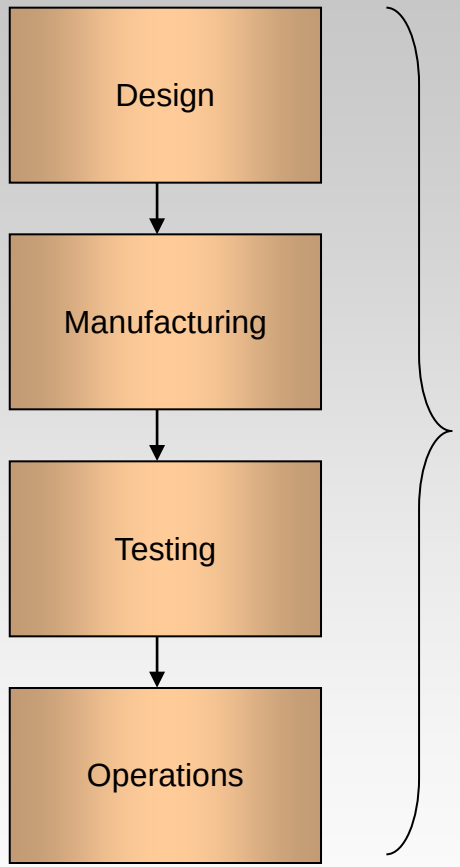
- Broadly, Independent Assurance is:

  The deployment of a third party organisation to confirm that a business or project is satisfying its obligations, requirements, and aspirations towards its stakeholders; including its customers, shareholders, employees, government and the general public.

- Specifically, ISA is:

  Provision of expert opinion on the acceptability of the safety risk of a system in a given environment, based upon the evidence provided. This activity is typically undertaken in accordance with international good practice, such as EN50126 or the 'Yellow Book'.

Why is ISA Necessary?

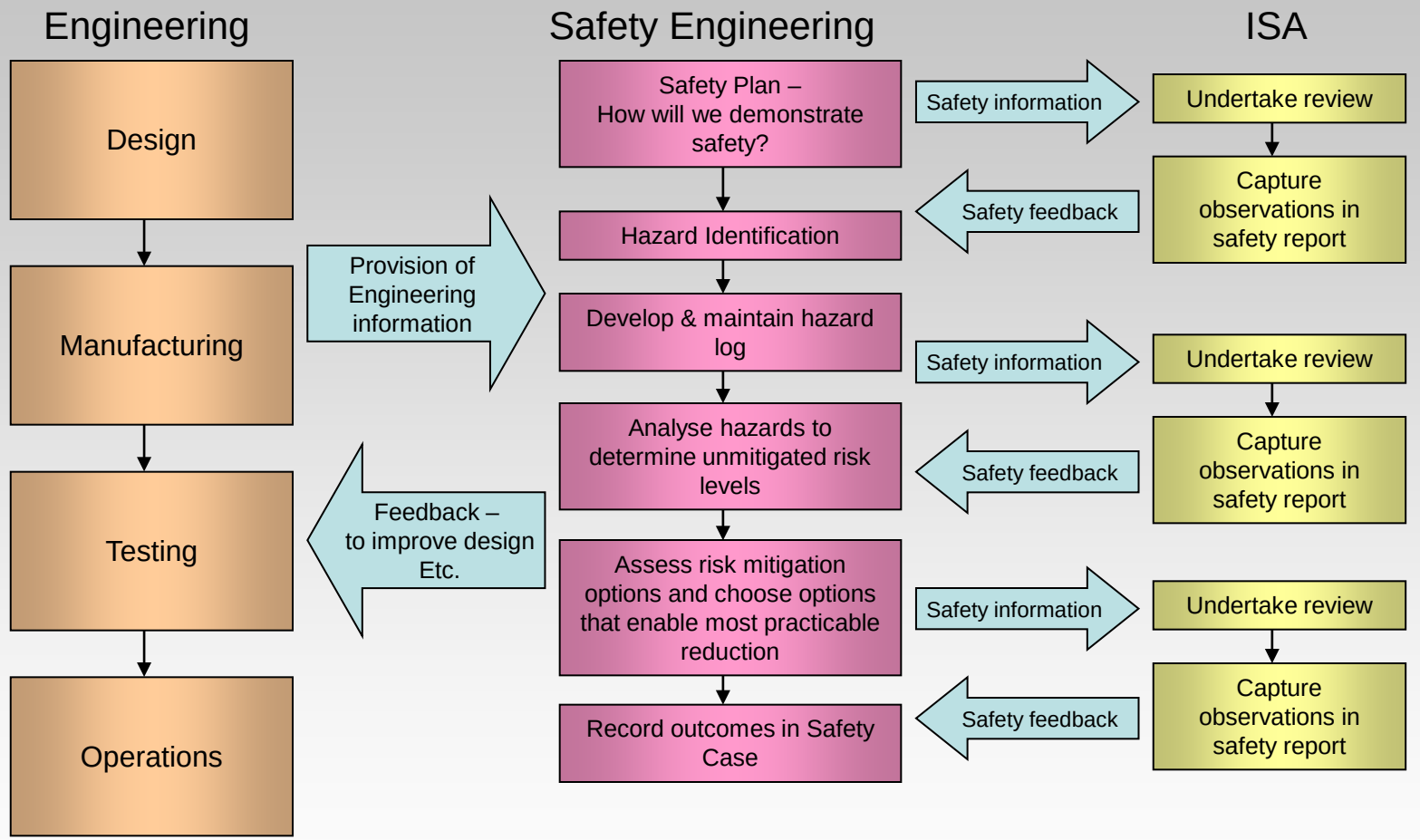


Safety is Implicit within Each Phase of work

- Major railway projects typically assume that safety risk will be minimised as an implicit part of system design and manufacturing.
- It is assumed that designers, engineers and operators are aware of key risk issues from training and experience.

- Issues:
  - Safety critical systems, such as train control systems, need more analysis of the extent of safety risk than non-safety critical systems
  - Without a formal approach to safety demonstration:
    - it is not possible to know whether a system has been designed to minimise risk
    - In the event of an incident, there is no evidence that suitable diligence was applied to minimise risk

Why is ISA Necessary?



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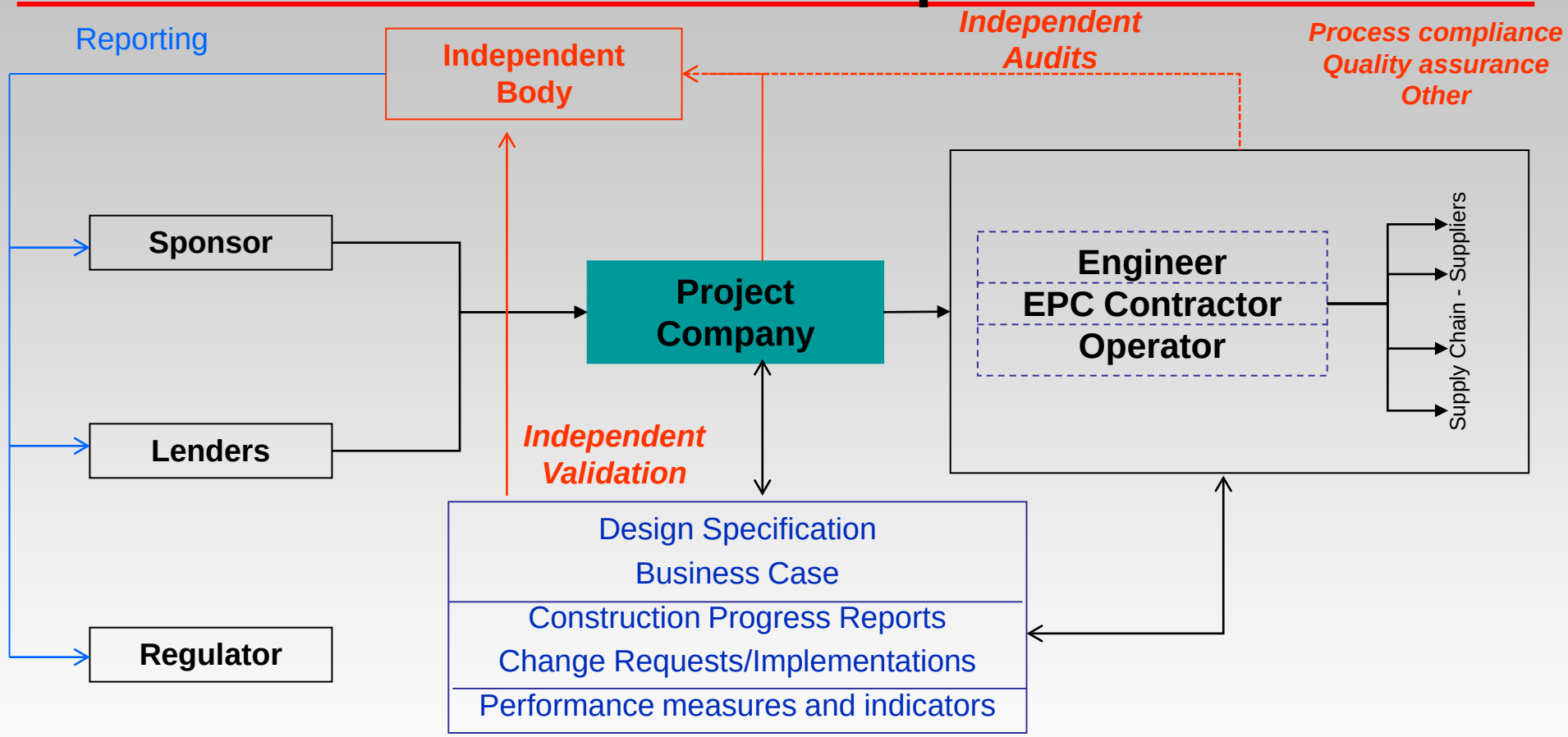
Role and Relationship



Benefits of Project Assurance

Identify and resolve problems before they affect the outcome	• Management of technical risks from first Concept stage
Provide an independent view, throughout the project	• Introduction of international, multi-discipline and cross sector experience • No vested interests • Application of global good industry practices
Bring greater certainty towards successful rail project delivery	• Safeguarding the business case
Independent Certificate that Project has met its objectives.	• Auditable trail, from an Independent Party, of all key project decisions.

Questions?