Recent PSA developments and use of PSA applications in Belgium

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Abstract: As Technical Support Organization (TSO) of the Belgian Federal Agency for Nuclear Control (FANC), Bel V has continuously stimulated the development and use of Probabilistic Safety Analysis (PSA) as a complementary approach to deterministic safety analysis. This paper summarizes (1) the current status of PSA for the Belgian nuclear power plants (NPP), (2) the current use of these PSAs, and (3) the main perspectives for the future.
In particular, Internal Fire and Internal Flooding PSA have been performed for all Belgian units. During the past few years, a considerable effort was made by the PSA team of Bel V to review those PSA.
In Belgium, PSA is also increasingly used by the licensee for several PSA applications (e.g. precursor analysis in support of event/incident analysis (OEF), safety demonstration of plant modifications, plant configuration control, etc.).
The upcoming challenges for the next few years will be mainly focused on the implementation of the WENRA Reference Levels for Existing NPPs published in 2014, including mainly the evaluation of external hazards (such as earthquake) by means of PSA.

Keywords: PSA update, Regulatory review, TSO.

1. INTRODUCTION

Belgium has 7 NPP from the PWR type (Westinghouse and Framatome designs PWR) on its territory (grouped in two sites). For these units, the licensee (ENGIE Electrabel) and its architect engineer (Tractebel Engineering) have developed and maintain 6 Level 1 Internal Events PSA models (as the twin unit Doel 1-2 is being treated by one single model) and 4 Level 2 Internal Events PSA models (for two units, another unit has been considered as representative).

After the completion of a first full cycle of establishment, review and interpretation of results of a plant-specific PSA, a comprehensive update of all PSA models has been performed within the framework of Periodic Safety Review (PSR).
During the PSR exercise, these models were evaluated by a peer review organized by the licensee and performed by an external company. This resulted in the identification of opportunities for improvement and strengths of the PSA models and, combined with the conclusions of the independent regulatory review by Bel V, led to the identification of possible corrective actions to be implemented in the PSA models by the next anniversary dates of the units.

In parallel, PSA models are also updated to incorporate recent plant modifications and Operational Experience Feedback (OEF).

In Belgium, the necessity of performing and using PSA has been introduced into the Belgian regulations in 2011, by means of the incorporation of the Western European Nuclear Regulators Association (WENRA) Reference Levels for Existing NPPs published in 2008.

This led to the development of internal Fire and Flooding PSA for all the Belgian units. Plant specific Fire and Flooding Level 1 PSA studies, results and proposal of corrective actions to be implemented on site were delivered in 2017 by the licensee. These PSA have recently been reviewed by Bel V.

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First Fire and Flooding Level 2 PSA were also developed for a representative unit (pilot project). The need for further development of these PSA and for developing Fire and Flooding Level 2 PSA for other units is currently under discussion.

This paper deals with the progress made since the start of the PSA updates and scope extensions, and since the announcement of the licensee's policy for PSA-related activities. In particular, the role of the licensee and his architect engineer on the one hand, and the Belgian TSO, Bel V, on the other hand, is emphasized.

It is also shown how the WENRA Reference Levels for PSA have been instrumental in obtaining the licensee's commitment to a broader and better use of the Belgian PSAs.

Finally, some perspectives and future challenges are described (among others related to the future incorporation of the updated WENRA Reference Levels of 2014 into the Belgian regulations).

2. STATUS OF PSA DEVELOPMENT IN BELGIUM

2.1. Former PSA developments and updates for Belgian NPP

In the framework of a previous PSR of the Belgian NPPs[1], a first full cycle of analysis, modelling and review of PSA has been completed [1]. The Level 1 PSA models of all seven PWR units covered internal events (without internal fire or flooding) in power and shutdown states. Limited-scope Level 2 PSA models were also developed (to identify containment failure modes, but without source term evaluation) and probabilistically quantified for three units only (Tihange 1 and twin-unit Doel 1-2).

The PSA has been developed by the architect-engineer Tractebel Engineering on behalf of the licensee ENGIE Electrabel. An on-line regulatory review of each PSA has been performed by Bel V, and has been concluded by a PSA Evaluation Report including recommendations for improvements of PSA models and related issues (such as methodological issues, data and model accuracy, completeness), for a more detailed exploration of PSA results, for PSA documentation issues, and for PSA scope extension. These recommendations were to be considered during the next PSA updates.

Within the context of the subsequent PSR[2], a comprehensive update of all existing PSA models has been performed [2].

The main objective of these PSA updates was to verify the robustness of each plant in its current state[3], by

- taking into account all changes to systems, operational practices and procedures, and considering an extended operating experience;
- taking into account more refined models and best-estimate hypotheses where needed (including error corrections, missing elements, well-balanced modelling);
- reconsidering some PSA methodologies (e.g. HRA[4] methodology, CCF[5] quantification) to be applied in view of the current state-of-the-art;
- extending the scope of the PSA with additional internal events and plant operating states;
- applying a full-scope PSA Level 2 approach to all plant designs (by means of four representative units), including power and shutdown states.

Moreover, significant improvements in maintainable up-to-date PSA documentation and ready-to-use computer models were expected.

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[1] Second PSR of the older units Doel 1-2 and Tihange 1. First PSR of the units Doel 3 & 4 and Tihange 2 & 3
[2] Third PSR of the older units Doel 1-2 and Tihange 1. Second PSR of the units Doel 3 & 4 and Tihange 2 & 3
[3] Reference Date : 1st January 2005
[4] HRA: Human Reliability Analysis
[5] CCF: Common Cause Failure

The implementation of the update of the Level 1 and Level 2 internal events PSAs has been done by Tractebel Engineering including a more detailed analysis and interpretation of results, the analysis of importance measures and updated and/or new uncertainty and sensitivity analyses.

The on-line review of Bel V focused on the following themes:

- Implementation of additional plant operating states and associated assumptions (initial conditions, system availabilities, etc.);
- Integration of new initiating events into the PSA models (e.g., very small LOCA[6], additional ISLOCA[7] initiators, loss of compressed air, loss of offsite power with several recovery times, etc.) or justifications to neglect some initiating events (e.g., loss of a single train of the component cooling system);
- Additional system models (e.g., compressed air systems and some ventilation systems);
- Plant system modifications not yet modelled in the PSAs;
- Update of initiating events frequencies[8] and use of new database for equipment failure rates[9];
- Implementation of the new HRA methodology and use of plant-specific procedures;
- Modelling choices made during the quantification using the RiskSpectrum PSA software;
- Coherency of the PSA results with the expected impact of plants-specific characteristics.

After the finalisation of this PSA update, Bel V again established an Evaluation Report which has been an input to elaborate the roadmap for the next PSA upgrade (see § 2.2).

2.2. Recent IE[10] PSA developments

After the first major PSA upgrade/update in 2011, a peer review of one PSA (i.e. for a representative NPP unit) against the ASME "Standard(s) for PRA for NPP Applications" [3] was performed by an external, independent peer review team, on behalf of the licensee (in the framework of a PSR based on the IAEA Safety Standard NS-G-2.10 (2003) [4] and SSG-25 (2013) [5]). The results of the peer review (i.e. strengths and weaknesses of the PSA, findings and recommendations) and the use of its recommendations by the licensee were also reviewed by Bel V, and confronted with the on-line/off-line review of plant-specific PSA by Bel V. Examples of such mutually corroborated recommendations and finally agreed PSA improvements are:

- use of realistic data for unavailabilities due to test or planned maintenance for all POS (instead of generic data based on theoretical frequencies and test durations);
- removing asymmetries in the PSA models (e.g., modelling of initiating events, system configurations with running and standby components, unavailability data for redundant components);
- verification of the identification of all potential initiating events (including, e.g., IE based on plant operating experience, or human-induced IE);
- identification and modelling of additional dependencies (diesel ventilation systems, normal feedwater as backup system, common cause failures for breakers and for AFW[11] pumps);
- development of full fault tree for the containment isolation system;
- identification and quantification of miscalibration errors (type A human errors), including CCF;
- implementation of a new HRA methodology for PSA Level 1 (type C actions) and a compatible HRA methodology for PSA Level 2, to allow modelling of HRA dependencies between PSA Level 1 and Level 2;

[6] LOCA: Loss of Coolant Accident
[7] ISLOCA: Interface systems LOCA
[8] As much as possible based on the Belgian Operational Experience Feedback, otherwise NUREG-5750 [6], NUREG-1829 [7], French studies, plant-specific system fault trees, or expert judgement were used.
[9] As no Belgian plant-specific data were available, the Nordic T-Book [8] was used.
[10] IE: Internal Events
[11] AFW: Auxiliary FeedWater

- modelling of fission product retention in the Nuclear Auxiliary Building;
- more detailed source term modelling and verification (release groups, check source terms of APET[12] branches by means of specific MELCOR calculations).

As mentioned above, some high-level recommendations (mostly related to scope and methodological aspects) were identified by both peer review and Bel V review. Nevertheless, the more detailed technical review performed by Bel V (i.e. a review for all NPP units, using the TSO's PSA experience and knowledge of the Belgian nuclear facilities) led also to the identification of several other needs for improvement of the PSA models. Several improvements could already be implemented during the on-line review.

Examples of further improvements identified by Bel V for PSA Level 1:

- improvements of supporting studies (e.g. a sufficiently extended set of thermal-hydraulics studies to justify success criteria (used in event trees) or recovery times (needed for quantification of type C human errors));
- re-examination of apparently optimistic HRA results (HEP[13] values), e.g. due to crediting several though dependent recoveries (in type C human errors) and not applying a dedicated methodology for errors of commission (EOC);
- re-assess the introduction of mission times other than 24 h, for specific accident sequences and/or systems, in particular if it cannot be demonstrated that a safe end state (or at least stable plant conditions) is reached after 24 hours;
- adequate use of the available databases or references for reliability data (e.g. T-Book data) or initiating event frequencies (e.g. LOCA frequencies according to NUREG-1829 [7]);
- differentiation between POS[14] (e.g. differences in availability of automatic safety signals) in the modelling of accident sequences;
- elaboration of CCF-type pre-accidental human errors related to changes of plant operating state (e.g. based on OEF).

Examples of further improvements identified by Bel V for PSA Level 2:

- elaboration of a sufficiently extended set of MELCOR supporting calculations for representative accident scenarios during the APET quantification process;
- use of less conservative assumptions compatible with operational practices and/or Technical Specification requirements (e.g. availability of ventilation systems considered in PSA Level 2, for buildings adjacent to the reactor building);
- consideration of hydrogen release and combustion outside containment (e.g. in annular space or nuclear auxiliary building) which may lead to loss of equipment used in severe accident management;
- evaluation of structural containment failure due to excessive water weight when containment and reactor cavity are flooded using alternative water sources (SAM[15] measure);
- improvement of the expert judgement technique (e.g. improvements of expert elicitation and aggregation of results);
- more extensive analysis of PSA Level 2 results in order to identify risk reduction options and/or plant-specific accident management strategies or measures.

The recommendations identified, on the one hand, by Bel V and, on the other hand, by the external company having performed the peer review were used as input to elaborate the roadmap of the current PSA upgrade of the existing Internal Events Level 1 and Level 2 PSA.

[12] APET: Accident Progression Event Tree
[13] HEP: Human Error Probability
[14] POS : Plant Operating State
[15] SAM : Severe Accident Management

During this exercise, the data used as input for the elaboration of the PSA models (i.e. OEF, maintenance durations, plant modifications, etc.) are also updated.

As before, this project is being performed by the licensee and its architect engineer, andBel V is performing its regulatory review during the development of the project itself (“on-line review”). The principal advantage of this way of working is the possibility to highlight problems early during the PSA development, allowing the licensee to adapt the PSA (methodology, model and documentation) by taking into account the regulatory recommendations as soon as possibly achievable.

2.3. Influence of WENRA Reference Levels

In January 2006, the WENRA RHWG (Reactor Harmonisation Working Group) concluded an exercise consisting in defining so-called Reference Levels (RLs) for different issues in nuclear safety of existing nuclear power plants and in benchmarking national regulations and the implementation of the RLs in the nuclear power plants. The final report of this exercise can be found on the WENRA website (www.wenra.org). Some RLs were later on revised resulting in a revised document with the complete set of RLs, published in January 2008, and also available on the WENRA website.

In response to this exercise, all participating countries set up an action plan to integrate the missing RLs into their legally binding and publicly available regulations and to implement the RLs that were considered not or not fully implemented in the nuclear power plants. As can be seen from the 2006 RHWG report, Issue O (Probabilistic Safety Analysis) was amongst the issues with the highest fraction of RLs that were not incorporated in the national regulations and not or not fully implemented in practice. This was also the case for Belgium, resulting in the actions described hereafter.

In Belgium, issuing regulations belongs to the competency of the FANC (Federal Agency for Nuclear Control). Therefore, to incorporate the WENRA RLs into legally binding regulations, FANC started an important effort, not only in view of incorporating the RLs related to PSA, but to incorporate the WENRA RLs in a global effort into legally binding regulations. Bel V participated in the review of the regulations as proposed by FANC. The whole exercise was concluded, at the end of 2011, with the publication of a Royal Decree integrating all WENRA RLs into legally binding and publicly available Belgian regulations on safety of nuclear installations.

Concerning the implementation of the RLs for the Belgian nuclear power plants, the regulator asked the licensee, ENGIE Electrabel, to set up an action plan aiming to implement all RLs. For 9 RLs of Issue O (PSA), specific actions have been defined. Some of them are related to PSA scope extensions, other are related to PSA applications.

Within the context of PSA, the following actions were identified:

- Integration of internal fire and flooding hazards in Level 1 and Level 2 PSA;
- Consideration of relevant dependencies during PSA development;
- Development of uncertainty and sensitivity analyses for Level 1 PSA and uncertainty analysis for Level 2 PSA;
- Elaboration of a policy for decision making using PSA;
- Use of PSA to assess the adequacy of plant modifications and other operational changes, as well as for the assessment of operational occurrences;
- Use of PSA outputs to develop and validate training program of the operators on site;
- Use of PSA outputs to check the adequacy of the inspection programmes;
- If PSA is used for evaluating or changing the requirements on periodic testing and allowed outage time for systems or components, consideration in the analysis of all SSC states and safety functions they participate in;
- Integration of the list of components found to be important for safety according to PSA outputs, in the SAR (Safety Analysis Report).

The first three actions identified through the WENRA Belgian Action Plan (BAP) concerned PSA developments. Fire and Flooding PSA are detailed in section 2.4 of this paper. The incorporation of relevant dependencies (such as area dependency) was performed during the development of those studies.

The development of sensitivity and uncertainty analyses was performed at the end of every type of PSA development. Even if these analyses already existed before, the definition of the action within the WENRA BAPhas permitted to consolidate the methodology used and to assure that those studies are performed in a systematic and coherent way.

The six last actions concerned PSA applications and will be detailed in section 3 of this paper.

2.4. Development of internal Fire and Flooding PSA

The most important step in the exercise performed by the licensee and its architect engineer to comply with the WENRA Royal Decree was the development of internal Fire and Flooding PSA using as basis the existing 6 IE PSA (for all Belgian NPPs). At first, no specific Fire and Flooding PSA for Doel 1&2 were envisaged (due to the planned permanent shutdown of these twin units). Finally, the Belgian government authorized the licensee to practice Long Term Operation (LTO) for those units and specific Fire and Flooding PSA have then also been developed for Doel 1&2.

For developing the internal Level 1 Flooding PSA for each Belgian unit, the EPRI guideline 1019194 [9] and the EPRI document 1021086 [10] (frequencies of pipe ruptures) were followed. Though, a few specific adaptations were made, for instance:

- For the pipe rupture frequencies, differences in safety class and in the integrity safety management strategy between the piping considered in the EPRI document and the piping in the Belgian NPPs were taken into account.
- The evaluation of maintenance-induced flooding was less detailed than intended by the EPRI guidance (i.e. full consideration of HRA).

A pilot project was established by the licensee and its architect engineer for one unit, permitting regular discussions between the PSA developers (ENGIE Electrabel and its architect engineer, Tractebel Engineering) and Bel V. Part of the intermediate comments of Bel V could therefore already be taken into account during the development of the pilot project by the licensee and its architect engineer.
Afterwards, a second phase of development of Flooding PSA models for the other units was started.

The evaluation of Bel V led to a series of recommendations for improvement of the Flooding PSA. Some of them were already considered in the most recent studies (i.e. for the units which have been assessed at the end of the project). Among the possibilities for improvement identified by Bel V, the following topics can be cited:

- additional effort to obtain pipe lengths which are as realistic as possible and the need for the consideration of Operational Experience Feedback (i.e. flooding events that occurred at the Belgian plants);
- more systematic consideration of all standby systems;
- potential improvements related to the flood simulation time and the associated hypotheses;
- improved flood specific HRA methodology.

The methodology for the Level 1 internal Fire PSA was based on the NUREG/CR-6850 [11], its Supplement 1 [12] and the NUREG-1921[13], developed jointly by US-NRC and EPRI. These guidances were followed except for specific points such as:

- No consideration of the explosion phenomenon in the scope of the Fire PSA study;
- No consideration of seismically-induced fire in the scope of the Fire PSA study;
- The detailed quantification of the human errors probabilities retained in Fire PSA.

The most important difficulty encountered during the development of the project was the data collection (in particular for the information about the cables). It required an important workload for the licensee but also important efforts for Bel V to verify the correctness and the representativeness of the databases established within the context of the Fire PSA projects. Bel V has organized specific meetings at the PSA developers' offices to audit the process of development of the databases and to challenge the accuracy of their description of the actual installations.

The evaluation of Bel V for the different Fire PSA projects is still ongoing at the time of writing this paper. Nevertheless, Bel V can already list the following important recommendations in relation to these studies:

- Consideration of the use of other sources of data for the ignition fire frequencies (e.g. the use of the OECD Fire Database);
- Reconsideration of the hypotheses taken to assess the fire ignition frequencies;
- Use of the guidance given in NUREG/CR-7150 [14] for expert elicitation for detailed circuit analysis;
- Improvement of the methodology used to assess fire propagation between PAU[16];
- Performance of a benchmark to permit the challenge of the methodology used for the detailed quantification of human errors probabilities;
- Improvement of the identification process of errors of commission resulting from erroneous indications in the MCR[17].

Positive aspects are also identified by Bel V (such as the analysis of the impact of smoke on I&C components and the development of a specific approach to assess the CDF contributions of the MCR and the MRR[18]).

Internal Fire and Flooding Level 2 PSA were also developed for one representative unit (pilot project) based on the Fire and Flooding Level 1 PSAs results. The APET and the HRA have been adapted in order to include internal fire and flooding. A safety evaluation of the study has been performed by Bel V based mainly on the recommendations expressed during the evaluation of the Fire and Flooding Level 1 PSAs. One of the important recommendations is that the possible plant improvements options, risk reduction options and Fire and Flooding specific accident management procedures should be better investigated using the Fire and Flooding Level 2 PSA results.

The need for further development of this model and the need for developing Fire and Flooding Level 2 PSA models for other units is currently under discussion.

In conclusion, from a regulatory point of view, the WENRA Reference Levels for PSA have been instrumental in permitting the extension of the scope of PSA.

3. CURRENT USE OF PSA FOR BELGIAN NPP

3.1 Regulatory PSA applications in Belgium

The first use of PSA consists of the systematic design re-evaluation of the nuclear installations. Indeed, the main objective of the PSA study, within the framework of the PSRs, was to confirm the robustness of the deterministic design, to identify design or operational weaknesses (if any), and to address these weaknesses (if necessary), e.g. by evaluating the importance of possible improvements to systems and procedures.

[16] PAU: Physical Analysis Units (fire compartments)
[17] MCR: Main Control Room
[18] MRR: Main Relay Room

The development of PSA has also led to specific insights and to several plant modifications [2]. In some cases, the results and insights obtained – in an early, intermediate or final stage of the PSA projects – have directly led to a number of safety improvements in design of SSC and in operating practices. In other cases, PSA findings have given a decisive push to safety arguments that were not necessarily new, but that did so far not prevail in re-evaluations of design or operational practices.

Proposals for modifications have emerged in two different ways:

- On initiative of the licensee or his architect/engineer.
  Quite some opportunities for improvement have been identified, decided and already implemented in an early stage of PSA development ("early feedback") by the licensee. These proactive modifications to the plant and to operating procedures were then directly taken into account in the PSA model.
  However, this practice also constitutes a challenge for the quality assurance of the PSA models and PSA documentation, since it may occur that some modifications in design or procedures are finally not implemented as initially proposed, so that differences between "as build" and "as modelled" may exist that need to be resolved a-posteriori.
- On initiative of Bel V (formerly AVN) based on its regulatory review.
  The established PSA results were explicitly used to address unresolved issues regarding operating practices (for instance, safety improvement during mid-loop operation).

In its review, Bel V always encouraged the Licensee to explore the PSA results for identifying safety improvements and to evaluate safety insights.

The application consisting in the identification of safety improvements on site by the analysis of the PSA results was already performed by the licensee before the publication of the WENRA Reference Levels of 2008 and their transposition into the Belgian regulations. This is the reason why this PSA application wasn't defined in the Belgian Action Plan mentioned in section 2.3 of this paper.

The WENRA Reference Levels of 2008 and the corresponding Belgian regulations led nevertheless to the diversification of PSA applications conducted by the licensee.

A decision making policy had to be established by the licensee. In a general way, the licensee decided to use PSA as a supplementary tool for risk management and not to base its decision making process on PSA insights solely.

The use of PSA to assess the adequacy of plant modifications and changes in operational practices became legally binding. It means that, in principle, any change in the design, in the operational procedures of the plant or in the technical specifications has to be assessed by the use of the PSA. In practice, this concerns only the modifications that can be modelled by the licensee with the existing PSA models. No risk increase is allowed by the Regulator unless it is compensated by an important safety improvement (e.g. in post-accidental management). Alternatives for the proposed modification, which do not lead to a risk increase, should nevertheless first of all be sought by the licensee.

Real events at the Belgian NPPs should also be assessed by means of PSA (PSA Event Analysis or precursor analysis). PSA outputs are also used to identify important post-accidental situations to be highlighted during training of operators on site. Importance measures analysis performed on the existing PSA permitted to create an input giving the list of most critical components, to be inserted in the SAR (providing information to non PSA practitioners and allowing risk informed inspections).

In conclusion, the integration of the WENRA Reference Levels into the Belgian regulations contributed to obtain the licensee's commitment to a broader and better use of the Belgian PSAs.

3.2. PSA Policy and PSA Applications by the Licensee

While PSA has now become a consolidated element of periodic safety review and an important element in the Belgian regulations, a tangible use of PSA in safety management by the licensee has – since a few years – also emerged. The Belgian licensee ENGIE Electrabel, being the real owner and end user of the PSA, has taken up more active ownership over the PSA developments and PSA applications. This is reflected in the publication of a PSA Policy.

After the publication of the licensee's PSA policy, a "PSA standing committee" was created that actively involves PSA team members from the architect-engineer Tractebel Engineering as well as dedicated staff from the licensee (at headquarters and both NPP sites). This group has gradually attempted to concretize the PSA policy, first by identifying all potential PSA applications, next by performing a prioritization exercise, and now by gradually implementing the selected applications while maintaining models up-to-date in different processes. Bel V has a yearly meeting with this PSA Standing Committee to discuss globally the present PSA applications and future PSA perspectives.

4. PERSPECTIVES

In Belgium, PSA has now become a consolidated evaluation tool of periodic safety reviews, on the one hand, and is also gradually used more intensively by the licensee within the context of a global PSA policy and an associated strategy for PSA-based applications.

In the near future, the Belgian regulations will be adapted to incorporate the WENRA Reference Levels of 2014. In addition, at the time of writing this paper, a gap analysis (assessing the differences between these Reference Levels and their current implementation at Belgian NPPs) has been performed and is used to define a new action plan.

For PSA, the upcoming challenges will be related to the development of PSA for external hazards and for the spent fuel pools. Up to now, a screening of external hazards for examination by means of PSA, has been performed. Possible developments of seismic PSA as well as PSA extensions for other screened-in external hazards, e.g. those leading to LOOP or loss of main heat sink, are under discussion.

This nevertheless takes place in a particular political context. At present it is foreseen that all Belgian NPP will have to be permanently shut down by 2025. Nevertheless, the efforts for implementation of all WENRA Reference Levels, both in the Belgian regulations and at the NPPs, are maintained.

5. CONCLUSIONS

PSA Level 1 models for all Belgian NPPs have been established and updated, for internal events and all plant operating states, in the framework of the successive Periodic Safety Reviews. PSA Level 2 models are also gradually established and updated.

The transposition of the WENRA Reference Levels of 2008 into the Belgian regulations has been instrumental for the extension of the scope of the Level 1 and Level 2 PSA (i.e. by the development of Fire and Flooding PSA) and for the performance of various PSA applications (e.g. assessment of plant modifications and modification of operating practices with the available PSA models).

The licensee ENGIE Electrabel keeps an active ownership over the PSA and its applications and defines its own policy and strategy in terms of PSA activities.

Upcoming perspectives, in relation to the future integration of the WENRA Reference Levels 2014 into the Belgian regulations, are the development of PSA for external hazards and for spent fuel pools.

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