



NUCLEAR SAFETY DIRECTORATE - BUSINESS MANAGEMENT SYSTEM		
TECHNICAL ASSESSMENT GUIDE		T/AST/050
PERIODIC SAFETY REVIEWS (PSRs)		ISSUE 003
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1. Purpose & Scope

- 1.1 To provide best practice expectations for the guidance of inspectors in judging the adequacy of a licensee's arrangements and output under LC15. Although not prescriptive, differences between a licensee's arrangements and these expectations should be justified.
- 1.2 To add detailed guidance to the Site Inspection and Enforcement Guide for LC15 (Ref 5.1).
- 1.3 The guidance does not address the following:-
 - 1) Requirements for periodic reviews arising from legislation other than the NI Act/LC15 (eg COMAH, IRRs);
 - 2) Requirements for the processes of producing safety cases themselves and aspects relating to the detailed content of safety cases. These are addressed in other guides.
 - 3) The need for safety reassessments that arise from specific events, such as a change in operation, change in plant life-cycle phase, plant modification, or incident.

2. SAPs Addressed

- 2.1 No specific SAPs are addressed

3. Relationship to licence and other relevant legislation

- 3.1 The guidance relates to LC 15, principally 15(1), the purpose of which is to ensure that the licensee makes and implements adequate arrangements for the periodic and systematic review and reassessment of safety cases. A further LC requirement for safety cases is that for any operation that may affect safety, the limits and conditions in the interest of safety are identified (LC23). Thus the PSR should demonstrate that such limits and conditions are adequate, and will remain so at least until the next review

4. Advice to assessors

4.1 Purpose of a PSR

- 1) It is accepted internationally (Ref 5.2) that the purpose of a PSR is to determine, by means of a comprehensive assessment against modern standards, whether the plants, processes, management, operations and facilities covered by a safety case are safe, and that ageing and other time-related phenomena will not render them unsafe before the next PSR. Where modern standards are not met the PSR should assess the significance of the shortfalls, and identify reasonably practicable improvements. It is NSD's policy that licensees carry out such a PSR, as required by LC15, at least every ten years.
- 2) It should be noted that a PSR represents the work that is undertaken, not the safety case documentation that results from that work. The outputs from a PSR are set out in section 4.4. The documented PSR findings and associated forward programme of work form the basis of a submission to NII and are hereinafter referred to as the 'PSR Submission'. The work done during the PSR should also be reported, including the procedures applied, and may be separate from or incorporated within any new safety case documentation.

4.2 Principal Requirements of PSRs

- 1) In summary these are:-
 - i) To review the total current safety case for an installation in order to confirm that it remains adequate, or to update and revalidate it as appropriate to cover the period up to the next PSR. The review should be conducted in the light of modern standards and criteria, changes in technology and knowledge, operating experience - especially in the period since the last review, and modifications to the plant and its equipment.
 - ii) To look forward in detail over planned future operation for at least the next ten years, and to review the whole of the remaining life of the facility, including post-operational cleanout (POCO) and decommissioning, to show that there are no foreseeable circumstances that could threaten the ability to maintain safe operation.
 - iii) To ensure that in cases where the plant provides a safety function that cannot be provided by alternative available plant or equipment, the forward review includes consideration of the time which may be needed to design, construct and commission, or to procure replacement plant or equipment, should the original be found to be unserviceable at some point in the future i.e. there must be no interruption in safety function. This applies particularly to radioactive waste stores, or to other plants in which the hazard cannot be simply removed by shutting them down.

- iv) To identify safety deficiencies and deal with them by making appropriate plant improvements or operating changes, or justify that no action is needed.
- 2) PSRs are major reviews of safety and the documented safety case, normally carried out every ten years. However a licensee's arrangements under LC15 should also require interim reviews on a shorter term basis. These reviews should take into account the number and safety significance of modifications to the plant and/or changes to the safety case since the previous review. The objective is to ensure that the cumulative impact of all modifications and changes has been considered and that the safety case remains valid and up to date and the safety of future operations will continue to be demonstrated. An important factor to consider is whether or not the plant or site safety case has been updated to reflect all the changes. If not, the interim reviews should determine if some form of consolidation is required to enhance the accessibility and usability of the safety case, particularly in any areas where there have been numerous changes. Interim reviews should also consider operating experience and the overall impact of incidents, events and operational changes. Components whose behaviour or nature may undergo significant change in the interval between major reviews should be encompassed by interim reviews. One possible outcome of an interim review is that the next scheduled PSR date should be brought forward. Interim reviews would normally be expected every one to three years. Within this time span, the period could be flexible if account is taken of the number changes that occur. In this guide, the term PSR is reserved for the ten yearly reviews and interim reviews are referred to as such explicitly.
 - 3) For each safety case identified for the purposes of LC23(1), and produced as required by LC14, the period between PSRs, or from implementation of the safety case to its first PSR, should be ten years unless a longer period has been agreed or a shorter period required. In the absence of any other requirements the first PSR of a safety case for a new plant should be completed within ten years of fuel being loaded in a reactor, or within ten years of the start of active commissioning for a non-reactor plant.
 - 4) The requirement for PSRs at no greater than 10 year intervals remains, even when a plant moves into its post-operational phases. However, if the work done in producing a safety case for post operational activities at any stage reviews all aspects of the underpinning plant safety case, to the extent necessary for a PSR, then it will be acceptable for the next PSR to be 10 years from the start of that stage. For plants where decommissioning activities are programmed a strategy for developing and managing the safety case as it evolves during the decommissioning process should be documented and submitted to NII prior to the start of work, as part of a Decommissioning Safety Case or as part of a PSR submission if a complete review is being carried out at that stage. This should show how the safety case for the project will remain live and valid at all stages, and indicate how the progressive reduction of hazard will be achieved. Where activities may increase

risks temporarily, for example to enable remedial work, plant installation or waste retrievals to be carried out, the submission should set out and justify the change in risk profile.

- 5) For each PSR there will be a date on which NII makes a decision about the adequacy of the licensee's safety review to support future activities associated with the relevant plant. This date will either be proposed by the licensee and agreed with NII, or fixed by NII, and will be referred to herein as the 'Decision Date'. This will normally be set at the ten year limiting date (see para 3), and, once set, will not change to a later date except where NII has sanctioned an alternative date, for example, to suit work planning requirements. NII will write to the licensee by this date either to confirm a favourable decision on the adequacy of the review or to set out specific actions to be taken. Such actions might take the form of regulatory enforcement requiring, for example, the licensee to cease operation, to undertake plant improvements, or to carry out other activities, such as preparing a forward improvement programme. Regardless of the decision taken or the timescale for required improvements or activities, the Decision Date for the next PSR will normally be set at no more than ten years from the current Decision Date.
- 6) There may be circumstances under which NII or the licensee may opt for a period between PSRs of less than ten years. Examples are: cases where ageing mechanisms demand more frequent review; cases where operational experience or significant changes in standards indicate that an earlier review may be prudent; or cases where a significant change in operation occurs (eg decommissioning). However, where a PSR is carried out more often than once every ten years the PSR must still include the detailed ten year forward look together with the whole life review (see section 4.2 para 1) (ii) in order to provide for a consistent basis for decisions on the reasonable practicability of important safety improvements across the UK nuclear programme.
- 7) The PSR Submission, for relevant operations and associated plants, should provide a comparison with modern standards, and demonstrate:-
 - i) that identified deficiencies will be corrected so far as is reasonably practicable in a timely manner (see section 4.4 para 1); or
 - ii) that identified deficiencies, where correction is not planned, are justified on the basis of their actual condition at the time of the Decision Date and potential deterioration up to the next PSR. However this need not rule out the making of predictions about associated improvements in safety resulting from modifications or procedural changes that have not yet been implemented.
- 8) The PSR should take account, where appropriate, of the availability of a disposal route for arisings of radioactive waste, and the capability of all the on-site storage facilities to continue to perform their function for

well beyond the ten year detailed forward look. As a guide, PSRs should demonstrate that there is no likelihood of any ageing effect that might jeopardise the safe storage of radioactive waste for at least 50 years, taking into account the unavailability of disposal routes in the UK for radioactive waste. In particular, for chemical plants that have waste processing and storage facilities that cannot be shut down (e.g. where they are required to fulfill a strategic function over the life of the reprocessing plants they serve or until the waste they contain is retrieved for treatment and/or disposal), the PSR should address the safety issues over the longest potential strategic life of the plant and associated facilities.

4.3. Scope of a PSR

1) General

- i) The PSR should address all nuclear safety aspects of plants, operations and processes (including waste management facilities) within the relevant safety case scope, including associated management aspects. A list of suggested topics to be covered in PSRs is given in Ref 5.2.
- ii) In particular, the PSR should:
 - a) identify and address appropriately any ageing processes that may limit the safe life of any items;
 - b) review changes in relevant safety standards, analytical methodologies (including possible changes in the circumstances or ranges for which they have been validated), and inspection techniques, apply them as appropriate, evaluate any deficiencies, and implement reasonably practicable improvements to enhance safety;
 - c) include in the PSR Submission a listing and explanation of all plant, process, procedural, analytical or other improvements identified during the review, ranked in order of nuclear safety significance;
 - d) confirm the validity of all relevant plant and process information and documentation;
 - e) identify the programme of work to address the improvements which could not be implemented by the decision date;
 - f) review operating experience;
 - g) review changes to the licensee's organisational structure and resources to consider their cumulative impact and to determine if the current position is adequate for continued safe operation of the plant or site; and
 - h) identify when the next PSR is due.

- iii) In considering ageing processes, the PSR should review the acceptance criteria for maintenance, inspection and test activities, especially those for structures, systems and components (SSCs) that require a robust justification in the safety case. The PSR should demonstrate that the SSCs will remain within these acceptance criteria for the next PSR period. In addition, the PSR should highlight any ageing features that require attention before the next PSR, and ensure that they are addressed during appropriate interim reviews.
- iv) The arrangements should ensure, by methods such as plant walkdowns, that the plant configurations and condition assumed in the safety case reflect the actual plant state. Consideration should also be given to all expected modes of operation, such as those arising during maintenance, refuelling and shutdown/start-up activities, to determine whether there is any potential for increased or unacceptable levels of risk arising therefrom. The adequacy of arrangements for reviewing operational instructions, warning notices, training programmes, and other aspects that underpin safe operation should also be considered.
- v) The arrangements should ensure that there is an appropriate blend of plant specific engineering, safety assessment, and operational expertise brought together to carry out the PSR. They should make appropriate provision for independent review of the work, both for new safety documentation and for the review processes that are applied. In addition they should provide for the identification of clear lines of management responsibility, including a safety case owner, and person(s) responsible for overseeing the PSR and for owning the findings and improvement programme.
- vi) Allowance should be made for the decommissioning elements of a PSR to change in nature as a plant ages and approaches the end of its life. Initially reviews will concentrate on the technical strategy and outline plans for decommissioning, making use of the design provisions. Later on and as decommissioning becomes closer, reviews will address the decommissioning safety management system and the integration of waste management and decommissioning strategies.
- vii) Site-wide topics to be addressed include dependencies on common services and other plant; a demonstration that all operations which may affect safety on the site are addressed by a safety case; radiological protection; emergency planning; radwaste and environmental impact; overall hazards and risks from the site, particularly from external hazards.

- viii) Also on a site-wide basis the PSR should review and justify the continuing adequacy of the licensee's management of safety arrangements, including the control of changes to the organisational structure or resources available to it which may affect safety. Further guidance is given in Refs 5.3, 5.4, 5.5, 5.6 and 5.7. With the many organisational changes that have taken place in the nuclear industry in recent years, and which are likely to continue, it is important that the PSR covers areas such as technical support capability (notably retention of core competencies and "intelligent customer" capability), staffing levels and capabilities, succession planning, control of contractors, and learning from experience (incidents and safety performance). The PSR should consider if the licensee's organisational structure and resources available to it are adequate for its current and future needs, including benchmarking with other organisations where appropriate. This will lead to a redefinition of the licensee's Baseline (Ref 5.7).
- ix) The PSR Submission should include an overview report which brings together issues raised in individual topic reports and commits the licensee to the findings of the review.
- x) Any new or revised safety case arising from the PSR should be categorised in accordance with its safety significance. The safety significance should determine the extent of peer review and independent assessment and whether or not it is then submitted to the NSC for consideration and advice. When categorising safety significance it is not the considered risk but the potential hazard arising directly or indirectly, during or after the activities under consideration that must be considered. This should include any hazard arising from inadequacy in conception or execution. In all cases, the documents should be reviewed and approved by staff of an appropriate level within the licensee's management before implementation. This peer review may comprise internal design validation and verification. It should include a check that hazards have been properly identified, that assumptions made comply with accepted criteria and that standards and methods to evaluate consequences are in accordance with recognised and accepted procedures. For the higher categories of safety significance an independent nuclear safety assessment (INSA) may be required and the arrangements should include for this. The INSA should be carried out by persons independent of the groups responsible for the production of the safety case and for operations. It provides a detailed overview based on a rigorous safety assessment. After peer review and any necessary INSA, higher category safety cases should be considered by the NSC. This requirement should be explicit in the licensee's arrangements.

xi) It should be noted that NII will normally issue a public report of its findings in response to a PSR Submission (but see also section 4.3 para 2) (iii)).

2) Special Arrangements for Multi-Plant Sites

i) Different arrangements may be made for multi-plant sites, where the licensee, by agreement with NII, chooses not to address all safety cases at the same time. In such cases the reviews should take the form of a rolling programme of PSRs, ensuring that all relevant safety cases are reviewed within a ten year period. This programme should be reviewed annually by the NSC, and should be submitted to NII, together with proposed Decision Dates, for consideration and agreement.

ii) Care must be taken to ensure that interactions between plants having safety cases subject to individual PSRs, and site-wide topics (see section 4.3 para 1) (vii) & (viii)), are addressed for the whole site at ten yearly intervals or less. This work will be referred to herein as the 'Site-Wide PSR', and it should be subject to the same arrangements as other PSRs. The Site-Wide PSR should also provide an overview of the rolling programme for the site and should summarise the outcomes from individual PSRs undertaken since the last Site-Wide PSR. Possible reissue of the site's Safety Management Prospectus should also be considered at the time the Site-Wide PSR Submission is produced.

iii) It should be noted that for multi-plant sites NII will normally issue a public report of its findings in response to the Site-Wide PSR Submission, rather than for each individual plant, although public reports may additionally be produced in response to plants of particular significance.

4.4 Outputs from a PSR

1) Shortfalls and Improvements. The PSR is required to identify shortfalls against modern standards, leading to an improvement programme that covers engineering, operating regimes, and the documented safety case.

i) The arrangements should take account of the need to identify shortfalls and improvements to plant, operations, and the safety case, and a programme should be developed which ensures the requisite changes are able to be implemented in a timely manner. Implementation should be carried out as an ongoing process, in accordance, where necessary, with a strategy for identifying priorities and programme, and with a means of tracking what are the components of the 'live' safety case at any point in time. The intent should be to implement all changes by the Decision Date. If this is not reasonably practicable, then significant safety improvements should be implemented by the Decision Date, with all other improvements completed within a maximum period of two years after that date. Deviations from

this policy should be permitted only in exceptional circumstances and by special agreement with NII. As soon as possible after shortfalls have been identified and improvements programmed NII should be advised of the proposals to allow time for any changes if required. The arrangements should also ensure that an effective control and monitoring process is in place to provide confidence that satisfactory close out of all issues will be achieved by the agreed dates.

- ii) The licensee should explain the reasoning behind the proposed improvement programme and completion timescales, in particular for changes that extend beyond the Decision Date. In applying the test of 'reasonable practicability' the extent and duration of major improvements may be taken into account, but extended implementation periods should not be permitted where the PSR could have started early enough for foreseeable improvements to be identified in good time.
- iii) Reasonable practicability arguments for not implementing improvements may be considered where, for example:-
 - a) the benefit would only be applicable during operation, the time to implement would extend beyond closure, and the closure date is guaranteed (without a guaranteed date a period of at least ten years' further operation should be assumed);
 - b) arguments against the improvement include detriments other than purely financial (eg dose);
 - c) it is physically impossible or impracticable to modify the plant so as to achieve compliance with modern standards; or
 - d) the cost of bringing the plant up to modern standards would be grossly disproportionate to the safety benefit gained.
- iv) Where NII requires any work to be undertaken over and above that identified by the licensee, such work should generally be completed within 2 years of the Decision Date. Exceptions include:
 - a) requirements relating to an agreed ongoing activity (eg condition monitoring) which can be incorporated into normal regulatory processes, e.g. start up meetings following periodic shutdowns, or routine site review meetings; and
 - b) requirements that result in major plant modifications or major analytical work, which may not be capable of completion within the stated period.
 - c) requirements with specified timescales.

2) Programmes

- i) The arrangements should require a licensee to submit a programme of PSRs, including proposed Decision Dates, for all of its sites and installations, to NII for consideration and agreement.
- ii) The licensee should address, under the arrangements, the implementation of any new or revised safety case resulting from the PSR, and ensure, in line with section 4.4 para 1) (i), that at least all significant changes are implemented before the Decision Date. In normal circumstances where the safety case changes the change itself should be carried out and categorised appropriately under the modification arrangements required by LC22 (See also section 4.3 para 1) (x)).
- iii) An indicative programme for production of a PSR Submission (due for completion by Decision Date 'X') is outlined in Table 1. For PSRs that are part of a rolling programme on a multi-plant site, it may be acceptable for the licensee to justify a more compact programme.
- iv) The programme needs to allow sufficient time for NII's assessment. Therefore, the licensee's arrangements should make provision for the PSR Submission to be received by NII 12 months, or some other suitable period by agreement, ahead of the Decision Date. Failure to submit within a reasonable time period, without prior agreement with NII, could result in regulatory action.

4.5 NII's Assessment Programme

- 1) The NII project manager should establish a programme for assessment of the PSR Submission, with the aim of producing a draft response to the licensee 3 months prior to the Decision Date (see Table 1), together with proposed target dates for addressing any issues still to be resolved. Normally NII will formally inform the licensee by letter of its decision by the Decision Date.

5 References

- 5.1 Site Inspection & Enforcement Guide for LC15 (T/INS/015)
- 5.2 IAEA Safety Guide 50-SG-012
- 5.3 Management of Safety T/AST/039
- 5.4 Successful Health and Safety Management HSG65
- 5.5 Managing for Safety at Nuclear Installations HSE Books 1996

- 5.6 The section "Organisation and administration" of IAEA's Revised Safety Guide on Periodic Safety Reviews (Currently in draft, Ref: DS 307)
- 5.7 Licence Condition 36 Arrangements T/AST/048

Table 1 Indicative Programme for Production of a PSR Submission

For a multi-plant site this programme should be followed for each PSR separately

Point in time	Activities expected to be done by the relevant point in time
X - 3 years	<ul style="list-style-type: none"> • Licensee has completed the PSR plan and provides NII with a timetable of activities • NII and licensee agree scope of work.
X - 2 years	<ul style="list-style-type: none"> • Licensee has identified significant areas for improvement and/or analysis, and demonstrates that associated work has commenced. NII advised of proposals. • NII advises licensee of anticipated problems.
X - 1 year	<ul style="list-style-type: none"> • Licensee presents the PSR Submission, together with a progress report on improvements that are under way.
X - 3 months	<ul style="list-style-type: none"> • NII makes available to the licensee its findings on the PSR Submission.
X	<ul style="list-style-type: none"> • The 'Decision Date'. • The latest date by which the licensee may plan to implement significant modifications (to plant, operations and documentation). • NII confirms its decision in writing to the licensee regarding future activities on the plant encompassed by the reviewed safety case. • Licensee confirms programme for addressing NII requirements • NII may issue a press release on the decision for continued operation.
X + 3 to 6 months	<ul style="list-style-type: none"> • Where appropriate NII publishes a report on the PSR assessment and issues arising, including the licensee's programme for further work. Where a public report is produced a press release is also issued via HSE Press Office.
X + 2 years	<ul style="list-style-type: none"> • Licensee confirms completion of all outstanding identified work, including NII requirements, except where agreed otherwise. • Where appropriate NII produces a close-out report and issues a press release via HSE Press Office