Incorporating Risk-Informed and Performance-Based Approaches/Attributes in ANS Standards

FOR INTERIM TRIAL USE

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American Nuclear Society

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1. PURPOSE

The purpose of this document is to identify roles and responsibilities and the process for using risk-informed and performance-based (RIPB) approaches, as appropriate, when developing or revising American Nuclear Society (ANS) Standards. For some standards, the incorporation of a RIPB approach/attributes will make them more effective for the user community to achieve the standard's outcome(s). This document also helps the Consensus Committees, Subcommittees and Working Groups (WG) decide if and how RIPB approaches can be incorporated into its standard

This document is intended to be used by all Consensus Committees during the development of new ANS standards and the development of revisions to ANS standards. This document may be useful and applicable to other Standards Development Organizations (SDOs).

2. BACKGROUND

In 2013, the ANS Standards Board created the Risk-Informed, Performance-Based Principles and Policy Committee (RP3C) to establish "approaches, priorities, responsibilities and schedules for implementation of risk-informed and performance-based principles in American Nuclear Society (ANS) standards." The RP3C was then tasked with developing a plan "which will provide the approaches and procedures to be used by ANS SC consensus committees, subcommittees and working groups to implement risk informed and performance based principles in a consistent manner." This document is part of that plan.

Appendix A provide further background on the development of RIPB approaches and how RIPB approaches were successfully incorporated into the Maintenance Rule.

3. ROLES AND RESPONSIBILITIES

The following describes the roles and responsibilities of the ANS Standards Committee (SC) to support implementation of this guide.

3.1 ANS Standards Board

(a) Approve this guidance document and promote its use within all Consensus Committees.

3.2 RP3C Chair

(a) Assign responsibilities to maintain this guidance document (e.g., developing a schedule for its review and update).

(b) Assign responsibilities for developing training on this guidance document.

(c) Assign responsibilities of members for review of new and revised standards.

(d) Provide guidance to WG Chairs during Project Initiation Notification System (PINS) development.

3.3 RP3C Members

(a) Support reviews of new and revised standards as assigned by the RP3C chair.

(b) Develop training on this guidance document as assigned by the RP3C chair.

(c) Take training on this guidance document as specified by the RP3C chair.

3.4 Consensus Committee Chairs

(a) Support awareness of and implementation of this guidance document throughout the various stages of development of new and revised standards.

(b) Take training on this guidance document.

3.5 Working Group Chairs

(a) Take training on the guidance document.

(b) Use this guidance document throughout the development of any new or revised standards for which they are leading.

4. PROCESS

The following describes the process that could be used to initiate or enhance the incorporation of RIPB approaches during the development or revision of standards.

4.1 Working Group Formation and Project Initiation Notification System Stage

4.1.1 WG Formation:

The WG Chair should consider recruiting a professional with some experience in RIPB approaches to be a part of the WG and consider a training session on this guidance document for all WG members.

4.1.2 PINS Development:

The PINS form includes the following question for the WG Chair:

> *Will this standard use risk-informed insights, performance-based requirements, and/or a graded approach?*

The PINS instructions state that it is strongly recommended that new and revised standards use risk-informed insights, performance-based requirements, and/or a graded approach, where applicable, and that WG Chairs contact the RP3C Chair for guidance to incorporate these methods.

Sections 5.1 and 5.2 of this document provides information on the types of standards where use of risk-informed insights/approaches or performance-based requirements/approaches may be appropriate (this document does not address when a graded approach may be appropriate). The WG chair can also consult with the RP3 Chair.

Note that should incorporating a risk-informed and/or performance-based approach(es) to the standard being developed or revised be deemed inappropriate or not effective, the remainder of this procedure is not applicable to that particular standard. The WG Chair should document this evaluation and assessment appropriately for consideration by future Working Groups.

4.2 Standards Development Stage

For standards that have been deemed appropriate to incorporate RIPB approach(es), the WG Chair shall interface with RP3C, as follows:

4.2.1 Early Outlines/Draft

The WG Chair should use this guidance document (particularly Section 5) to support incorporation of RIPB approaches into the standard and should reach out to the RP3C Chair (via standards@ans.org) to request any necessary assistance. The RP3C Chair should offer to assign a member(s), i.e., primary point of contact, to support the WG during the early stages of the standard development.

4.2.2 Pre-Sub-Committee Draft

The WG Chair should send the draft standard to the RP3C for review by the RP3C Chair or designated members of RP3C. The WG should use his/judgment as to when the draft is mature enough to benefit from the RP3C review. Details of the standard do not necessarily have to have been completed. The RP3C should schedule and perform the review to minimize any impact to the standard development schedule. The WG Chair has the authority to adopt any of the RP3C recommendations resulting from the review.

At this point in the standard development phase, it might be too late to implement any or all of the recommendations. This will be based upon the value added versus the difficulty in implementing the recommendations. The WG Chair should consult with the Subcommittee and Committee Chairs to factor in questions of schedule, volunteer resources (amount and appropriate skill sets), extensiveness of standard rework, etc. so as to chart most the appropriate path forward. The WG Chair should document appropriately whatever decisions are made in this regard for consideration by future Working Groups.

5. RISK-INFORMED, PERFORMANCE-BASED APPROACHES

The following discusses RIPB approaches. Table 5-1 provides a high-level attributes that are the key elements of the performance-based and risk-informed approaches that can be used to support the development or revision of standards. Examples are provided in Appendix B on how these approaches have been used (and where their use could be enhanced) in some current ANS standards.

5.1 Performance-Based Approaches

All standards prescribe what (the outcome) is to be obtained from using the standard and to different levels, how to obtain the outcome.

Depending upon the outcome to be achieved, different degrees of prescription on how to achieve that outcome may be appropriate. For example, in calculating the reactor decay heat it is necessary to use scientific first principles, representative data, and applicable equations; therefore, defining the exact steps to perform may be the best means for achieving the outcome.

Alternatively, a standard outcome be a type where it may be appropriate to provide some high level expectations for what needs to be done to meet the outcome and allow flexibility (be less prescriptive) in how to achieve the outcome. For example, a standard might have “not exceeding an exposure limit” as an outcome. The user of the standard can be provided the flexibility on how to meet this outcome, but certain high level expectations (margin and reliability) might be specified. Generally, where there is more margin, there is room for more flexibility.

Note that a standard needs to provide some level of direction/prescription on what needs to be done to achieve the outcome. If it did not, then the standard would have no “shall” statements and would not be a standard.   However, a performance-based standard would keep the direction provided at a high level and would allow flexibility in the specific steps that could be taken to achieve the outcome. The degree of flexibility manifests itself by permitting the standard user to determine what performance metrics are necessary (to ensure success) and what the desired values of such metrics should be to declare success, as well as how to measure those metrics. The degrees of “hows” would be up to the standard writer; he/she would determine any constraints that would need to be placed on the standard user when determining performance-based metrics, how they will be measured, and what constitutes a success.

This is outlined in a step by step manner below.

5.1.1 Defining the Ultimate Outcome of the Standard

Clear understanding and statement of the ultimate outcome of the standard is a critical step in the early stage of any standard development. Clear statement of the outcome and the attributes that characterize the outcome will also support efforts to determine whether the standard is candidate for incorporating a performance-based approach. Examples of clear outcome statements are provided in Appendix B.

5.1.2 Define the Approach (Major Steps) to Obtaining the Outcome

All standards define and require the use of an approach for achieving an outcome. This can be done at a high level or at a more detailed (prescriptive manner) depending upon the nature of the standard, the preference of the standard writers, and needs of the standard users. The goal of a standard is to define the approach such that there is a high level of confidence that the outcome will be achieved in an efficient manner.

5.1.3 Determine Whether there are Alternative Approaches for Achieving the Outcome.

For some situations, there will only be one approach that will result in achieving the outcome (e.g., calculation of decay heat load). In that case, the standard is generally not considered suitable to being written in a performance-based manner.

In other situations, there may be different means to establish the outcome (e.g., achieving an appropriate fire protection program or radiation protection program). In these situations, the level of specificity in the definition of the process for achieving the outcome (or sub-outcomes) should be determined.

5.2 Risk-Informed Approaches

Risk insights can be used to support decisions on the scope, focus, level of rigor or sophistication of the standard (and the program or process that is the subject of the standard). A "risk-informed" approach to decision-making represents a philosophy whereby risk insights are considered together with other factors to establish requirements that better focus attention on design and operational issues commensurate with their importance to health and safety. Decisions made in process described in a standard can be risk-based or risk-informed. Risk-based decisions are decisions made entirely on specified risk criteria, which could be qualitative or quantitative. While it is acceptable to use risk-based steps in a process, broader decisions should be risk-informed. A risk-informed process sets up an integrated decision-making structure that allows consideration of a broad range of technical and stakeholder input uncertainties, imperfections in analysis and decision criteria and knowledge constraints. Regulatory Guide 1.174, *An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis*, is an example of a risk-informed process.

5.2.1. Using Risk Insights to Define the Scope of the Standard

Risk insights can be used to define/narrow the scope of standard, e.g., program elements or structures, systems, and components (SSCs), to those which need to be addressed to meet the outcome. Facilities with risk models may be able to consider quantitative measures, such as risk importance measures as part of the scoping decision.

5.2.2. Using Risk Metrics as Part of the Standards Outcome Statement

The outcome of the standard can be stated in terms of risk metrics such as “As Low As Reasonably Achievable” or “consequence at a given frequency.”

5.2.3 Using Risk Insights to Define How to Meet the Standard’s Outcome

Risk insights can be used in defining the rigor, sophistication, or level of effort to be used in meeting the standard’s outcome. Examples include using risk-insights to help set requirements for testing, surveilling, or inspecting SSCs. For example, a standard that tests a number of similar components could require monthly tests for the high risk category, quarterly tests for the medium risk category, and annual tests for the low risk category. The industry has been successful in implement risk-informed in-service testing and inspection program that reduce the rigor and periodicity of tests/inspections, which provide both cost and exposure savings (RG 1.175, *An Approach for Plant-Specific, Risk-Informed Decision-making: In-service Testing* and RG 1.178, *An Approach For Plant-Specific Risk-informed Decision-making In-service Inspection of Piping*.

Similar to the categorization and focus above, the increase in level of rigor or sophistication can be applied on a continuous scale based on risk insights. The treatments can be different and focused based on the specific risk contribution. For example, an SSC may have different functions during different modes of reactor operation. The categorization and the suggested treatment may differ for the different functions. Similarly, the level or rigor and sophistication of an analysis called for in a standard or the elements of a safety program can be tailored based upon risk insights. Further, the standard can specify the use of probabilistic or statistical methods for achieving the outcome. The industry has been successful in identifying safety-related SSCs that have little or no safety significance, and reduced the regulatory treatment requirements typically placed on safety-related SSC (10 CFR 50.69, *Risk-informed Categorization and Treatment of Structures, Systems and Components*).

Finally, the standard can allow different approaches to be made to achieve outcomes, but require that the approach used be justified to provide an appropriate level of confidence on the accuracy or repeatability of achieving the outcome. An example is where the margin of safety provided (or amount of conservatism) is based on the confidence (or uncertainty) associated with the data or the process used in achieving the outcome.

Table 1. Key RIPB Attributes

Performance-Based Attributes

P1. The outcome of the standard is clearly defined.

P2. The criteria that are established to achieve the outcome are high-level (i.e., provide flexibility in the manner in which the criteria is measured and to determine the "successful" level of the metrics).

Risk-Informed Attributes

R1. The standard defines how to develop the risk insights (e.g., the importance of inputs or steps used in the Standard).

R2. The standard defines how to use risk insights (e.g., to specify a required actions to achieve the outcome).

APPENDIX A

BACKGROUND ON RISK INFORMED AND PERFORMANCE BASED APPROACHES

A1. GENERAL BACKGROUND

The Nuclear Regulatory Commission (NRC) has defined the RIPB approach as:

> *An approach in which risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history are used, to (1) focus attention on the most important activities, (2) establish objective criteria for evaluating performance, (3) develop measurable or calculable parameters for monitoring system and licensee performance, (4) provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and (5) focus on the results as the primary basis for safety decision-making.* [Ref 1, SRM-SECY-98-0144].

In SRC-SECY-98-0144 the NRC provided characteristic attributes and expected outcomes of applying RIPB approaches in regulations. The following is largely taken from the NRC document.

<u>Outcome Attributes of Risk-Informed Safety:</u>

A "risk-informed" approach to safety decision-making represents a philosophy whereby risk insights are considered together with other factors to establish requirements that better focus licensee and regulatory attention on design and operational issues commensurate with their importance to public health and safety. A "risk-informed" approach enhances the deterministic approach by: (1) allowing explicit consideration of a broader set of potential challenges to safety, (2) providing a logical means for prioritizing these challenges based on risk significance, operating experience, and/or engineering judgment, (3) facilitating consideration of a broader set of resources to defend against these challenges, (4) explicitly identifying and quantifying sources of uncertainty in the analysis (although such analyses do not necessarily reflect all important sources of uncertainty), and (5) leading to better decision-making by providing a means to test the sensitivity of the results to key assumptions. Here, "prioritization" is key; while "risk-informed" means, in part, "not relying purely on the PRA," it also means being able to say that some scenarios or systems are more important than others and understanding how sure we are about the statements we are making.

<u>Outcome Attributes of Performance-Based Safety:</u>

A performance-based safety approach is one that establishes performance and results as the primary basis for safety decision-making, and incorporates the following attributes: (1)

measurable (or calculable) parameters (i.e., direct measurement of the physical parameter of interest or of related parameters that can be used to calculate the parameter of interest) exist to monitor system, including facility and licensee performance, (2) objective criteria to assess performance are established based on risk insights, deterministic analyses and/or performance history, (3) licensees have flexibility to determine how to meet the established performance criteria in ways that will encourage and reward improved outcomes; and (4) a framework exists in which the failure to meet a performance criterion, while undesirable, will not in and of itself constitute or result in an immediate safety concern. A performance-based approach offers two categories of benefits: (1) the focus is on actual performance rather than satisfaction of prescriptive process requirements, and (2) the burden of demonstrating actual performance can be substantially less than the burden of demonstrating compliance with prescriptive process requirements.

<u>Outcome Attributes of Risk-Informed and Performance-Based Safety:</u>

A risk-informed and performance-based approach to safety decision-making combines the "risk-informed" and "performance-based" elements. Stated succinctly, risk-informed and performance-based safety is an approach in which risk insights, engineering analysis and judgment including the principle of defense-in-depth and the incorporation of safety margins, and performance history are used to (1) focus attention on the most important activities, (2) establish objective criteria for evaluating performance, (3) develop measurable or calculable parameters for monitoring system and licensee performance, (4) provide flexibility to determine how to meet the established performance criteria in a way that will encourage and reward improved outcomes, and (5) focus on the results as the primary basis for decision-making. By “results,” we mean actual safety performance, not demonstrations of adherence to mandated processes or prescriptions.

A2. EXAMPLE OF REGULATORY APPLICATION: MAINTENANCE RULE

The nuclear industry has had many successes in implementing RIPB approaches. One area that the nuclear industry has been particularly successful has been in establishing maintenance programs to meet the NRC Maintenance Rule (10 CFR 50.65), which is a RIPB rule

The following provides examples of risk-informed and performance-based (RIPB) <u>attributes</u> in the Nuclear Regulatory Commission’s (NRC’s) Maintenance Rule. Although there are significant differences between what is put in a regulation versus a standard, the identification and discussion of some of the key attributes in the Maintenance Rule can be beneficially in understanding what is meant to use a RIPB attributes/approach.

A2.1. Outcome:

The rule states in (a)(1):

> *[liciensees] shall monitor the performance or condition of structures, systems, or components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components, as defined in paragraph (b) of this section, are capable of fulfilling their intended functions.*

The is, in essence, the required "outcome." It is clear (Attibute P1 from Table 1) and supports performance-based implementation because it establishes a high level goal. It is risk-informed because it includes a risk metric as part of the outcome (Attribute R2). Note that there are other ways for a rule (or standard to be risk-informed), so one should not think that a risk metric must be included in the outcome for a standard to be risk-informed.

A2.2. Method for Achieving Outcome

Several parts of the rule provide instructions for achieving the outcome. Examples include:

Example 1: *These goals shall be established commensurate with safety and, where practical, take into account industry-wide operating experience.*

This is a high level instruction for how to meet part of the Maintenance Rule's outcome and flexibility is provided on how best to perform this (Attribute P2).

Example 2: *Performance and condition monitoring activities and associated goals and preventive maintenance activities shall be evaluated at least every refueling cycle provided the interval between evaluations does not exceed 24 months*

This is another example of a high level instruction for how to meet part of the Maintenance Rule's outcome (Attribute P2).

Example 3: *[t]he licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The scope of the assessment may be limited to structures, systems, and components that a risk-informed evaluation process has shown to be significant to public health and safety.*

This is an example of a high level instruction for meeting an element of the Maintenance Rule as well a requirement of develop risk insights and to use risk insights in meeting the Maintenance Rule outcome (Attributes P2, R1 and R2).

APPENDIX B

EXAMPLES OF RISK-INFORMED PERFORMANCE BASED ATTRIBUTES IN ANS STANDARDS

The following provides examples of performance-based and risk-informed attributes in American Nuclear Society (ANS) standards. The examples are organized to cross reference the attributes to those listed in Table 1 in the main body of this guidance document.

Different types of standards (i.e., standards that define a design basis event; standards that define a safety program, etc.) are used as examples because each of the types can been seen to be more (or less) easily make use of risk-informed and performance-based approaches.

B1. ANSI/ANS-2.26-2004, CATEGORIZATION OF NUCLEAR FACILITY STRUCTURES, SYSTEMS, AND COMPONENTS FOR SEISMIC DESIGN

This "design basis event" type of standard.

B1.1 Performance-Based Attributes

B1.1.1 Attribute P1: Outcome

ANS 2.26 states in the SCOPE section that:

> *This standard provides (a) criteria for selecting the seismic design category (SDC) for nuclear facility structures, systems, and components (SSCs) to achieve earthquake safety and (b) criteria and guidelines for selecting Limit States for these SSCs to govern their seismic design. The Limit States are selected to ensure the desired safety performance in an earthquake.*

In simple terms, the outcome could be stated to be:

> "The outcome of the use of this standard is the identification of the Seismic Design Criteria (SDC) and Limit States for System, Structures, and Components (SSCs) to achieve earthquake safety."

B1.1.2 Attribute P2: High Level Criteria

Three examples of appropriate criterion that have this attribute are provided below:

> *One of the SDCs listed in Table 1 shall be assigned to the SSCs based on the unmitigated consequences that may result from the failure of the SSC by itself or in combination with other SSCs.*

Following determination of the regulatory requirements applicable to the project or to the facility, a safety analysis or integrated safety analysis shall be performed. The guidelines provided in this standard and other applicable standards such as Refs. [4] and [5] should be used.

To achieve the objectives of this standard, the safety analyses shall evaluate the uncertainties with determining failure and the consequences of failure. The depth and documentation of the uncertainty analyses should be sufficient to support the judgment that categorization based on Table 1 and the design requirements in ANSI/ASCE/SEI 43-05 produce a facility that is safe from earthquakes. [Note that this is also an example of a risk-informed approach.]

Note that although ANS 2.26 includes many criteria that provide what needs to be done, it does include some prescriptive criteria and ANS 2.26 invokes other consensus standards that provide very prescriptive criteria for the design of safety SSCs. For example:

SDC-1 and SDC-2 in conjunction with the IBC and SDC-3, SDC-4, and SDC-5 in conjunction with ANS-2.27, ANS-2.29, and ANSI/ASCE SEI 43-05 establish the design response spectra (DRS) and SSC design and analysis Requirements

ANS 2.2.6 also includes some guidance that supports use of performance-based approach to achieving the standards outcome.

The scope and comprehensiveness of the safety analysis will vary with the complexity of the facility, its operations, and the contained hazard. The assignment of an SDC to an SSC determined to have a safety function is based on the objective of achieving acceptable risk to the public, the environment, and workers resulting from the consequences of failure of the SSC.

B1.2 Risk-Informed Attributes

B1.2.1 Attribute R1: Development of Risk Importance

An example of a criterion that has this risk-informed attribute is:

One of the SDCs listed in Table 1 shall be assigned to the SSCs based on the unmitigated consequences that may result from the failure of the SSC by itself or in combination with other SSCs.

This criteria specifies that a higher SDC will be assigned to SSCs whose failure would have greater consequences.

B1.2.2 Attribute R2: Use of Risk Insights

An example of a criterion that has this attribute is;

The scope and comprehensiveness of the safety analysis will vary with the complexity of the facility, its operations, and the contained hazard. The assignment of an SDC to an SSC determined to have a safety function is based on the objective of achieving acceptable risk to the public, the environment, and workers resulting from the consequences of failure of the SSC.

B2. ANSI/ANS-2.3-2011, ESTIMATING TORNADO, HURRICANE, AND EXTREME STRAIGHT LINE WIND CHARACTERISTICS AT NUCLEAR FACILITY SITES

This "design basis event" related standard.

B2.1 Performance Based Attributes

B2.1.1 Attribute P1: Outcome

ANS 2.3 states in the SCOPE section that:

> *This standard establishes criteria for acceptable guidelines to estimate the frequency of occurrence and the magnitude of parameters associated with rare meteorological events such as tornadoes, hurricanes, and extreme straight line winds at nuclear facility sites within the continental United States.*

The outcome from the use of this standard could be stated to be:

> An estimate of "the frequency of occurrence and the magnitude of parameters associated with rare meteorological events …"

This is a good, clear performance-based outcome statement.

B2.1.2 Attribute P2: High Level Criteria

An example of a criterion that has this attribute is

> *Tornado hazard probability models shall account for the following:*
>
> *(1) constant or gradations of velocity along and across the tornado path;*
> *(2) meteorological conditions affecting the site;*
> *(3) topographical features surrounding the site; and*
> *(4) biases in reporting occurrence and velocity of tornadoes on target structures. .*

This is performance-based because it provides broadly based statements on what needs to be considered, but does not provide details on how to account for these items.

Another example of a criterion that has this attribute is

Two basic approaches in the characterization of wind-generated missiles are recognized as acceptable in this standard:

(1) a standard spectrum of missiles; and

(2) a probabilistic assessment of the hazard.

This is somewhat performance-based (high level) because it provide options for achieving an outcome.

B2.2 Risk-Informed Attributes

None identified.

The following is an example of a **non**-RIPB feature:

> *The height of the radial inflow layer shall be at least 0.35 R. Above this height, the radial wind is assumed to be zero or to flow outward.*

Note: this does not mean the standard or the criterion is not appropriate. There are times when it is very appropriate to be prescriptive.

B3. ANS 2.21, CRITERIA FOR ASSESSING ATMOSPHERIC EFFECTS ON THE ULTIMATE HEAT SINK

This is a "design analysis" type standard.

B3.1 Performance Based Attributes

B3.1.1 Attribute P1: Outcome

ANS 2.21 states in the SCOPE section that:

> *This standard establishes criteria for acceptable guidelines to estimate the frequency of occurrence and the magnitude of parameters associated with rare meteorological events such as tornadoes, hurricanes, and extreme straight line winds at nuclear facility sites within the continental United States.*
>
> *Required analyses are provided for a meteorological assessment of the ultimate heat sink to ensure that design temperatures and cooling capacity requirements for the facility are met.*

The outcome could be stated to be:

> "A determination of whether design temperature and cooling capacity requirements for the ultimate heat sink for a facility are met."
>
> .

This is a good performance-based outcome.

Note that the introductory statement could be better written (to be consistent with other ANS introduction statements) as:

> *This standard establishes criteria for performing an analysis to determine whether design temperature and cooling capacity requirements for the ultimate heat sink for a facility are met.*

Another example of a criterion that has this attribute is:

> *Ultimate heat sinks shall be designed to have the cooling capacity to provide sufficient cooling water at the maximum allowable inlet temperature under the most adverse meteorological conditions expected for the power plant climatic regime.*

This is a good performance-based statement.

B3.2 Risk-Informed Attributes

B3.2.1 Attribute R1: Development of Risk Importance

An example of a criterion that has this attribute is;

> *The results of the 10-year–or–longer simulation with several extreme events shall be used to perform extreme value statistical analyses that project the most extreme weather conditions for the expected license period of the power plant, which could be 60 years or more.*
>
> *The U.S. Nuclear Regulatory Commission provides guidance in regard to the critical time period. In the case of a cooling lake, the lake temperature may reach a maximum in five days following a shutdown. Therefore, three critical time periods to be included in the assessment are five days, one day, and 30 days to ensure the availability of a 30-day cooling supply. The three periods need not occur contiguously but may be combined to produce a synthetic 36-day period that may be used as the design basis for the lake. In the case of a wet cooling tower, the meteorological conditions resulting in maximum evaporation and drift losses shall be the worst 30-day combination of the controlling parameters such as wet-bulb temperature and wind speed.*
>
> This does incorporate some risk-informed elements.