

The UK Nuclear Industry Good Practice Guide To:

# Supply Chain Mapping



This Nuclear Industry Good Practice Guide was produced by the Supply Chain Sub-Working Group and published on behalf of the Nuclear Industry Safety Directors Forum (SDF)

**March 2017**

## Revision History

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<b>1</b>	<b>March 2017</b>	<b>First Issue</b>

It is recognised that – through the experience of using these Guides – there may be comments, questions and suggestions regarding its contents.

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## **Foreword**

Executive Summary for the contents and subject matter discussed within the Guide

This guidance document has been established by a technical working-group of the Safety Directors' Forum (SDF) comprising UK Nuclear Licensees (Customers).

The UK Nuclear Industry places Nuclear Safety as the foremost priority. It is committed to working together with its Supply Chain to deliver excellence in everything it does; having the right people, with the right skills in place at the right time. This requires Customers and the Supply Chain to develop a supporting relationship, working together to deliver to the required standards, identifying opportunities to improve performance, preventing concerns escalating and resolving issues promptly.

The UK Nuclear Industry needs to develop capacity and capability within its Supply Chain whilst maintaining a rigorous and clear approach to assuring the quality of products and services. The intention is to assist existing contractors, new entrants and potential new entrants to the UK Nuclear Industry by improving consistency and transparency. Supply Chain Mapping is one of the tools that may be utilised to achieve this.

The information within this guidance document aligns with the regulatory expectations placed on the UK Nuclear Licensees, and should be shared throughout the nuclear Supply Chain to support quality improvements. This guide supports BS EN ISO 9001 and the existing codes and standards within the Nuclear Industry; Office for Nuclear Regulation's (ONR) Technical Assessment Guides (TAGs); IAEA's General Safety Guides (GSG). These are outlined in Appendix A (Related references).

## ***Safety Directors Forum***

In a sector where safety, security and the protection of the environment is, and must always be the number one priority, the Safety Directors' Forum (SDF) plays a crucial role in bringing together senior level nuclear executives to:

- Promote learning;
- Agree strategy on key issues facing the industry;
- Provide a network within the industry (including with government and regulators) and external to the industry;
- Provide an industry input to new developments in the industry; and,
- To ensure that the industry stays on its path of continual improvement.

It also looks to identify key strategic challenges facing the industry in the fields of environment, health, safety, quality, safeguards and security (EHSQ&S) and resolve them, often through working with the UK regulators and DECC (BEIS), both of whom the SDF meets twice yearly. The SDF members represent every part of the fuel cycle from fuel manufacture, through generation to reprocessing and waste treatment, including research, design, new build, decommissioning and care and maintenance. The Forum also has members who represent the Ministry of Defence nuclear operations, as well as "smaller licensees" such as universities and pharmaceutical companies. With over 25 members from every site licence company in the UK, every MoD authorised site and organisations which are planning to become site licensees the SDF represents a vast pool of knowledge and experience, which has made it a key consultee for Government and regulators on new legislation and regulation.

The Forum has a strong focus on improvement across the industry. It has in place a number of subject-specific sub-groups looking in detail at issues such as radiological protection, human performance, learning from experience and the implementation of the new regulatory framework for security (NORMS). Such sub groups have developed a number of Codes of Practice which have been adopted by the industry.

## ***Sub-Group Description***

This document is produced by the Supply Chain Forum, which is a sub-group of the Safety Directors' Forum. The Supply Chain Forum was established in November 2014 and brings together a wide range of representatives of nuclear operators, from all the Licensees and Authorisees across the United Kingdom, including:

- Civil, commercial and defence activities;
- Design, operation and decommissioning of nuclear facilities;
- Research facilities.

The purpose of the Supply Chain Forum is to provide guidance that is useful to, and will benefit the widest possible range of UK nuclear operators and Suppliers.

Such guidance is not mandatory, nor does it seek to identify minimum standards. It aims to provide a tool kit of methods and processes that nuclear operators can use if appropriate to their sites and facilities.

These guides are intended to improve the standardisation of approach to the delivery of fit for purpose Supply Chains, while improving quality and reducing the cost of production. They are designed to cater for all stages of a facility's life cycle and for all processes within that life cycle. This includes any interim, continuous and periodic safety reviews, allowing for the safe and efficient operation of nuclear facilities.

When using the information contained within these guides, the role of the Intelligent Customer shall always remain with the individual nuclear operator, which shall retain responsibility for justifying the arguments in their respective Supply Chains. The Office for Nuclear Regulation is a consultative member of the Supply Chain Forum.

The following companies and organisations are participating members of the Supply Chain Forum:



## ***Disclaimer***

This UK Nuclear Industry Good Practice Guide has been prepared on behalf of the Safety Directors' Forum. Statements and technical information contained in this Guide are believed to be accurate at the time of writing. However, it may not be accurate, complete, up to date or applicable to the circumstances of any particular case. This Good Practice Guide is not a standard, specification or regulation, nor a Code of Practice and should not be read as such. We shall not be liable for any direct, indirect, special, punitive or consequential damages or loss whether in statute, contract, negligence or otherwise, arising out of or in connection with the use of information within this UK Nuclear Industry Good Practice Guide.

This Good Practice Guide is produced by the Nuclear Industry. It is not prescriptive but offers guidance and in some cases a toolbox of methods and techniques that can be used to demonstrate compliance with regulatory requirements and approaches.

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# Introduction

The UK Nuclear Industry is committed to working together with its Supply Chain delivering excellence in everything it does; having the right people, with the right skills in place at the right time. This requires Customers and the Supply Chain to develop a supporting relationship, working together to deliver to the required standards, identifying opportunities to improve performance, preventing concerns escalating and resolving issues promptly through:

- open and honest communication
  - at all levels and tiers, throughout the Supply Chain – raising queries and concerns as they become known
  - checking for understanding and compliance at all levels and tiers of the Supply Chain – ensuring that specifications, requirements, and identified processes are flowed down, understood, and met
- sharing learning
  - identifying and building on best practice
  - utilising Learning from Experience (LfE) to prevent issues and improve performance
- continuous improvement
  - having the right measures,
  - using the right tools,
  - looking at the right things
- structured problem solving
  - basing decisions on data
  - addressing the root cause
  - implementing robust corrective actions

## ***Aims / Objectives***

Supply Chain Maps provide UK Nuclear Licensees and their Supply Chains with:

- Identification of Suppliers at all tiers of the Supply Chain for procurement activities
- Knowledge of the provenance of its materials, structures, systems and components, and full awareness of the resources delivering work on its behalf (who, what, where).
- Confidence that any risks / opportunities posed by the Supply Chain to successfully deliver Projects, Products or Services, can be identified and managed.

Identification of Suppliers on the Supply Chain Map also allows the Customer to assess and confirm the effective flow down of contractual and quality requirements and supports a risk based approach to Supply Chain assurance and oversight.

## ***Scope***

This document is a Nuclear Industry Best Practice Guide detailing the Supply Chain Mapping process for Suppliers contributing to the delivery of Projects, Products or Services to the UK Nuclear Industry.

The guidance herein presents a common approach to Supply Chain Mapping to aid Suppliers' understanding of the requirement and describes principles and tools by which Supply Chain Maps can be developed.

In addition, it suggests a risk based approach to segmentation of Suppliers and identifies a link to the oversight and assurance required to deliver Projects, Products and Services at each tier of the Supply Chain.

Responsibilities for the specification and flow down of requirements for Supply Chain Maps, and delivery of the Maps to the Customer, are identified. Methods for developing and managing Supply Chain Maps are described, and templates and case studies provided to enable Suppliers' provision of Supply Chain Maps that meet Customer expectations.

The scope of Projects, Products or Services subject to Supply Chain Mapping should be identified by the Supplier following the principles identified in this document and in alignment with its identified risks.

## ***Terminology***

Within this guide, where the word "should" appears, UK Nuclear Licensees may utilise the word "shall" within their respective contract quality requirements.

Other definitions and terminology included within this guide can be found in Appendix B - Glossary.

## ***Application / Readers Guide***

Licensees undertake Supply Chain Mapping to identify the sub tiers of their Supply Chain. The benefits of Supply Chain Mapping are not just applicable to licensees; they are applicable to each Customer within the Supply Chain. Listed below are some of the ways in which Supply Chain Mapping information can be used:

- **Intelligent Customer**  
The Supply Chain Map provides a level of information that assists the Licensee to operate as an intelligent Customer.
- **Nuclear Safety Technical Assessment Guide 077 – Supply Chain Management arrangements for the procurement of nuclear safety related items and services**  
In line with the above Technical Assessment Guide the licensee must be able to demonstrate its capability in a number of different elements of Supply Chain management. The licensee may utilise a Map of its Supply Chain in development of its Supply Chain strategy.
- **Supply Planning**  
With a large number of major projects in development and implementation there is a growing need to understand the impact on the nuclear Supply Chain across the civil and defence Supply Chains.

This includes identification and mitigation of potential bottlenecks within the Supply Chain with multiple demands on limited resources. This in turn can help the intelligent Customer to make decisions on priorities at a project, Customer or sector level. It can also aid mitigation of associated risks through establishing visibility of available inventory and the identification of appropriate inventory levels to support the UK civil nuclear and defence Customers.

- **Industry standards**

Knowledge of the Supply Chain will support Customers when providing input into the development and adoption of new industry standards. Understanding the implications of a change or new standard on a Supply Chain can help to minimise the impact on the Supply Chain.

- **Obsolescence Management**

The early identification and management of obsolete components will enable development of obsolescence management processes, tools and solutions that can be adopted by the Customer at the appropriate point in its project.

This may help reduce costs associated with development of new products / systems or re-engineering existing products / systems and the potential impact on the project.

- **Counterfeit Fraudulent and Suspect Items (CFSI)**

Sharing of Supply Chain Mapping information will help to manage the risk of CFSI entering the Supply Chain. By sharing this information within the Supply Chain it will aid the identification of risk against product commodity type and geographical regions.

- **Corporate Social Responsibility (CSR)**

Suppliers have an obligation to manage their corporate social responsibility both voluntarily and underpinned by statute law (including modern slavery). By Mapping the Supply Chain it will also help to identify potential areas of risk.

- **Anti-Bribery & Corruption**

All Suppliers have an obligation to manage the Supply Chain in such a way that identifies and eradicates bribery and corruptive practices. Mapping of the Supply Chain enables the Customer to assess the potential areas of bribery and corruption risk.

- **Business Continuity**

Supply Chain Mapping will assist in identification and mitigation of potential risks within the Supply Chain where multiple demands, limited resources, single point of failure or unforeseen circumstances may adversely affect the Supplier's ability to deliver.

# Introduction to Supply Chain Mapping

The depth and breadth of Supply Chain Mapping should be commensurate with the perceived risk as described in the section Supply Chain Mapping and Risk, following the guidelines below:

- Suppliers should follow procurement / contractual requirements, and should produce a Supply Chain Map to enable understanding and risk management within the Supply Chain
- Suppliers should flow down contractual and quality requirements to Sub-contractors and each organisation in the Supply Chain should provide information to its Supplier for all sub-contracts placed. This information should be fed up the Supply Chain to the Licensee.
- Information required by the Customer for each contract placed should include; sub-contractor (company), Certification held (e.g. BS EN ISO 9001) location, sub-contracted Product/Service, Project to which sub-contracted Product/Service relates. As required, segmentation/risk category of the sub-contractor should also be communicated.
- The lowest Supply Chain tier at which this information is required will be a function of the associated risk and should be specified within the contract.
- Information gathered should be compiled in a format to depict the full Supply Chain for a Project, e.g. typical Supply Chain Map Appendix E.

If required, the Supply Chain Map will be colour coded to reflect Sub-contractor segmentation/risk categorisation. A contractor's segmentation must be equal to or greater than the segmentation of its sub-contractors to reflect Supply Chain risk.

## ***Relevant legislation***

This guide is not a standalone document; it incorporates and supports existing codes and standards within the UK Nuclear Industry, such as BS EN ISO 9001; the ONR's Technical Assessment Guides (TAG) and the IAEA's General Safety Guides (GSG). These are outlined in Appendix A: Related references.

## **Guiding Principles/Concepts**

The following principles underpin the successful application of oversight of Quality Management system arrangements within the UK Nuclear Industry Supply Chain, and Customers and Suppliers shall act in accordance with these principles at all times:

- UK Nuclear Licensees will act as Intelligent Customers
- Suppliers shall satisfy Customer Contractual requirements at all times
- Suppliers shall support Nuclear Safety requirements at all times
- Suppliers shall understand and apply the principles of configuration management
- Suppliers shall understand and operate robust change control processes
- Suppliers shall promote cultures and behaviours that support the principles of Nuclear safety

UK Nuclear Licensees (current and future) and the Supply Chain will be transparent and share information, including lessons learnt from Operational Experience (OE) and discovery of CFSI.

### **Communication**

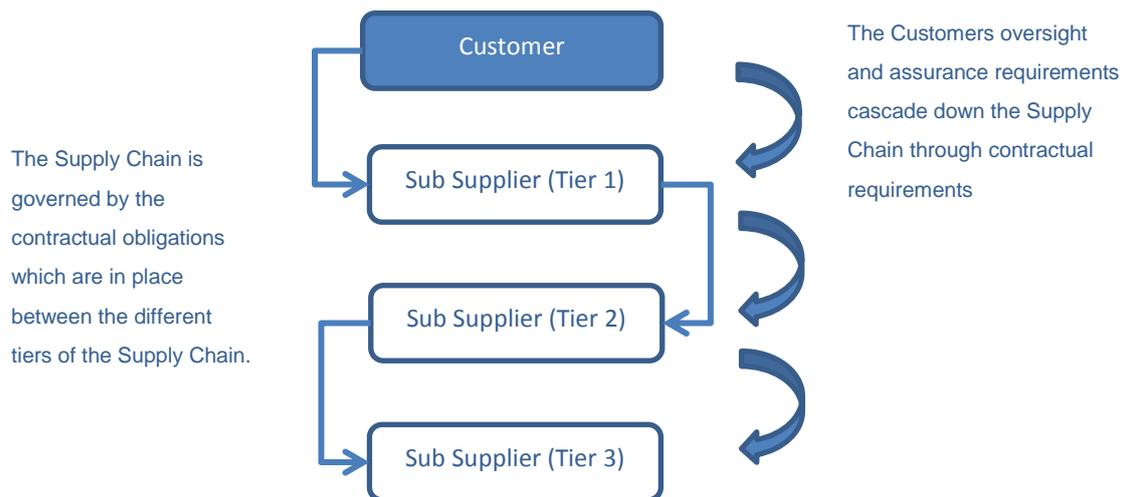
Communication with the Supply Chain explaining the rationale(s) for Supply Chain Mapping can be by a variety of means including:-

- Supplier engagement via websites, social media etc
- e-mail communication via cascading invitations down through tiers of the Supply Chain
- pre-qualification questionnaires and pre-contract notices
- invitations to tender
- contracts

### **Supply Chain Flow of Information**

This guide extends to all tiers of the Supply Chain via standard arrangements, as outlined in the diagram below. Flow of information is the distribution of the Customer's Contract arrangements established for the perceived level of risk. These arrangements should also be adopted regardless of where the Contractors are geographically located and operating.

#### **Flow of Customer requirements within the Supply Chain**



## Main Body

### Supply Chain Mapping and Risk

A key enabler to the success of any nuclear related project is the Supply Chain. If the Supply Chain is suitably qualified and experienced, has the correct culture and values, processes and procedures, works to Customer contracts effectively and controls their own Supply Chain to Customer requirements, then any nuclear related project has a greater chance of success.

The Nuclear Licensee acts as the Intelligent Customer and is required to understand the perceived risk / opportunity in its Supply Chain and place oversight, controls and performance management on the Supply Chain as appropriate. Nuclear licensees need to be able to demonstrate this to wider audiences such as regulators and other important stakeholders.

It is important for Customers to understand which packages/Suppliers are deemed high risk and which packages/Suppliers are deemed lower risk. The 4 box matrix (Appendix D) is an example of an internationally accepted standard for assessing Supply Chain risk, and providing segmentation of packages/Suppliers. This allows Customers to place oversight and assurance arrangements on Projects, Products or Services dependent upon the perceived level of risk.

A risk evaluation tool (Appendix C) is an example which has been developed to guide the segmentation of a package/Supplier into a 4 box matrix. The criteria which should be considered (but not exhaustive) under the model are:

- Nuclear Safety
- Conventional HSE
- Quality
- Critical Path Analysis
- Regulatory Interest
- Capability and Capacity of Supplier
- Geographical Placement of Supplier
- Value of package and financial stability of the Supplier.

The 4 box matrix may be colour coded to be more intuitive so that it becomes visually easier to ascertain where the areas of risk are likely to manifest themselves in the Supply Chain; an example of this is provided in the 4 box matrix (Appendix D).

### Supply Chain Mapping Management

The production of any Supply Chain Map is a statement of the Supply Chain at the time of its production and will be subject to change as the Supply Chain structure changes. These changes may be as a result of:

- Managed and known changes to the structure of the Supply Chain as Contractors seek to mitigate risk, drive efficiency and improve Supply Chain performance.
- The development of Supply Chain capability as Contractors progress through the commercial procurement process to move from tender to contract award.
- Assured reaction to changes in the availability of goods or services which mean Contractors must make changes to their Supply Chain.

In consultation with the Supplier, the Customer will agree a review frequency under which the Supplier will advise the Customer of the state and structure of their Supply Chain. The communication methodology will be agreed between the Customer and Supplier.

Regardless of the need to regularly communicate the state and structure of the Supply Chain, the Supplier will immediately make the Customer aware of significant changes in their Supply Chain. Subject to the contract of supply the Customer may reserve the right to reject these changes.

## Summary of Key Points

The UK Nuclear Industry needs to develop capacity and capability within its Supply Chain whilst maintaining a rigorous and clear approach to assuring the quality of products and services. The intention is to assist existing contractors, new entrants and potential new entrants to the UK Nuclear Industry by improving consistency and transparency. Supply Chain Mapping is one of the tools that may be utilised to achieve this.

The scope of Projects, Products or Services subject to Supply Chain Mapping should be identified by the Supplier following the principles identified in this document and in alignment with its identified risks.

Identification of the Supply Chain Map allows the Customer to assess and confirm the effective flow down of contractual requirements and supports a risk based approach to Supply Chain oversight and assurance

The production of any Supply Chain Map is a statement of the Supply Chain at the time of its production and will be subject to change as the Supply Chain structure changes.

In consultation with the Supplier, the Customer will agree a review frequency under which the Supplier will advise the Customer of the state and structure of their Supply Chain. The communication methodology will be agreed between the Customer and Supplier

The Supplier will immediately make the Customer aware of significant changes in their Supply Chain which may affect / undermine the original arrangements. Subject to the contract of supply the Customer may reserve the right to reject these changes

## Appendix A - Related References

The following reference documents may provide further information on Nuclear Safety and also identifies standards that may be included in contracts by individual Nuclear Licensees:

- ASME NQA-1: Quality Assurance for Nuclear facility Applications
- AWE – CQM 423: Generation of Quality Plans
- Babcock – SBU(D)-SD-129: Design and Quality Assurance Standards for Structures Systems & Components
- BAE Systems Submarines – Standard Submarine Quality Assurance Clauses (SSQAC)
- BS EN ISO 9001: Quality Management System Requirements
- BS EN 10204:2004 – Metallic products - Types of inspection documents
- EDF / NNB – GQAS (Quality Assurance for Contracts)
- Horizon – GQR: General Quality Requirements
- Institute of Nuclear Power Operators (INPO)
- International Atomic Energy Agency - Safety Standards
  - GS-R-3: The Management System for Facilities and Activities
  - GS-G-3.1: Application of the Management System for Facilities and Activities
  - GS-G-3.5: The Management System for Nuclear Installations
  - Fundamental Safety Principles, No. SF-1
- Magnox – MCP-004: The Graded Application of Quality Assurance
- MOD Defence Standards
  - Def Stan 02-884: Submarine Enterprise Standard Quality Requirements
  - Def Stan 05-135: Avoidance of Counterfeit Materiel
  - Def Stan 05-57: Configuration Management of Defence Materiel
  - Def Stan 02-207: Quality Management Framework and Requirements for Materiel Safety in Submarines
- NATO – Allied Quality Assurance Publications
  - AQAP 2105: Requirements for Deliverable Quality Plans
  - AQAP 2110: QA Requirements for Design, Development and Production
  - AQAP 2210: Supplementary Software Quality assurance requirements
- NQSA – NSQ 100: Nuclear Safety and Quality Management System - Requirements
- ONR – Technical Assessment guides
  - TAG 33: Licensee Management of Records
  - TAG 49: Licensee use of Contractors and Intelligent Customer capability
  - TAG 77: Supply Chain Management Arrangements for the Procurement of Nuclear Safety Related Items or Services
- “Operating Experience and Learning” A Guide to Good Practice, produced by the OE and Learning Group and published on behalf of the Nuclear Industry Safety Directors Forum, First Edition, April 2015
- Rolls Royce - SABRe, GS3001: Nuclear Submarines – General QA Requirements
- Sellafield – SLM 4.06.02: Contract Quality Requirements Manual
- SSP 25: Quality Assurance for Safety in Submarines

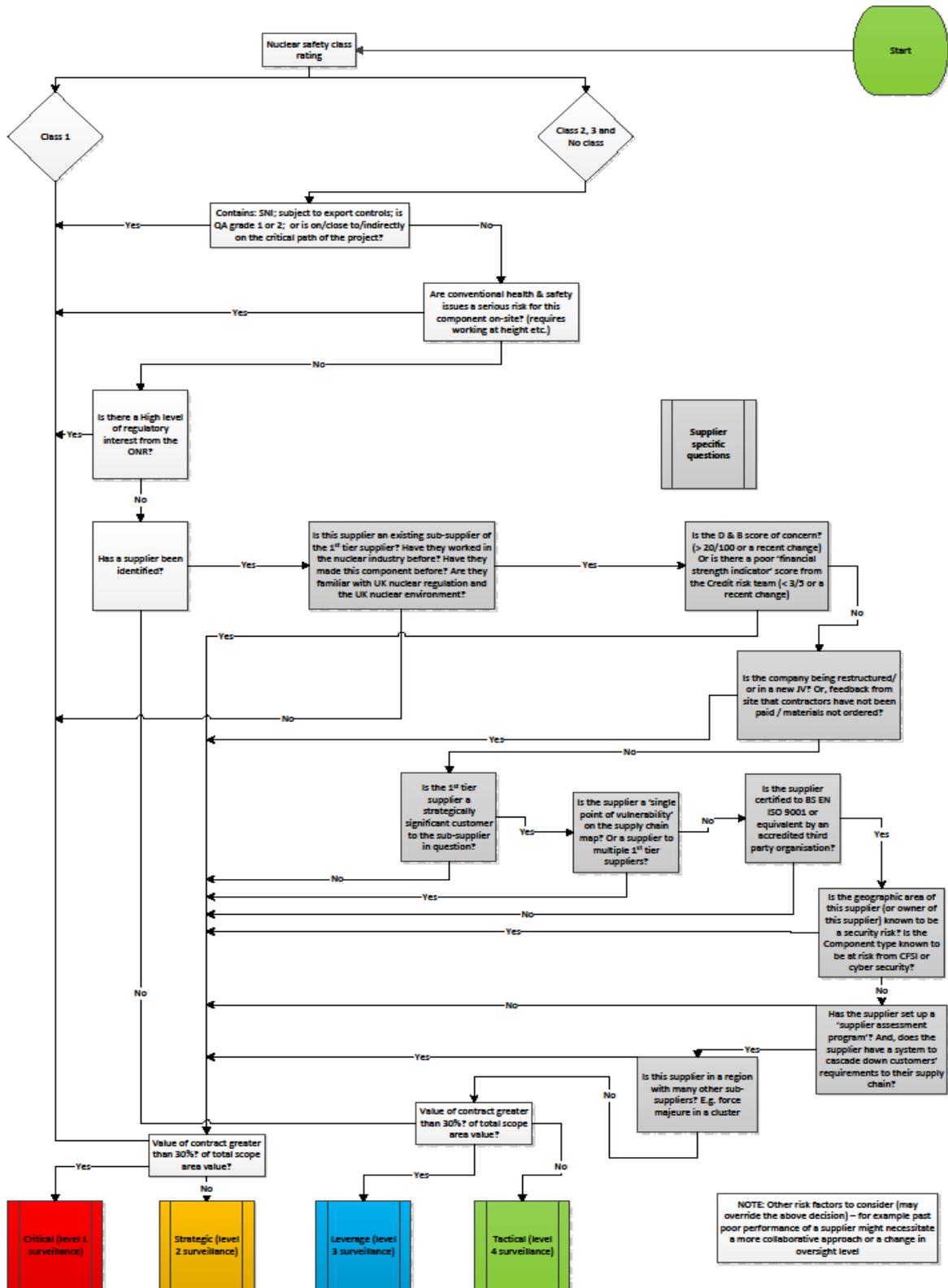
## Appendix B - Glossary

Audit	Systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which audit criteria are fulfilled
Assurance	A systematic approach to confirm activities are being completed as per the requirements, to the appropriate standard and to confirm that arrangements comply with required legislation, standards and Customer requirements
Capability	The sum of knowledge, expertise and capacity of an organisation to achieve its goals
Configuration Management (CM)	A management system for establishing a product's functional and physical characteristics and for maintaining consistency with its changing requirements through the life cycle. CM includes configuration management and planning, configuration identification and documentation, configuration change management, configuration status accounting and audit
Change Control	Change control is a systematic approach to managing all changes made to a product or system. The purpose is to ensure that no unnecessary changes are made, that all changes are documented, that services are not unnecessarily disrupted and that resources are used efficiently
Contract	Binding agreement between the Customer and a Contractor
Contractor/Sub-Contractor	Supplier or individual who provides products or services in accordance with the Customer's Contract requirements. Contractor is an all-inclusive term which may be used in place of: Supplier, Contractor, Sub-Contractor or consultant
Counterfeit	Items intentionally manufactured or altered to imitate a legitimate product in order to pass themselves off as genuine.
CFSI	Counterfeit, Fraudulent and Suspect Items: also includes services
Customer	The organisation receiving the Product or Service. May be defined as the Nuclear Licensee or the next tier up in the Supply Chain from the Contractor in question
Deviation	Departures from the originally specified requirements of a product prior to realisation. Deviations can emerge at any stage of the Supply Chain, including design, manufacturing, storage and transportation.
Flow-down	Distribution of the Customer's Contract requirements as applicable to the specified Quality Grade to every tier of the Supply Chain where the risk associated with the procurement of product or services continues to be a Quality grade 01, 02 or 03
Fraudulent	Fraudulent items are misrepresented with intent to deceive, including items with incorrect identification or false certifications.
Intelligent Customer	The capability of an organisation to understand where and when work is needed; specify what needs to be done; understand and set suitable standards; supervise and control the work; and review, evaluate and accept the work carried out on its behalf.
Learning from Experience (LfE)	See also Operational Experience (OE)
Nuclear Licensee	The body corporate that has been granted a Nuclear Site Licence under the Nuclear Installations Act 1965 (as amended), which permits it to carry out a defined scope of activities on a delineated site (NIA).
Nuclear Safety	The protection of workers, the public and the environment from undue radiation hazards by achievement of proper operating conditions, prevention of accident and the mitigation of accident consequences,. In this document safety means nuclear safety unless otherwise stated.
Operational Experience (OE)	The organisation systematically and effectively collects, evaluates, and implements lessons from relevant internal and external operating experience information in a timely manner
Product	TBC - to include components, equipment (incl. free-issue / Customer-issued), software, maintenance, decommissioning etc
Quality Grade	A graded approach to the procurement and supply of products and services as outlined within Section 6 of the UK – Nuclear Industry Guidance for Supply Chain Quality
Quality Management System	A management system to direct a unit and control an organisation with regard to quality; a combination of resources and means with which quality is realised.

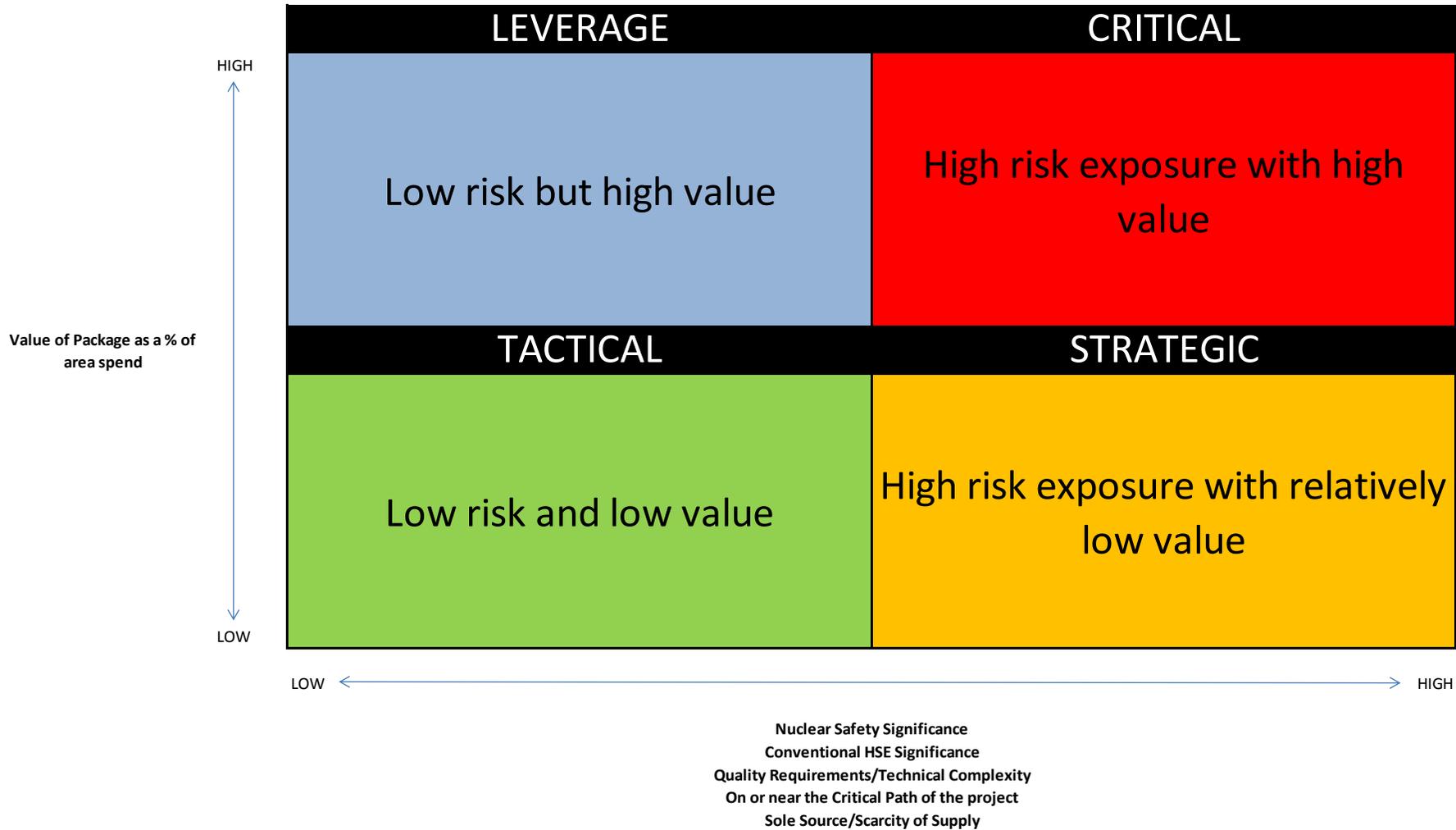
Quality Plan	A document or set of documents setting out the specific quality practices, resources and sequence of activities relevant to realisation of a particular item or service. A quality plan is useful for formalising and co-ordinating the interactions of various organisations, through the identification of witness and hold points.
Safety Culture	The assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance.
Supplier	See Contractor/Sub-contractor
Supply Chain	The network of organisations that are involved in the different processes and activities that contributes to the provision of products or services to the purchaser.
Suspect Item	Indication by inspection, testing or documentation that the Product may not conform to specified standards, specifications and/or technical requirements. Additional information or investigation is needed to determine whether the suspect item is acceptable, Non-conforming, Counterfeit or Fraudulent.

# Appendix C - Risk Evaluation Tool

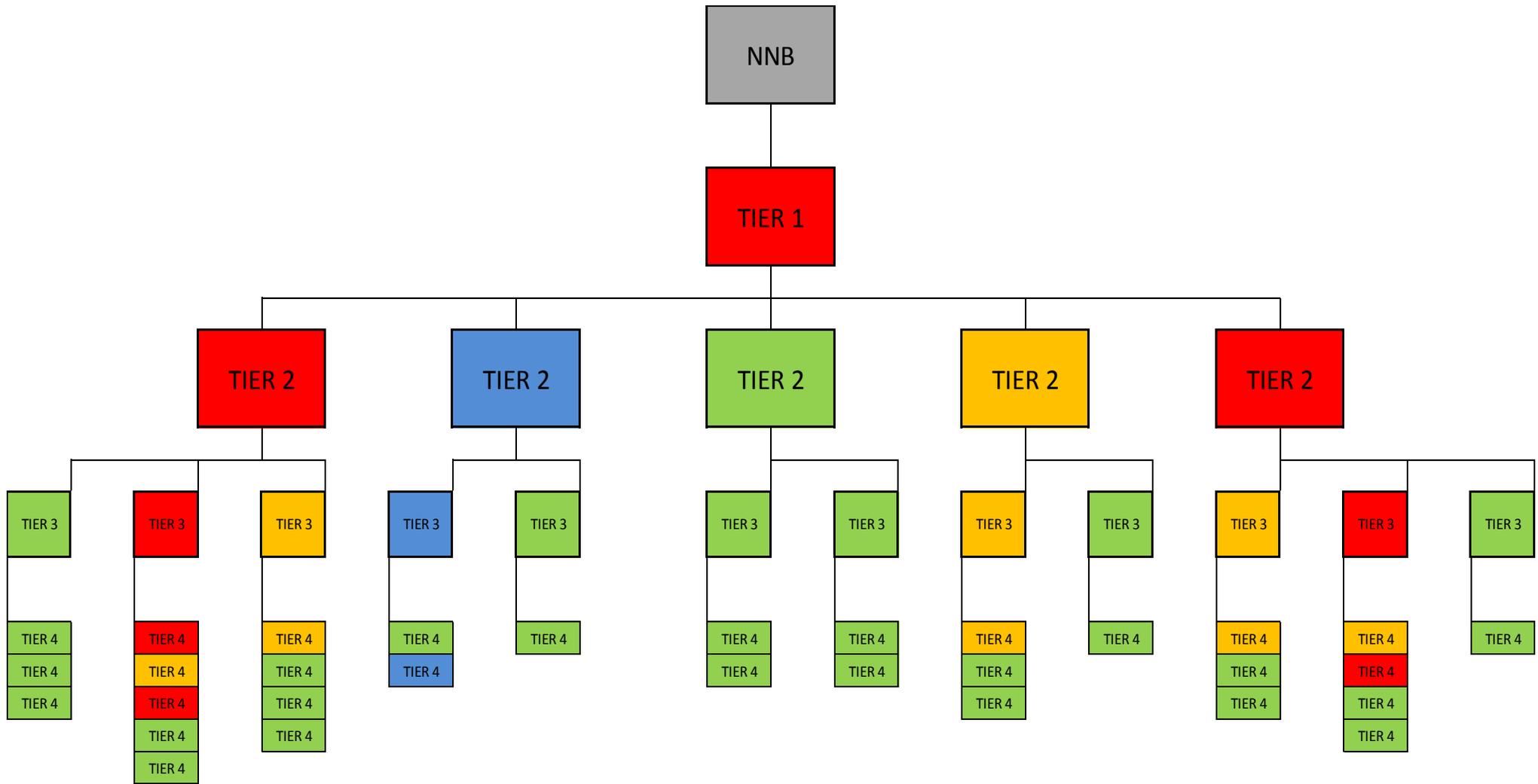
MDT Supply Chain  
Risk Positioning v3  
16/03/2017



# Appendix D – Typical 4 Box Model



# Appendix E – Typical Supply Chain Map



# List of SDF Publications

## Codes of Practice

Best Available Techniques for the Management of the Generation and Disposal of  
Radioactive Wastes  
Changeroom Design, Operation and Maintenance  
Clearance and Radiological Sentencing  
Management of Change and the Nuclear Baseline

## Good Practice Guides

UK - Nuclear Industry Guidance for Supply Chain Quality  
Independent Oversight – A Nuclear Industry Good Practice Guide

## Other Guidance