

CHALLENGE: Improvement of information management in Nuclear Safety Cases

Sellafield Ltd is seeking technologies to improve the efficiency of managing its Nuclear Safety Cases. Sellafield is a large, highly complex nuclear facility which has a lot of structured data across its Nuclear Safety Cases. These require very manual, resource-intensive processes to cascade changes and as such, a solution that could improve the efficiency and/or effectiveness of these processes is desirable.

Introduction

The Nuclear Safety Case is the body of evidence that justifies and demonstrates that nuclear hazards are adequately managed, that operations are safe and that associated risks are reduced to As Low As Reasonably Practicable (ALARP) in the required context.

Outputs from nuclear safety assessments (risk assessments) typically identify pieces of equipment or operator actions that have an important impact on nuclear safety; these outputs are referred to as Limits and Conditions. Limits and Conditions are the engineering and operational controls that are required to be implemented to ensure nuclear safety. They are embedded into a number of documents and systems to ensure safe day-to-day operations.

A solution is sought that accurately and efficiently manages the transfer of information within these Nuclear Safety Cases and associated documentation.

The body of evidence that forms each Nuclear Safety Case is contained within a series of written documents that include:

- The initial safety analysis, equivalent to a risk assessment.
- Documents that implement the requirements of the Nuclear Safety Case.
- Day-to-day working documents that are used to detail the operation and maintenance of the nuclear facilities.

The safe operation of the nuclear facilities is reliant on the accuracy of the information contained within all of the above documents.

Sellafield Ltd's challenge lies in the complexity and scale of its Nuclear Safety Cases. Sellafield Ltd has many nuclear facilities, and the safety cases for these facilities will typically consist of hundreds of interlinked documents per facility with potentially thousands of Limits and Conditions contained within them. Management of this wealth of information requires considerable time input from Nuclear Safety Case professionals and Sellafield Ltd's engineering, operations and maintenance teams.

The numerous documents that the Limits and Conditions cascade across include operator instructions, maintenance instructions, alarm response instructions, all of which link back to the safety case. All of these documents need to be kept up to date with any necessary modifications and changes needed to be implemented in a controlled manner. These documents reside within several locations, including:

- The Nuclear Safety Case Index (database).
- Various network drives.
- A plant-facing database known as 'Link Map'.

There are no live links between these documents, which exist in a variety of formats. If an update needs to be made to a document, this is likely to have consequences for other Nuclear Safety Case documents. Assessing and implementing the necessary changes within all associated Nuclear Safety Cases relies on manual effort and requires significant levels of checking to ensure its accuracy.

Sellafield Ltd is seeking a system that could automatically identify, interpret and propose where such amendments would need to be introduced within the series of nested/linked documents based on the nature of the proposed alteration. The automatic system should be able to provide a verifiable audit trail for the solutions it proposes.

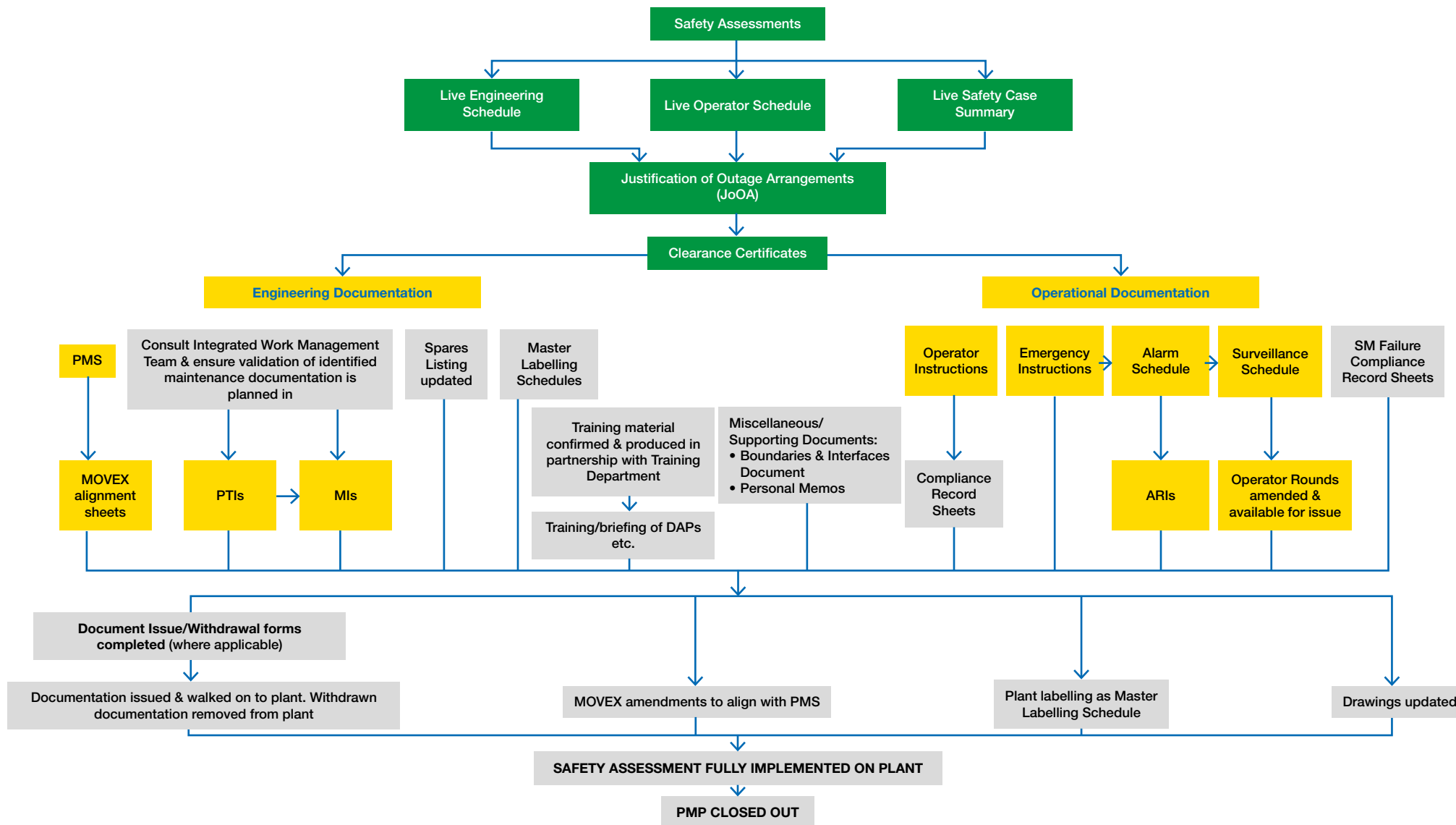


Figure 1: This flow diagram shows an example of a Nuclear Safety Case implementation map. The green shaded boxes are Nuclear Safety Case processes/deliverables; yellow shaded boxes are engineering and operations interactions which are currently beyond the scope of the Nuclear Safety Case but which Sellafield Ltd would like to include within the scope of this challenge.

Current Practice

At present Nuclear Safety Cases are managed entirely manually through a large number of digital documents which are developed and updated. Some low-level paper documents still exist, though master copies of these should be available digitally. Manual management of the Nuclear Safety Cases can lead to the following issues during production and implementation:

- Transcription errors within and between documents.
- Difficulties with change control between documents.
- Difficulty in managing the audit trail of information.
- Considerable resource is required to manage the information in these documents.

These issues are currently addressed by the application of comprehensive checking and assurance steps, which is extremely labour-intensive and subject to human error.

There has been limited work on improving the current practice. A Nuclear Safety Case configuration tool was developed around 10 years ago to improve management of the outputs (Limits and Conditions) from the risk assessments via a database. A trial system was developed but not fully implemented, as the tool that was developed did not integrate fully with Sellafield Ltd's systems and was not widely used.

Challenge Aims

This challenge will seek solutions for one Nuclear Safety Case with the key challenge aims being:

- To improve the accuracy and visibility of the audit trail (golden thread) through Nuclear Safety Cases from the top level down to the plant operational and maintenance documents.
- To reduce the time and cost required for the development, implementation, and maintenance of a Nuclear Safety Case, which will enable risks to be reduced more quickly.
- To provide an automated solution. Nuclear Safety Cases are developed with stakeholders across plant that spend a lot of time and resource checking the Nuclear Safety Case documents and updates. An automated solution would help to free up this resource.
- To improve change control for Nuclear Safety Cases, with reliable and accurate flagging of the cascade of changes required within all associated documents, when a single change is made to a single document. The ultimate aim would be to achieve automatic flagging once confidence levels have been met.
- The greatest benefit will be gained if the solution can be backfitted to existing Nuclear Safety Cases, and so the solution is able to manage the Nuclear Safety Case documents which exist in a variety of formats.

The challenge forms part of a package of work to improve the development and management of Nuclear Safety Cases at Sellafield. The aim is to deliver these improvements by:

- Reducing the amount of manual work to develop and Quality Assurance (QA) the various documents that form the Nuclear Safety Case.
- Improving the consistency of the data format across all documents within the Nuclear Safety Case.
- Reducing the amount of time taken to develop and manage Nuclear Safety Cases to better enable the Sellafield Ltd mission.

Sellafield Ltd will consider a commercial off-the-shelf (COTS) proposal, or may invest in the development of a solution. Either approach will require the oversight and approval of Sellafield Ltd's Information Services Organisation (ISO).

Benefits to Sellafield

For Sellafield Ltd, finding an automated solution to updating Nuclear Safety Cases across the site would have a significant impact on reducing resource time, improving accuracy and improving safety. It would allow better focus on the Safety Aspect of Nuclear Safety Cases rather than managing documents and information, currently the more time-consuming task.

A successful solution to the challenge will yield the following benefits:

- Faster and more efficient delivery of Nuclear Safety Cases.
- Allow deployment of Nuclear Safety Case resource onto higher value-adding activities.
- Higher confidence in the accuracy of information contained within Nuclear Safety Cases.

Constraints

- Digital solutions must be developed in conjunction with Sellafield Ltd Information Services Organisation (ISO) oversight and approval.
- Some of the Nuclear Safety Case documents are PDFs, some are PDF auto-scanned, some are PDF scanned by hand (so not straight on the page), and some do not have searchable text as they have been scanned as image files.
- There is also a variability in the document format, so the layout of a Nuclear Safety Case document could differ from one to the next, headings could be assorted sizes or in different locations.
- Documents are tabulated but the tables can be of different formats, so they have some variation. Therefore, some flexibility would be needed in the detection system.
- The final solution will need to be deployable on the Sellafield IT system and must be able to handle Official-Sensitive information (see the Functional Requirements section for the definition of Official-Sensitive).

Functional Requirements

- The solution must manage the information flow within Nuclear Safety Cases at Sellafield.

- Some Nuclear Safety Cases are marked as 'Official-Sensitive'. Official-Sensitive is a security classification for information which defines how it is managed, stored, and who can view it. Any potential solution must be able to work within the confines and restrictions associated with managing Official-Sensitive information. Dummy data will be provided for proof-of-concept evaluation of a solution.
- The solution must be able to track/audit all changes made by any proposed new system.
- The solution must be able to be applied to existing and new Nuclear Safety Cases at Sellafield.
- The solution must be able to identify and enable the elimination of any inconsistencies within Nuclear Safety Cases, e.g. the human element could mean that wording for the same information is slightly different across documents – text should be consistent/identical throughout the Nuclear Safety Cases.
- The solution should be able to interpret varied document formats and file types, i.e. Word, PDF, scanned images with and without Optical Character Recognition (OCR).
- The solution must improve change control and accurately flag all documents to change when one change is made to a Nuclear Safety Case.
- The solution should be scalable to allow application to all of Sellafield Ltd's Nuclear Safety Cases.

Any proposed new system should highlight to the operator:

- When a change might affect the principles applied in the nuclear risk assessment / safety assessment.
- Which documents are affected by any proposed change.
- Where any text changes should be made within each document.
- What any text changes could be.
- Provide a document audit trail of amendments, including when and how the amendments were made and by whom.
- Flag text inconsistencies within documents.
- Flag text inconsistencies between documents.

Find Out More

Game Changers are hosting a workshop for this challenge where delegates will have the opportunity to meet challenge owners. Details are available on the Game Changers website www.gamechangers.technology.

If you have new ideas or innovations which can be applied to address this challenge, we invite you to join us. If you'd like more information about the funding available through the Game Changers programme, please visit [Our Funding Process \(gamechangers.technology\)](http://www.gamechangers.technology).

The deadline for applications for this challenge is 3pm on Thursday 19 September 2024.

Assessment questions for this challenge can be found on the challenge webpage.



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