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Development of methods for risk follow-up and handling of CCF events in PSA applications

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Abstract: Risk follow-up aims at analysis of operational events from their risk point of view using probabilistic safety assessment (PSA) as the basis. Risk follow-up provides additional insight to operational experience feedback compared to deterministic event analysis. Even though this application of PSA is internationally widely spread and tried out for more than a decade at many nuclear power plants, there are several problematic issues in the performance of a retrospective risk analysis as well as in the interpretation of the results.

An R&D project sponsored by the Nordic PSA group (NPSAG) has focused on selected issues in this topic. The main development needs were seen in the handling of CCF and the reference levels for result presentation. CCF events can be difficult to assess due to possibilities to interpret the event differently. Therefore a sensitivity study with varying assumptions is recommended as a general approach. Reference levels for indicators are proposed based on the survey of criteria used internationally. The paper summarizes the results.

Keywords: PSA, risk follow-up, PSA application, CCF

1. INTRODUCTION

Risk follow-up aims at analysis of operational events from their risk point of view using probabilistic safety assessment (PSA) as the basis. Risk follow-up provides additional insights to operational experience feedback compared to deterministic event analysis. Risk follow-up can also be called PSA-based event analysis (PSAEA), probabilistic event analysis, accident sequence precursor (ASP) analysis, probabilistic precursor analysis, precursor analysis, or probabilistic operational event analysis.

A deterministic risk follow-up approach consists mainly of an in-depth analysis of the operational event, to identify, amongst others, root causes, aggravating factors that occurred during the event, and possible actions to avoid reoccurrence. A probabilistic approach provides quantitative measure of risk importance of the event with sometimes surprisingly high or low values. There are also other important aspects as pointed out in [1].

Even though this application of PSA is internationally widely spread and tried out for more than a decade at many nuclear power plants, there are several problematic issues in the performance of a retrospective risk analysis as well as in the interpretation of the results [2, 3]. The fundamental problem is to find a practical guideline for handling of operational information when making retrospective probability assessments. It is difficult to define unambiguous rules for conditioning, and apparently more than one approach is needed due to different natures of operational events. A consequence of this ambiguity is that the interpretation of results can be difficult and comparison of results e.g. with respect to safety goals is troublesome.

Taking into account experience from risk follow-up and identified problem areas, the objective with the R&D project sponsored by the Nordic PSA group (NPSAG) was to further develop the method for

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risk follow-up. Specific issues to be considered were selected based on an information survey, i.e., literature review and questionnaire sent to the end users in Finland and Sweden. The aim was to provide guidance for the performance of risk follow-up. The emphasis of the work was in the calculation methodology. Also quality requirements for risk follow-up application were discussed. [4]

2. DEFINITIONS

2.1. Risk metrics in living PSA applications

The three main risk metrics used in living PSA applications are:

f_{ave} = Average risk frequency (CDF) calculated by the living PSA for full power operation. This is the level of risk that is calculated when the components average maintenance and test unavailabilities are introduced into the model and hence it is always greater than the baseline risk.

f_0 = Baseline risk frequency (CDF) calculated by a modified PSA model in which the basic events representing component unavailability due to test, maintenance or repair are set to zero (always available). Such model is also called a zero-maintenance model.

$f(x)$ = Instantaneous risk frequency (CDF) for a given plant configuration x. In risk follow-up, the plant configuration x is a historical situation at the plant.

In this paper, "risk" is understood as the "reactor core damage risk" assessed with a level 1 PSA, "risk frequency" is the "core damage frequency", and f = CDF. This simplification is made due to the fact that most organisations (not only in Nordic countries) perform risk follow-up only with level 1 PSA. However, level 2 PSA aspects will addressed later in the paper.

2.2. Risk follow-up calculation modes

Mathematically, risk follow-up is calculation of conditional probabilities of events given certain information about the situation. Due to the structure of the PSA model, there are two basic modes in the conditioning of the probabilities, depending on the type of event [1]:

1. Conditional probability of an unwanted event (core damage accident) given an initiating event
2. Conditional probability of an unwanted event over a time period, essentially when unavailabilities are detected in safety systems.

An event thus can have a two-fold meaning. It can be something that happens suddenly and that can be associated with an initiating event in a PSA. It can also be associated with a time period when conditions are different from normal (also called condition event). In reality, there is often an ambiguity in the definition of an event. A condition event can have an unclear character and can have existed an unknown time period. An event may have a combined character including an unavailability of safety systems which is detected in an initiating event. Should this be considered as one event or split into two events? In addition, the reference "normal" condition is a matter of definition. For instance, it is not evident how to define normal condition for different plant operating modes during plant shutdown. Ambiguities mean that the risk follow-up assessment is always more or less speculative and subject to alternative interpretations.

Regarding occurred initiating events, the main quantity is the (incremental) conditional core damage probability, ΔCDP, calculated with the zero maintenance model so that the frequency of the corresponding initiating event is 1 and the frequencies of the others are set to 0. In addition, component unavailabilities existing simultaneously with the occurred event are taken into account.

Regarding unavailabilities of the safety systems, the incremental risk frequency increase, ΔCDF, is the difference between the instantaneous risk frequency and the reference level (see Figure 1)

$$\Delta CDF = CDF(x) - CDF_0. \qquad (1)$$

The baseline CDF is typically used as the reference but some organisations use the average CDF. The baseline CDF should be a quite well defined quantity for full power operation. For shutdown periods, it can be an ambiguous definition.

The incremental conditional core damage probability, ΔCDP, is derived by multiplying the incremental CDF with the duration of the event, Δt,

$$\Delta CDP = \Delta CDF \cdot \Delta t, \qquad (2)$$

assuming that ΔCDF is constant during the event. In some cases, e.g. for latent unavailabilities or overlapping events, ΔCDF may vary during the time interval.

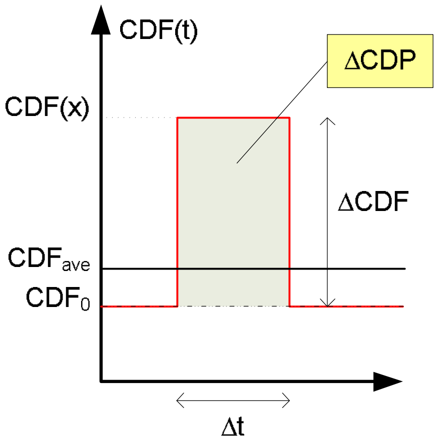


Figure 1: Incremental risk from the safety system unavailability.

It is important to notice that the conditional probability assessments of risk follow-up are typically carried out in a way that information is censored in an asymmetrical way. Information from failed conditions is accounted while success information is not accounted but nominal failure probabilities are used instead. These lead to conservatism in the results and they mean also that comparison between events cannot always be made fully consistently.

2.3. Cumulative risk metrics

The cumulative conditional accident (core damage) probability is the sum of individual conditional accident probabilities

$$\Delta CDP_{cum} = \textstyle\sum_i \Delta CDP_i. \qquad (3)$$

Some organisations add together ΔCDP:s from safety system unavailabilities and initiating events, some calculates ΔCDP_{cum} separately for the two categories, as will be discussed later in the report.

3. STATUS OF RISK FOLLOW-UP ACTIVITIES IN THE NORDIC COUNTRIES

3.1. History

The history of performing risk follow-up studies in Nordic countries is linked with the implementation of different living PSA applications in the early 1990's. A method for risk follow-up was developed in the Nordic research project NKS/SIK-1, taking input from the U.S.NRC’s ASP-methodology [5, 6, 7].The U.S. NRC ASP program was established in 1979 shortly after the Three Mile Island accident and it has been in operation ever since. The ASP program systematically analyses operating experiences of U.S. nuclear plants to identify, document and rank operating events that are most probable to lead to insufficient core cooling and core damage.

In the Nordic project NKS/SIK-1, pilot studies were made on risk follow-up and the concepts for risk follow-up and other living PSA applications were defined including a theoretical basis for risk follow-up [8, 9, 10]. The method development has been the basis for practices still used in Sweden and Finland. The Vattenfall's method, published in 1998 [11], was a practical implementation of the NKS/SIK-1 approach including a definition of PSA indicators with three importance levels represented by green, yellow and red colours. This method has then been used in Forsmark and Ringhals.

3.2. Summary of present status

To perform risk follow-up is common practice for the Nordic utilities. Some variation exists in the quantification methods, but more variation in the usage of the results. For some utilities, results from risk follow-up are background material for discussions on safety importance of operational events. For some utilities, PSA indicators are part of the plants' safety indicator system. The indicators may be reported quarterly or annually.

Risk follow-up is not a regulatory requirement in the Nordic countries. The Finnish regulatory body, STUK, performs risk analysis of significant events at Finnish plants and use the results in their operating experience indicator system. The Swedish regulatory body, SSM, does not perform risk follow-up.

4. OVERVIEW OF THE GUIDANCE DOCUMENT

The main result of the project is a guidance document covering the following topics:

- Procedure for risk follow-up
- Selection of risk indicators
- Information sources
- Calculation of indicators
- Handling of CCF events
- Handling of long lasting events
- Handling of overlapping events
- Handling of latent events
- Handling of events applicable to many plants
- Handling of events relevant to large release risk
- Handling of events during low power and cold shutdown
- Handling of planned vs. unplanned unavailabilities in safety systems
- Handling of seasonal variations in success criteria and initiating event frequencies
- PSA quality requirements.

In most of the topics there is general consensus of how to perform risk follow-up and references can be made to international documents such as [5, 6, 7]. A few topics were identified and selected as focus areas for method development.

5. SPECIFIC METHOD ISSUES

5.1. Handling of CCF

The problem of handling of CCF events is related to the problem of assessing the conditional probability of a CCF event given that one or more components in a CCF group are detected failed.

There are four possibilities for the assessment of the CCF probability for the case of a two-component-CCF-group (see Figure 2):

a) P(CCF-AB) = 0
b) P(CCF-AB) = q_{AB}
c) P(CCF-AB) = P(CCF-AB | A = 1) ≈ $q_{AB} / (q_A + q_{AB})$
d) P(CCF-AB) = 1.

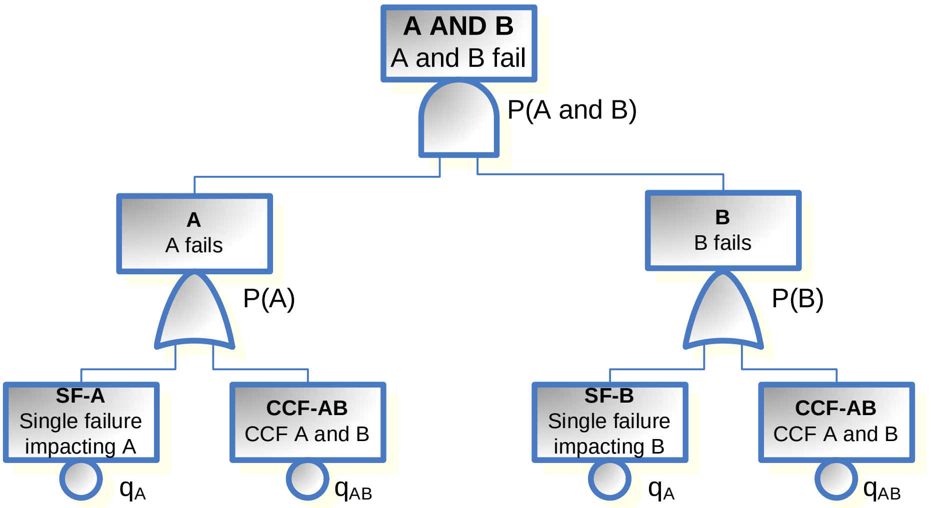


Figure 2: Common cause failure fault tree.

The approaches have the following interpretations

a) It was not a CCF event and this “success” information is taken into account.
b) It was not a CCF event but this “success” information is not taken into account (“Failure memory only” approach).
c) It is not known whether it was a CCF event or not. (“On-line risk monitoring” approach).
d) It was a CCF event (conservative, what if -approach assuming that B also has failed).

Generally, in risk follow-up applications, success information is not considered. Furthermore, for the case with the evidence of multiple failures, the risk follow-up calculation should consider all failures.

The usually recommended conservative approach (e.g. the NRC RASP handbook volume 1 [5]) is to assume that it is a CCF event, and then the failure probability for CCF-AB shall be the conditional probability, in principle the CCF factor. This recommendation is justified by the fact that it is difficult to convincingly argue or find evidence that the events are independent. The use of a conditional probability (c) compared to an absolute probability (b) will result in an increased CCF event probability. This in turn will lead to a larger risk increase result in the risk follow-up assessment. As sensitivity cases, the risk follow-up calculation can be made for both independence and complete dependency cases.

5.2. Time dependencies

Time dependency of component unavailabilities is a factor that needs consideration [3], since most basic events in a PSA model are failures of standby components. In the Nordic countries, the standby components are usually modeled with a constant failure rate (exponential distribution) together with a constant failure probability parameter, the “$q_0 + \lambda \cdot TI$” model [12].

The basic calculation of the top event probability or frequency is usually based on the mean failure probabilities for each basic event. However, this is not mathematically correct. An example is a cut set with failure of two redundant pumps A and B modeled with a failure rate lambda, λ, and with test interval TI. The approximate mean failure probability for each basic event will be $U_A = U_B = ½ \lambda \cdot TI$, assuming no contribution from q_0 in the "$q_0 + \lambda \cdot TI$" model [12]

The basic calculation will result in a top event (A AND B fail) probability

$$P_{basic} = U_A \cdot U_B = (\lambda \cdot TI)^2 / 4. \tag{4}$$

Assuming sequential testing, the theoretically correct top event probability would be

$$P_{seq} = (\lambda \cdot TI)^2 / 3. \tag{5}$$

Assuming staggered testing, the theoretically correct top event probability would be

$$P_{stag} = (\lambda \cdot TI)^2 \cdot 5 / 24. \tag{6}$$

This means that in case of no CCF, the basic calculation is optimistic for the sequential testing case and conservative for the staggered case.

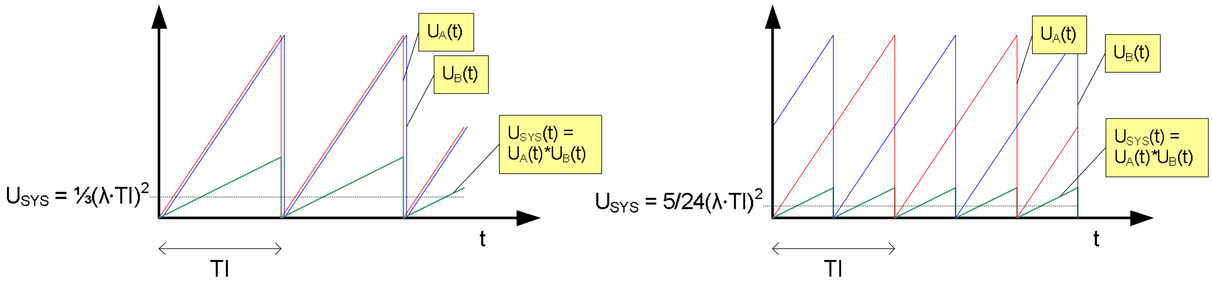


Figure 3: Time-dependent and average unavailability of a two-component system with sequential vs. staggered testing, no CCF between components.

When CCF is included, the top event mean failure probability will mostly depend on the CCF probability. Assuming a beta factor model, the mean top event probability would be in case of sequential testing

$$P_{seq} = (\lambda \cdot TI \cdot \beta) / 2. \tag{7}$$

In case of staggered testing, the mean top event probability would be

$$P_{stag} = (\lambda \cdot TI \cdot \beta) / 4, \tag{8}$$

since the CCF event is tested more frequent, assuming also that the test will detect CCF.

The difference in result will increase more in case of higher order redundancies and the number of events in a cut set. Adding the contribution from time-independent unavaibility, q_0, the impact of the time dependent part will be reduced.

In general, neglecting the time factor attributed to staggered testing, the basic CDF value will be overestimated. The size of this overestimation is larger for plants where the core damage frequency is dominated by higher order cut sets and CCF events. This also means that the risk increase in the case of a risk follow-up calculation is underestimated, since the reference level will be lower.

A simple example is to look at one CCF event representing the failure of two components, A AND B, and which have staggered testing with test interval TI. $q_0 = 0$ is assumed, and the test is assumed to detect a CCF. The following operating history has been observed:

- at t = 0, A is tested and it is OK
- at t = TI/2, B is tested and it is OK
- at t = TI, A is tested and it fails.

The probability of detecting A failed at t = TI is

$$\begin{aligned} P(\text{A failed at } t = TI) &= P(\text{A failed due to single failure}) + P(\text{A failed due to CCF}) \\ &= (1 - \beta) \cdot \lambda \cdot TI + (\beta \cdot \lambda \cdot TI) / 2. \end{aligned} \qquad (9)$$

In risk monitoring application, the conditional probability of a CCF at t = TI is of interest, i.e.,

$$\begin{aligned} P(\text{A AND B at } t = TI \mid \text{A failed}) &= (\beta \cdot \lambda \cdot TI / 2) / P(\text{A failed at } t = TI) \\ &= \beta / (2 - \beta) \approx \beta / 2. \end{aligned} \qquad (10)$$

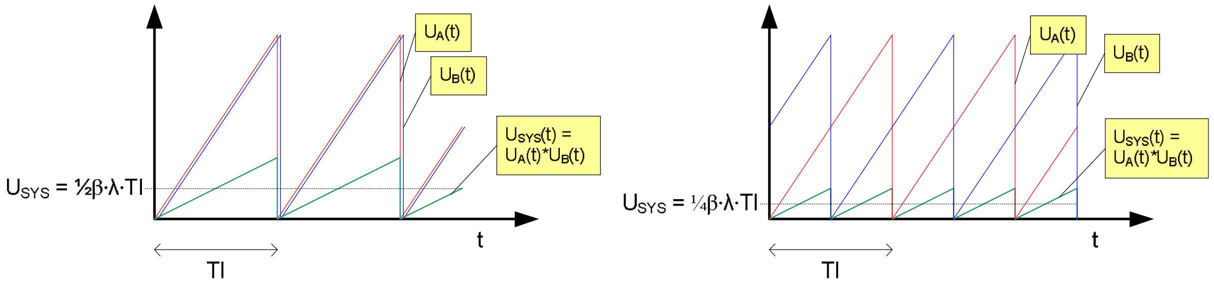


Figure 4: Time-dependent and average unavailability of a two-component system with sequential vs. staggered testing, CCF between components.

In risk follow-up, the conditional probability of a CCF at $t \in (TI/2, TI]$ is of interest. The average conditional probability over the interval is approximately half of the risk monitoring unavailability given above

$$P_{ave}(\text{A AND B at } t \in (TI/2, TI] \mid \text{A failed}) = 1/2 \cdot \beta / (2 - \beta) \approx \beta / 4. \qquad (11)$$

In Table 1, a comparison is made between PSA applications and use of a mean value model versus time-dependent model. The mean value model gives double as high results as the time-dependent model. The difference is larger for higher order CCF events, in the order of a factor 3 for CCF events of third order and a factor of 4 for CCF events of fourth order. However, the relative ratio between the applications is the same.

Table 1: CCF probability when using a mean value and time-dependent basic event models (staggered testing of A and B).

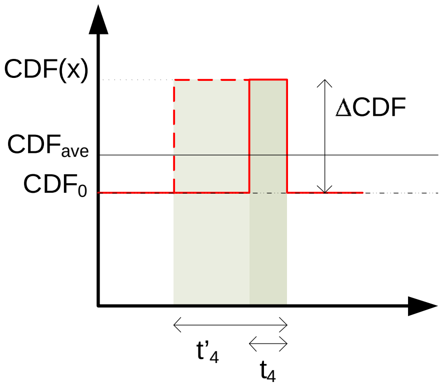
PSA application	**Mean value model**	**Time dependent model**
Mean unavailability P(A AND B)	$\beta * \lambda * TI / 2$	$\beta * \lambda * TI / 4$
Risk monitoring probability P(A AND B at t = TI | A failed)	β	$\beta / 2$
Risk follow up probability P_{ave}(A AND B at $t \in (TI/2, TI]$ | A failed)	$\beta / 2$ or β [1]	$\beta / 4$

[1] Depending on how the mean value model is used in risk follow-up. Alternative "β" is a straightforward and conservative calculation as in the "risk monitoring" approach. Alternative "β/2" takes into account the time-dependency as in the "mean unavailability" approach.

In a full scope PSA, the system failure probability or core damage frequency is a result of many different contributing cut sets and CCF events. The results are usually dominated by CCF events, which are typically of higher order than 2 for newer plants. Therefore, it is important that the time factor is taken into account in the calculation and in judging the risk follow-up result.

5.3. Handling of latent events

A related question to the time-dependencies is the handling of latent events. Usually the aim is to use the real unavailability period, and if unknown, b) or c) approach is used (see Figure 5). The benefit of using the b) approach is to study the possible effect of overlapping events.



a) $I_4 = \Delta CDF \cdot t_4$, only evident unavailability is taken into account
b) $I_4 = \Delta CDF \cdot t'_4$, possible latent unavailability is fully taken into account
c) $I_4 = \Delta CDF \cdot t_4 + ½ \cdot \Delta CDF \cdot (t'_4 - t_4) = \Delta CDF \cdot ½ \cdot (t_4 + t'_4)$, latent unavailability is taken into account probabilistically assuming that the risk increases from CDF_0 to CDF(x) during the time interval $t'_4 - t_4$

Figure 5: Methods to calculate an indicator for latent unavailabilities.

The RASP handbook [5] defines two approaches:

1. Exposure Time = TI + Repair Time, TI = test interval (latent unavailability period)
2. Exposure Time = TI/2 + Repair Time

The first approach (T = TI + repair time) is used for a failure that was determined to have occurred when the component was last functionally operated in a test or unplanned demand (e.g., failure occurred when the component was being secured), the exposure time is then equal to the total time from the last successful operation to the unsuccessful operation plus the repair time. This exposure time determination approach is appropriate for standby or periodically operated components that fail due to a degradation mechanism that is *not* gradually affecting the component during the standby time period.

The second approach (T = TI/2 + Repair Time) is proposed to be used for a failure that could have occurred at any time since the component was last functionally operated (e.g., time of actual failure cannot be determined due to the nature of the failure mechanism). This approach is appropriate for standby or periodically operated components that fail due to a degradation mechanism that gradually affects the component during the standby time period.

5.4. Effect of seasonal variation

Seasonal variation, also called environmental factor, are not normally taken into account in risk follow-up. There are however several such factors that can have a significant impact on the instantaneous risk. From the PSA model point of view the factors can be grouped into those affecting frequencies for initiating events and those affecting plant configuration and system success criteria. Further, most of the factors can be grouped into winter/summer related, but some of them have a stronger and some have weaker seasonal variation, as illustrated in Figure 6.

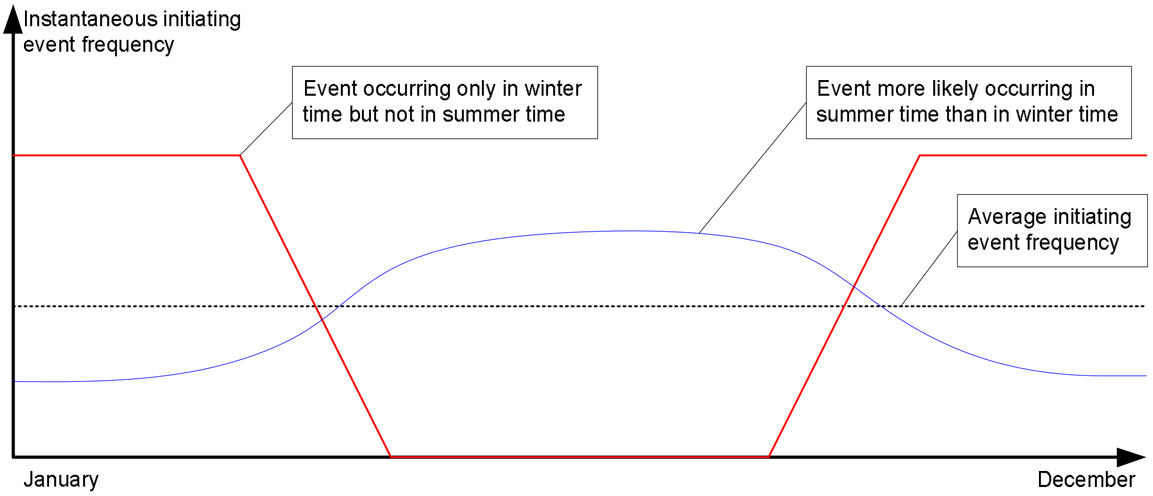


Figure 6: Principal examples of initiating event frequencies having a strong/weak seasonal variation.

A strong seasonal variation means that the event practically can only happen in winter/summer time and in very exceptional case at other times. Examples of such events are weather related events like frazil ice, heavy snow storm and low/high air temperature. For these events, it could be reasonable to assume a seasonal variation provided that the event is significant to the plant risk. The Nordic PSAs show that the contribution of the external events to CDF can vary a lot, between 1–50 %.

Many events are known to be correlated with the season but the correlation is not strong. For these events, it could also be possible to estimate the seasonal variation but it could be impractical to implement a season dependent initiating event frequency in risk follow-up calculations.

Seasonal variations in system configurations, like system trains in operation, could be taken into account precisely if needed. The impact of operational systems configurations may be minor. A more important factor could be the success criteria for residual heat removal systems, which is dependent on the sea water temperature. The difference between 1 or 2 system trains required for a successful function can have a significant impact on the core damage frequency. However, in practical risk follow-up calculations, it may be cumbersome to account for different system success criteria.

The conclusion is that even though seasonal variations can have large impact on CDF, it can be cumbersome to implement a "season-depedent" PSA-model for risk follow-up purposes. It can be also difficult to validly estimate season dependent initiating event frequencies. Therefore season independence (= average initiating event model) may be regarded as the base approach and season dependence could be a matter for a sensitivity study.

5.5. Reference levels for result presentation

In order to interpret the significance of events, reference levels need to be defined. The reference levels translate a risk metric into an indicator having typically three levels:

- Low risk significance (green). The event or time period is screened out from further assessment.
- Medium risk significance (yellow). Detailed assessment is optional.
- High risk significance (red). Detailed assessment is required.

All organisations calculate risk indicators both for single events and cumulative for a period, which can be a quarter of a year or a whole calendar year. Indicators should be calculated separately for initiating events and for unavailabilities in systems important to safety. It is also identified a need for a combined indicator covering both cases. Even though probabilistically it is questionable to add together conditional core damage probabilities for initiating events and for unavailabilities in safety systems, as an indicator it can be practical.

Single events:

- unavailabilities in safety systems
    - instantaneous CDF or risk increase factor
    - $\Delta CDP = \Delta CDF \cdot \Delta t$, where $\Delta CDF = CDF(x) - CDF_0$
- An initiating event
    - CCDP

Cumulative indicators

- unavailabilities in safety systems
    - sum of $\Delta CDP = \Delta P_{cum}$
- initiating events
    - sum of CCDP
- combined indicator of the above
    - sum of $\Delta CDP + CCDP$

The risk indicators should be calculated both for power operation and low power and shutdown periods (LPSD). The latter of course requires availability of an LPSD model. It can be practical to report the refuelling outage period separately.

Presently, the Nordic organisations covered by the project, perform risk follow-up only for core damage risk. It can be important to consider certain events from the level 2 PSA perspective. For instance, the screening of events could include the question of relevance of an event for level 2 PSA.

Each organisation should decide the reference levels based on experience with PSA results and risk follow-up evaluations. There should be a correspondence with the perceived risk level and the indicator level. This report recommends the use of an absolute scale at least for the criterion between Medium and High, since the target value for the average CDF is an absolute number. The criteria between Low and Medium may need more consideration, and the relative scale, e.g., with regard to the average or baseline CDF, may be more practical in this case. Table 2 presents example reference levels for core damage risk indicators for a plant with an average (or baseline) CDF close to 1E-5/yr.

Table 2: Example reference levels for core damage risk indicators for a plant with an average CDF close to 1E-5/yr.

Indicator	**Low**	**Medium**	**High**
Instantaneous CDF for safety system unavailabilities during power operation	$2 \cdot CDF_{ave}$	$2 \cdot CDF_{ave}$ – 1E-3 1/yr	1E-3/yr –
Single event • ΔCDP (unavailabilities in safety systems) • CCDP (initiating event)	$0{,}1 \cdot CDF_{ave} \cdot 1$ yr	$0{,}1 \cdot CDF_{ave} \cdot 1$ yr – 1E-4	1E-4 –
Cumulative CDP for a year [1] • Sum of ΔCDP from unavailabilities in safety systems • Sum of CCDP from initiating events	$CDF_{ave} \cdot 1$ yr	$CDF_{ave} \cdot 1$ yr – 1E-4	1E-4 –
Combined cumulative CDP for a year [1] • Sum of ΔCDP + Sum of CCDP	$2 \cdot CDF_{ave} \cdot 1$ yr	$2 \cdot CDF_{ave} \cdot 1$ yr – 2E-4	2E-4 –

[1] If the reporting period is shorter, the Low/Medium criterion needs to be adjusted accordingly

6. CONCLUSIONS

To perform risk follow-up is common practice for utilities both in the Nordic countries and internationally. Some variation exists in the quantification methods, but more variation in the usage of the results. For some utilities, results from risk follow-up are background material for discussions on safety importance of operational events. For some utilities, PSA indicators are part of the plants' safety indicator system. Some utilities report indicators quarterly, others annually.

Risk follow-up is not a regulatory requirement, except now in Switzerland [13]. However, many regulators perform risk follow-up themselves, e.g., STUK in Finland, U.S.NRC, GRS in Germany and CSN in Spain [14]. The regulators typically follow the trend in the number of risk significant events. It is also common practice to require the utility to perform a probabilistic assessment of very significant events.

Generally, core damage probability is used as risk metrics. It is considered sufficient, even though it is recognized that some events may be relevant from a radioactive release point of view but are not necessarily well reflected in the core damage risk level. A recommendation is to screen the events also from radioactive release point of view and to include a level 2 PSA assessment for relevant events.

The main development needs were seen in the handling of CCF and the reference levels for result presentation (PSA indicators). The effect of seasonal variation was also discussed, but was not seen so problematic issue, even though seasonal variation can be an important factor.

CCF events are often difficult to assess due to possibilities to interpret the event differently. The root cause of CCF may be uncertain, components may be degraded in different degree and the latent unavailability period may be unknown. Therefore a performance of a sensitivity study with varying assumptions is recommended as a general approach.

The time factor affecting the time dependent standby failure probability of CCF events can be important to consider both when calculating absolute reference levels, and when calculating relative levels. The effect of this is not negligible, especially for newer plants with a higher degree of redundancy resulting in more events in each cut set, and the existence of higher order CCF events.

The following indicators are proposed:

1. Instantaneous CDF for safety system unavailabilities during power operation
2. Single event ΔCDP respectively CCDP
3. Cumulative ΔCDP respectively CCDP for a year (or shorter reporting period). Cumulative CDP should be presented separately for initiating events and safety system unavailabilities. A combined indicator can be considered, too.

The risk indicators are proposed to be presented in a three level system: Low-Medium-High. Each organisation should decide the reference levels based on experience with PSA results and risk follow-up evaluations. There should be a correspondence with the perceived risk level and the indicator level. This report recommends the use of an absolute scale for the criterion between Medium and High, since the target value for the average CDF is an absolute number. The criteria between Low and Medium may need more consideration, and the relative scale, e.g., with regard to the average or baseline CDF, can be more practical.

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