

PSA applications



Living Probabilistic Safety Assessment (LPSA)



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LIVING PSA: DEFINITION

“A PSA of the plant, which is updated as necessary to reflect the current design and operational features, and is documented in such a way that each aspect of the model can be directly related to existing plant information, plant documentation or the analysts’ assumptions in the absence of such information.

The LPSA would be used by designers, utility and regulatory personnel for a variety of purposes according to their needs, such as design verification, assessment of potential changes to the plant design or operation, design of training programmes and assessment of changes to the plant licensing basis”



LIVING PSA: GENERAL REQUIREMENTS

- **The basis for the LPSA model should be comprehensively documented so that each aspect of the model can be directly related to existing plant information or to the analysts' assumptions of how the plant and the operating staff behave.**
- **It must be possible to update the LPSA as changes are made to plant design and operation, feedback is obtained from internal and external operational experience, understanding of thermal-hydraulic performance or accident progression is improved, and advances are made in modelling techniques**



LPSA DOCUMENTATION GENERAL

- It is essential to identify at the beginning of the project the documentation that will be generated, and to develop it throughout the course of the work
- It would be very difficult to generate the technical documents discussed later after the work has been finished



Living Probabilistic Safety Assessment (LPSA)

LPSA DOCUMENTATION

DOCUMENTATION FOR THE MANAGEMENT OF THE PSA

- **Project Plan**
- **Quality Assurance Plan**
- **Quality Assurance Procedures**



LPSA DOCUMENTATION PROJECT PLAN

- Its primary aim is to ensure that the PSA's purpose and objectives and hence its scope is clearly understood and defined at the beginning of the project
- As many of the future applications as possible should be identified at this stage, as these will affect the approach to be used in the individual tasks
- It identifies the required level of QA
- It also identifies the various reports and procedures which will be produced during the course of the PSA development



LPSA DOCUMENTATION

QA PLAN AND PROCEDURES

The main objectives of the QA plan and procedures are:

- to ensure that the necessary documentation is developed,
- and to ensure that the review process for all the work products is clearly specified



The basis for the PSA model should be comprehensively documented so that each aspect of the model can be directly related to:

- an existing plant document
- plant design and operational features which may be non-documented or for which the existing documentation is not comprehensive enough
- the analysts assumptions of how the plant and the operating staff behave



LPSA DOCUMENTATION TECHNICAL DOCUMENTS

- **Work plan: Task Procedures**
- **Task Documentation: Analysis Files**
- **Document Data Base**
- **Summary Report**



LPSA DOCUMENTATION TASK PROCEDURES

- **The purpose of these documents is to ensure that all analysts working in a task develop a consistent set of models which interface without overlap or omission**
- **Future revisions to the PSA will use the same procedures to ensure consistency with the original model**



LPSA DOCUMENTATION

THE TASK PROCEDURES SHOULD INCLUDE

- Detailed set of steps that give guidance of how to perform the tasks
- Techniques to be used
- General assumptions to be made
- Each Task Procedure should clearly identify the interfaces with other tasks and the information/data to be exchanged between tasks



LPSA DOCUMENTATION TASK ANALYSIS FILES

- **Controlled documents which are maintained for the life of the plant**
- **They enable any PSA analyst familiar with the particular task to either recreate or modify the particular part of the model**
- **Only if there is a complete set of such files it is possible to define and understand each element of the computer model, and the results of its quantification**



LPSA DOCUMENTATION

THE TASK ANALYSIS FILES SHOULD INCLUDE

- Detailed steps in the development of each part of the model
- All the systematic and explicit information on the assumptions made in the development of each aspect of the final model
- The computer models and databases
- Identification of the interfaces with other tasks and the information/data that has been exchanged between tasks
- List of all references used



LPSA DOCUMENTATION DOCUMENT DATA BASE

- The performance of the PSA requires the use of documents generated at the plant, and documents generated by outside bodies such as the plant designer, architect engineer, or research organisations
- Significant amount of new material is generated during the development of the PSA, for example, minutes of meetings, procedures, calculation notes, reports, etc.
- Future changes to the input documents will impact the PSA
- It is recommended to develop a Document Data Base to have control of all the documentation used and produced
- Ideally, this date base should cross reference input, output and usage of the various documents



LPSA DOCUMENTATION SUMMARY REPORT

- Its purpose is to communicate the project's motivations, objectives and scope, methods, results and conclusions of the study, to interested users
- It should also provide an overview of the contents and organisation of the documentation of the study

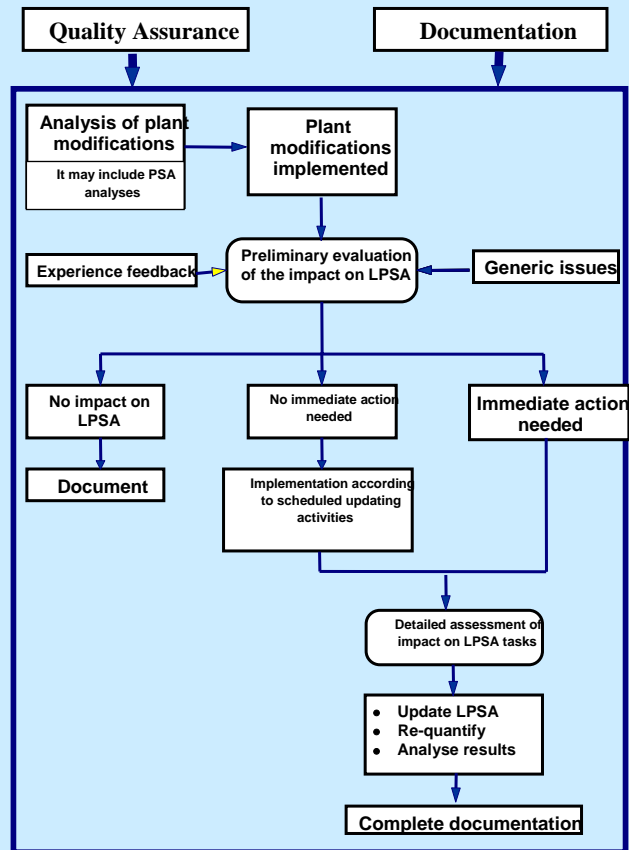


LIVING PSA: UPDATING LPSA UPDATING

- The LPSA should be updated *as frequently as necessary* to ensure that the model remains an accurate representation of the safety of the plant
- It is necessary to assess the impact of any modification on the PSA in order to check its continuing validity and thus to identify any need for updating. *It would be good practice not to accumulate a backlog of such assessments for a period longer than one year*
- Modifications that impact the PSA results may require an immediate updating of the LPSA. However, even if this type of modification does not arise for a longer period, it is still suggested *that the updating process be audited every three years and the LPSA formally amended at that time*



LIVING PSA: UPDATING





LPSA: ORGANIZATIONAL ASPECTS DEVELOPMENT PHASE

- Full commitment and support of the plant management and personnel
- Integrated plant activity with the co-operation and assistance of several departments, e.g. involvement of plant staff in the development/review of the model
- Qualified specialists and support teams with clear definition of interfaces



LPSA: ORGANIZATIONAL ASPECTS UPDATE/MAINTENANCE PHASE

- **If the LPSA is maintained by a utility team:**
 - ◆ 4 to 7 engineers
 - ◆ updating and applications
 - ◆ some external support may be required
- **If the LPSA is maintained by a team external to the plant:**
 - ◆ at least 1 dedicated engineer at the plant
 - ◆ ensure communication of changes to the PSA team
 - ◆ co-ordinate visits to the plant and internal plant review
 - ◆ would help advise plant management of potential applications