Review Guide for Classification of Importance of Safety Functions of Light Water Nuclear Power Reactor Facilities

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I. Objective

This Guide aims at defining the relative importance of various functions necessary to ensure the safety (hereinafter referred to as "safety functions") of light water nuclear power reactor facilities (hereinafter referred to as "light water reactors") from the viewpoint of safety, and thus setting the basis to impose adequate requirements on design of the structures, systems and components which should perform those functions.

II. Position and scope of this Guide

This Guide is to set the application criteria of the importance of safety functions for concrete application of each guideline stipulated in the Review Guide for Safety Design of Light Water Nuclear Power Facilities (hereinafter referred to as the "Review Guide for Safety Design") in carrying out a safety review in relation to application for light water reactor establishment permit (including application for establishment permit amendment; the same applies hereinafter).

III. Classification of importance of safety functions

1. Classification of safety functions

The structures, systems and components with safety functions are classified into the following two groups in accordance with the nature of the safety functions:
(1) The loss of function could bring reactor facilities into abnormal situation and thus it could cause excessive radiation exposure of the general public and/or the occupational workers (system for preventing the occurrence of abnormalities; hereinafter referred to as PS).
(2) The one which works to prevent expansion of abnormal situations when reactor facilities are in abnormal situations, or to resolve such abnormal situations promptly, thus preventing or mitigating possible excessive radiation exposure of the general public and/or the occupational workers (system for mitigating the impact of abnormalities; hereinafter referred to as "MS").

2. Classification of importance

Structures, systems and components which belong to PS and MS are classified into three groups, Class 1, Class 2 and Class 3 respectively, in accordance with the importance of the safety functions incorporated in the structures, systems and components. The name of each class is as described in Table 1 and the definition and safety functions of the structures, systems and components of each class are as described in Table 2.

Table 1: Classification of importance of safety functions

Classification by function / Classification by importance		Structures, systems and components with safety functions		Structures, systems and components without safety functions
		The one for preventing the occurrence of abnormalities (PS)	The one for mitigating the impact of abnormalities (MS)	
Safety-related structures, systems and components	Class 1	PS-1	MS-1	
	Class 2	PS-2	MS-2	
	Class 3	PS-3	MS-3	
Non-safety-related structures, systems and components				Those that perform functions other than safety functions

Table 2: Definition and functions in relation to classification of importance of safety functions

Classification		Definition	Function
Class 1	PS-1	Any structure, system or component which could cause the following through the events caused by its damage or failure: (a) significant core damage, or (b) a large amount of fuel damage	1) Reactor coolant pressure boundary function
			2) Function to prevent form imposing excessive reactivity
			3) Core geometry maintenance function
	MS-1	1) Any structure, system or component which will bring the reactor to emergency shutdown when any abnormal situation occurs, remove the residual heat, prevent over-pressurization of the reactor coolant pressure boundary, and prevent excessive radiation exposure of the public in the site vicinity	1) Reactor emergency shutdown function
			2) Sub-criticality maintenance function
			3) Function to prevent over-pressurization of the reactor coolant pressure boundary
			4) Cooling function after reactor shutdown
			5) Core cooling function
			6) Radioactive materials confinement function, and radiation shielding and release reduction functions
		2) Any other structure, system or component which is essential for the safety	1) Function to generate actuation signals for engineered safety features and reactor shutdown systems
			2) Pertinent functions particularly important for safety
Class 2	PS-2	1) Any structure, system or component which will not cause immediately significant core damage or a large amount of fuel damage through the events caused by its damage or failure, but could cause excessive release of radioactive materials to the outside of the site	1) Function to contain reactor coolant (excluding small caliber piping such as instrumentation which is excluded from the reactor coolant pressure boundary and piping that is not directly connected to the boundary)
Classification		Definition	Function

			2) Function which is not connected to the reactor coolant pressure boundary but stores radioactive materials
			3) Function to handle the fuel safely
		2) Any structure, system or component which is required to operate during normal operation and at the time of abnormal transients during operation, and could disturb core cooling if it fails	1) Reclosing function of safety valves and relief valves
	MS-2	1) Any structure, system or component which will work to reduce radiation effects to the public in the site vicinity, which could be caused by damage or failure of the structures, systems or components of PS-2	1) Fuel pool water supply function
			2) Function to prevent the discharge of radioactive materials
		2) Any structure, system or component which is specially important to respond to the abnormal situations	1) Function to grasp the conditions of the plant when an accident happens
			2) Function for mitigation of abnormal situations
			3) Remote safe shutdown function
Class 3	PS-3	1) Any structure, system or component which can be an initiating event for abnormal situations, but which are not the structures, systems and components of PS-1 or PS-2	1) Reactor coolant preserving function (excluding PS-1 and PS-2)
			2) Reactor coolant circulation function
			3) Radioactive materials storage function
			4) Power supply function (excluding emergency power supply)
			5) Instrumentation and control functions of the plant (excluding safety protection function)
			6) Plant operation supporting functions
Classification		Definition	Function

		2) Any structure, system or component which keeps the reactor coolant radioactivity concentration sufficiently low so as not to disturb normal operation	1) Function to prevent fission products from diffusing into the reactor coolant
			2) Reactor coolant purification function
	MS-3	1) Any structure, system or component which will mitigate the events, combined with MS-1 and/or MS-2, even if an abnormal transient occurs during operation	1) Mitigation function for the increase of reactor pressure
			2) Function to control the power increase
			3) Reactor coolant make-up function
		2) Any structure, system or component which is necessary to respond to abnormal situations	Functions necessary for emergency response and functions to grasp abnormal situations

IV. Principles of classification application

The concrete application of the classification shown in Table 2 shall be as provided below.

1. Scope and classification of related systems

The scope and classification of the structures, systems and components which are directly or indirectly needed (hereinafter referred to as “related systems”) for the structures, systems and components (hereinafter referred to as “subject systems”) to perform their safety functions described in Table 2 are as stated in the following sub-paragraphs:

(1) The related systems which are directly needed for the subject systems to perform their functions are considered to be as important as the subject systems.

(2) The related systems which are not directly needed for the subject systems to perform their functions but important to maintain or secure the reliability of the subject systems are considered to be less important than the subject systems. However, if the subject systems belong to Class 3, the related systems are considered to also belong to Class 3.

2. Structures, systems and components with more than two safety functions

When one structure, system or component has more than two safely functions, the design requirements for all the expected safely functions shall be met.

3. Principle of separation and isolation

Appropriate functional isolation and physical separation of the structures, systems and components with safety functions shall be considered to ensure it will not happen that regarding the situations between more than two of the structures, systems and components with safety functions or between the structures, systems and components with safety functions and those without safety functions, operation or failure of one of them will impair the safety function of the other which has the same or higher level of importance, resulting in impairment of the safety of reactor facilities.

4. Connection of different classes

When structures, systems and components of different levels of importance is connected, the design requirements for structures, systems and components of a lower level of importance shall be equivalent to those of a higher importance, or appropriate functional isolation with the use of isolation devices which are equivalent to those of a higher importance shall be considered so that failure of the structures, systems and components of a lower importance will not impair the safety function of those of a higher importance.

V. Design considerations for structures, systems and components with safety functions

1. Basic objectives

The basic design or basic design principles of the structures, systems and components of each class shall meet the basic objectives as described in the following sub-paragraphs from the viewpoint of ensuring safety functions, by the established design, construction, testing, engineering and operations management.

(1) Class 1: Ensure and maintain the highest reliability which can be reasonably achieved

(2) Class 2: Ensure and maintain high reliability

(3) Class 3: Ensure and maintain the same or a higher level of reliability as general industrial facilities

2. Application of classification to “Review Guide for Safety Design”

For the structures, systems and components with safety functions, design considerations shall be given to achieve the basic objectives stated in Paragraph 1 above . For that purpose, the classification of this Guide shall be applied to the “Review Guide for Safety Design” as stated in the following sub-paragraphs:

(1) Design considerations for reliability

The following systems are considered to be those stated in Paragraph 2 “Systems with safety functions of particularly-high importance,” Guideline 9 of “Review Guide for Safety Design”.

(a) Among those of PS-1, valves which are open during normal operation and closed when an accident happens to serve as part of the reactor coolant pressure boundary function

(b) MS-1

(c) Among those of MS-2, systems which are to fulfill the function to grasp the plant situations when an accident happens,

(2) Design considerations for natural phenomena

The following are considered to be those stated in Paragraph 2 “Structures, systems and components with safety functions of particularly-high importance”, Guideline 2 of “Review Guide for Safety Design”.

(a) Class 1

(b) Among those which belong to Class 2, structures, systems and components which are likely to be affected by natural phenomena and are difficult to maintain their functions by alternative means or extremely difficult to repair them

(3) Design considerations for electrical systems

“Safety functions of particularly-high importance” of Paragraph 1 and “Safety functions of high importance” of Paragraph 4, Guideline 48 of “Review Guide for Safety Design” are as stated below:

(A) Safety functions of particularly-high importance

i) PS-1

ii) MS-1

iii) Among those of MS-2,

a) Fuel pool water supply function

b) Function to grasp the conditions of the plant when an accident happens

c) Among the functions for mitigating the abnormal situations, function to stop reactor coolant discharge from the relief valve

d) Remote safe shutdown function

(B) Safety functions of high importance

i) Class 1

ii) Class 2

Commentary

I. Objective

A safety review regarding the application for light water reactor establishment permit shall be carried out by applying the "Review Guide for Safety Design" to the designed safety measures for the reactor facilities concerned. Each guideline provided in this Guide shall be properly applied in accordance with the safety importance of the structures, systems and components concerned. For that purpose, it is necessary to properly classify the safety functions that the structures, systems and components should achieve in accordance with the safety importance.

This Guide aims to provide classification criteria on the importance of safety functions when applying the "Review Guide for Safety Design," and also at setting the basis to impose adequate requirements on design of structures, systems and components with safety functions.

II. Position and scope of this Guide

This Guide should be applied together with the "Review Guide for Safety Design" in carrying out the safety review regarding the application for light water reactor establishment permit, as described in the previous paragraph. It is quite natural that there are various requirements for each phase of construction and operations management as well as design to ensure the safety of reactor facilities. These requirements must be appropriate and consistent in accordance with the importance of the safety functions that the structures, systems and components should achieve. Although this Guide is to be applied in carrying out the safety review regarding the application for the light water reactor establishment permit, it can be a useful reference in deciding the requirements for the subsequent design phase and the requirements for each phase after the design phase.

Matters which require special attention are as stated below:

Firstly, the classification of importance shown in Table 2 of this Guide and the examples of the structures, systems and components shown in the appendix table were established by keeping in mind the light water reactor which were believed to be of standard design when this Guide was established. For reactor facilities with different design from this, appropriate classification shall be made, with correct understanding of the intent of this Guide.

Secondly, the classification in this Guide was established by comprehensively evaluating what role each function would play from the viewpoint of safety of the entire reactor facilities. Classifications of the structures, systems and components with a focus on particular aspects may appear to be inconsistent with the classification of this Guide, when looking at the details. Such classifications include the classification of importance for seismic design ("Review Guide for Seismic Design of Nuclear Power Reactor Facilities") (hereinafter referred to as "Review Guide for Seismic Design"), and the structural design classification (Ministerial Order No. 62 of the Ministry of International Trade and Industry of June 1965 as amended on July 1, 2005). When comparing these classifications with those of this Guide or verifying them, it is necessary to have a full understanding of the difference in the objectives, intents and features of each classification. Automatic diversion of classifications defined by one Guide to other Guide or Notice or application of it in other Guide or Notice shall be avoided.

III. Classification of importance of safety functions

This Guide is to cover the entire reactor facilities which are related to the safety in one way or another. Considering that requirements differs different depending on the safety functions to be achieved, the functions necessary to ensure safety (safety functions) are covered as focal features of the classification.

The structures, systems and components with safety functions are classified broadly into two types, depending on the nature of safety functions, i.e., system for mainly preventing the occurrence of abnormalities (Preventions System: PS) and system for mitigating the impact of abnormalities (Mitigation System: MS), because it has been taken into account that the safety function requirements for PS and MS tend to be different from each other. The safety importance is divided into three classes for PS and MS respectively. There is no safety requirement for the structures, systems and components which do not fall under these categories. Some concrete examples of the structures, systems and components with safety functions described in Table 2 are shown in the appendix table as reference.

IV. Principles of classification application

While the points basically considered in applying the classification given in this Guide are as described in Article II, the principles for a more concrete application of the classification are as stated in Paragraphs 1 to 4, Article IV.

1. Scope and classification of related systems

In this Guide, the structures, systems and components which directly achieve required safety functions are referred to as "subject systems". For instance, when

a loss of coolant accident (hereinafter referred to as “LOCA”) occurs, it is the emergency core cooling system (hereinafter referred to as “ECCS”) that functions to cool the core by injecting coolant water, and ECCS is the subject system in terms of the function to cool the core when LOCA occurs.

However, the required safety functions are not always achieved by the subject systems on their own. In case of ECCS, not only a safety protection system to generate seizing signals, a power system (including an emergency auxiliary power system) to supply power and an auxiliary cooling system to cool equipment but also instrumentation to secure and monitor the reliability of the said systems, test facilities, foundations to install equipment, supports, buildings to house the systems and air ventilation systems for the said buildings are all needed to a varying degree. The structures, systems and components which are directly or indirectly necessary for the subject systems to achieve their functions are referred to as related systems in this Guide.

For the structures, systems and components which are supposed to be characterized as related systems according to the definition stated above, if they support a wide range of the subject systems, they are characterized as the subject systems. “Any other structure, system or component which is essential for safety” in MS-1 of Table 2 of this Guide is an example of it.

Other related systems are classified broadly into two groups, i.e. related systems which are directly necessary for the subject systems to perform their functions and other related systems. The former is considered to have the same level of importance as the subject systems and the latter is considered to have a lower level importance than the subject systems. However, if the subject systems of the related systems of the latter are classified as Class 3, the related systems are also regarded as Class 3, because they have safety-related functions.

“Related systems which are directly necessary for the subject systems to perform their functions” means the essential structures, systems and components without which the subject systems cannot perform or maintain their functions, such as instrumentation which controls startup and operation, a drive system, an equipment cooling system and an equipment fuel system. And, the above statement that the related systems “are considered to have the same level of importance as the subject systems” indicates that the subject systems including the related systems are required to ensure and maintain the required reliability, and that the same considerations must be given to design the related systems as

to design the subject systems so that the requirements of the subject systems will be met including the related systems.

For instance, if the design is required to ensure that a single failure of a subject system will not result in the loss of the safety functions of the system, it is necessary to ensure that the safety functions of the subject system shall not be lost even if a single failure occurs in a related system which is necessary for the subject system to achieve its functions. However, this does not ask the designer to assume that the subject system and the related system fail independently at the same time.

2. Structures, systems and components with more than two safety functions

Many of the structures, systems and components with safety functions have multiple, different safety functions. For instance, safety valves and relief valves which are connected to the reactor coolant pressure boundary serve as PS as part of the pressure boundary during normal operation and if the pressure rose abnormally, they also have the function of MS to mitigate it . Another example is that one pump may be designed to be part of ECCS and also part of the residual heat removal system simultaneously. As in the case of these examples, it is necessary for the structures, systems and components with multiple, different safety functions to meet all the design requirements of each of the expected safety functions.

3. Principle of separation and isolation

When the structures, systems and components with safety functions and other structures, system and components might possibly affect each other, the safety function expected to the one which has the same or higher level of importance should not be lost as a result of the other malfunction. To that end, the structures, systems and components with safety functions shall be designed so as not to be affected by the malfunction of those with the same or lower level of importance (including those without safety functions), functionally isolated and/or physically separated from them.

Examples of “functional isolation“ include isolation between the systems with tie lines by the alignment of valves, provision of an isolated amplifier and the like between the instrument systems, and provision of an isolated area in the electrical systems using a relay and a breaker. Examples of “physical isolation” include to

ensure the appropriate alignment and provision of physical barriers (walls, weirs, etc.).

This requirement does not necessarily require that the structures, systems and components with safety functions should be strictly independent from each other. It can be regarded as satisfactory if it is clear that the safety functions expected in the design will work without impairment.

4. Connection of different classes

In connecting the structures, systems and components of different levels of importance, the concrete methods of functional isolation are the same as required for functional isolation in Paragraph 3, Article IV of this Guide. However, the reliability required for the isolation area shall be equivalent to the reliability required for those of a higher importance.

V. Design considerations for structures, systems and components with safety functions

1. Basic objectives

When the safety functions necessary to ensure the safety of reactor facilities and their relative importance are established, various requirements are imposed on the structures, system and components with such functions. The purpose of these requirements is to ultimately ensure a sufficiently-high reliability in accordance with the importance of each function.

Since this Guide is to provide a rough guidance to the application of the importance of safety functions to the “Review Guide for Safety Design,” the areas to be directly covered by this Guide are the basic design and basic design principles of reactor facilities. It is quite natural that high reliability can be achieved not only by design but also by consistent efforts at each stage of construction and operations management. The efforts in each phase can be complementary to each other. The basic objectives stated herein should be achieved not only by design but also ultimately by quality assurance activities in each of the succeeding phase. It should be confirmed that the basic design and basic design principles should be developed in such a way that the activities in each of the succeeding phased can be fully achieved and the basic objectives stated herein are achievable.

Generally, some standards, which include the standards based on the domestic laws and appropriate civil and overseas standards, shall be applied to the structures, systems and components of facilities including reactor facilities, in order to ensure reasonable reliability. Those which are classified as Class 3 in this Guide are considered as having the need to ensure the reliability required for general industrial facilities, and shall conform to the Building Standard Law, the Japanese Industrial Standards, regulations on the electric structures, etc. However, regarding the reactor facilities, higher reliability is usually required for the structures, systems and components of high safety importance than those for the general industrial facilities, in the light of the importance to ensure safety. For instance, the "Review Guide for Seismic Design" assumes more severe design seismic forces for the structures, systems and components of Classes S and B than the Building Standard Law, and requires that the structures, systems and components will withstand such severe seismic forces. Ministerial Order No. 62 of the Ministry of International Trade and Industry of June 1965 as amended on July 1, 2005 also sets especially severe requirements for the structures of high importance. Based on these same principles, this Guide requires the structures, systems and components of Classes 1 and 2 to ensure higher reliability than the general industrial facilities. However, the concrete measures to be taken at each phase of design, construction and operations management in order to ensure the required reliability vary depending on the structure, principles of operation, use conditions, features, etc. of each structure, system and component. Thus, adequate concrete requirements for each structure, system and component must be selected in the light of the basic objectives of this Guide.

For instance, in determining the concrete measures and requirements for maintenance and operations management related with each structure, system and component during the phase of the operations management, it is appropriate to use the operating experience and risk insights including results of the probabilistic safety assessment (PSA), while maintaining the significance of the safety functions provided in this Guide. This considers the aspects of improvements in rationality, consistency and transparency in securing safety and distribution of resources, as well as reflects the progression of risk assessment technology after enactment of this Guide.

2. Application of classification to "Review Guide for Safety Design"

In order to achieve the basic objectives stated in Paragraph 1, Article V of this Guide, appropriate design considerations shall be given to the structures, systems

and components with safety functions in accordance with their features. The basic considerations among such considerations are as stated in “Review Guide for Safety Design,” this Guide deals with the concrete contents which were remitted to this Guide in the “Review Guide for Safety Design”.

(1) Design considerations for reliability

Paragraph 2, Guideline 9 of the “Review Guide for Safety Design” requires that a system with safety functions of particularly-high importance shall be designed with redundancy or diversity and independence. Also Paragraph 3 requires that such system shall be designed in such a way that the safety functions of the system will work even in cases of unavailability of offsite power as well as a single failure of a component consisting of the system. This requirement basically applies to the systems of MS-1 and some of the systems of PS-1 and MS-2.

An example of the systems of PS-1 to which this requirement applies is the valve which works as part of the reactor coolant pressure boundary by being opened in normal condition and being closed during an accident. For the systems equipped with such valves, the reactor coolant pressure boundary extends to and including the second isolation valve from the reactor side. That is, redundancy is required for valves of this type.

An example of the systems of MS-2 to which the above-mentioned requirement applies is the system with the function to grasp the conditions of the plant when an accident occurs. The system is essential to monitor the conditions of the three most important functions of reactor shutdown, core cooling and radioactivity confinement. The “Review Guide for Safety Design” requires that the shutdown condition of the reactor and the cooling condition of the core can be monitored or assumed with more than two types of parameters in terms of the reliability of the instrumentation and control system, which means that the diversity is required to grasp the shutdown and cooling conditions. In the “Review Guide for Radiation Measurement During Accidents from Light Water Nuclear Power Reactor Facilities”, it is required that the main radiation measuring system to provide information to confirm the integrity of radiation barriers shall be designed with diversity.

(2) Design considerations for natural phenomena

Paragraph 2, Guideline 2 of the “Review Guide for Safety Design” addresses the design considerations for the possible natural phenomena except earthquakes and specifies the requirement for “structures, systems and components with safety functions of particularly-high importance.” This requirement basically applies only

to those of Class 1, but it will also apply to some of the Class 2 category if they are likely to be affected by the natural phenomena. Generally, buildings and outdoor structures are considered to be likely to be affected by these natural phenomena. Among those of Class 2, the auxiliary building stacks of PWR and the ventilation pipes of the standby gas treatment system of BWR excluding the ventilation pipe supporting function are considered to be the subject systems, and the related systems include buildings which are equivalent to Class 2.

(3) Design considerations for electrical systems

Regarding the “Safety functions of particularly-high importance” in Paragraph 1, Guideline 48 of the “Review Guide for Safety Design,” that which is required to be capable of receiving a power supply from the emergency auxiliary power system are basically classified as Class 1, however, this requirement applies to some of those of Class 2. Those which belong to Class 2 but are required to be connected to the emergency auxiliary power system are the spent fuel pool water supply function and the particularly-important functions to respond during abnormal events. In more concrete terms, those with the latter function are some of the monitoring instruments at the time of an accident described in (1), the remote reactor shutdown function system, and the main and power operated relief valves (manual open/close function) of PWRs.

Attached Table　Classification of importance of safety functions of PWR and BWR

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
PS-1	Any structure, system or component which could cause the following through the events caused by its damage or failure: (a) severe core damage, or (b) a large amount of fuel damage	1) Reactor coolant pressure boundary function	Components and piping system constituting reactor coolant pressure boundary (excluding small bore piping and components such as instrumentation)		Components and piping system constituting reactor coolant pressure boundary (excluding small bore piping and components such as instrumentation)		
		2) Function to prevent from imposing excessive reactivity	Control rod drive mechanism pressure housing		Control rod coupling		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		3)Core geometry maintenance function	Core support structure (core baffle, upper core support plate, upper core support column, upper core plate, lower core plate, lower core support column and lower core support plate) and fuel assembly (excluding fuel)		Core support structure (core shroud, shroud support, top fuel guide, core support plate and control rod guide tube) and fuel assembly (excluding fuel)		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
MS-1	1) Any structure, system or component which will bring the reactor to emergency shutdown when any abnormal situation occurs, remove the residual heat, prevent over-pressurization of the reactor coolant pressure boundary, and prevent excessive radiation exposure of the public in the site vicinity	1)Reactor emergency shutdown function	Control rod system of emergency shutdown system (rod cluster control and control rod drive mechanism (scram function))		Control rod system of emergency shutdown system (control rod and control rod drive mechanism (scram function))		
		2) Sub-criticality maintenance function	Emergency shutdown system (control rod system, chemical and volume control system and boric acid water injection function by emergency core cooling system)		Emergency shutdown system (control rod system and boric acid water injection system)		
		3) Function to prevent over-pressurization of the reactor coolant pressure boundary	Pressurizer safety valve (opening function)		Safety relief valve (opening function as safety valve)		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		4) Cooling function after reactor shutdown	System to remove residual heat (residual heat removal system, auxiliary feedwater system, main steam and feedwater systems to steam generator secondary system isolation valve, main steam safety valve and main steam relief valve (manual relief function)		System to remove residual heat (residual heat removal system, reactor shutdown cooling mode), reactor core isolation cooling system, high pressure core spray system, relief safety valve (manual relief function) and automatic depressurization system (manual relief function)		
		5) Core cooling function	Emergency core cooling system (low pressure injection system, high pressure injection system and accumulator injection system)		Emergency core cooling system (low pressure core spray system, low pressure injection system, high pressure core spray system and automatic depressurization system)		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		6) Radioactive materials confinement function, and radiation shielding and release reduction functions	Reactor containment, annulus, reactor containment isolation valve, reactor containment spray system, annulus air recirculation facility, safety air purification system and flammability gas control system	Reactor containment vent stack	Reactor containment, reactor containment isolation valve, reactor containment spray cooling system, reactor building, standby gas treatment system, emergency recirculation gas treatment system, flammability gas control system	Vent stack (supporting function of emergency gas treatment system ventilation pipe)	
	2) Any other structure, system or component which is essential for the safety	1) Function to generate actuation signals for engineered safety features and reactor shutdown systems	Safety protection system		Safety protection system		
		2) Pertinent functions	Emergency auxiliary power system, control	Diesel power generator fuel	Emergency auxiliary power system, control	Diesel power generator fuel	

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		particularly important for safety	room and its shielding system, ventilation & air conditioning system and component cooling water system, emergency cooling service water system, DC power supply system and control air compressor system (all related with MS-1)	transportation system, diesel cooling system, intake structure (including outdoor trench)	room and its shielding system, emergency ventilation & air conditioning system, emergency equipment cooling water system and DC power supply system (all related with MS-1)	transportation system, diesel cooling system, intake structure (including outdoor trench)	

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
PS-2	1) Any structure, system or component which will not cause immediately significant core damage or a large amount of fuel damage through the events caused by its damage or failure, but could cause excessive release of radioactive materials to the	1) Function to contain reactor coolant (excluding small caliber piping such as instrumentation which is excluded from the reactor coolant pressure boundary and piping that is not directly connected to the boundary)	Extraction and purification systems of chemical & volume control system		Main steam system and reactor water cleanup system (only the outer of the containment isolation valve for each system)		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
	outside of the site	2) Function which is not connected to the reactor coolant pressure boundary but stores radioactive materials	Radioactive waste treatment facility (for waste with large radioactive inventory, Note 1) and spent fuel pit (including spent fuel rack)	Spent fuel pit cooling system	Radioactive waste treatment facility (for waste with large radioactive inventory, Note 1) and spent fuel pit (including spent fuel rack)	Spent fuel pool cooling system	Note 1) Under current situations, gaseous radioactive waste treatment system may be applicable.
		3) Function to handle the fuel safely	Fuel handling facility		Fuel handling facility		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
	2) Any structure, system or component which is required to operate during normal operation and at the time of abnormal transient during operation, and could disturb core cooling if it fails	1) Reclosing function of safety valves and relief valves	Pressurizer safety valve and pressurizer relief valve (portions related with reclosing function for both valves)		Relief safety valve (portions related with reclosing function)		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
MS-2	1) Any structure, system or component which will work to reduce radiation effects to the public in the site vicinity, which could be caused by damage or failure of the structures, systems or components of PS-2	1) Fuel pool water supply function	Spent fuel pit water supply system		Emergency water supply system		Note 2) Under the current situations, the containment area monitor of PWR and containment atmosphere radiation monitor of BWR may be
		2) Function to prevent the discharge of radioactive materials	Radioactive release reduction system during fuel assembly drop accident and vent stack (auxiliary building)		Isolation valve of gaseous radioactive waste treatment system and vent stack (except supporting function of emergency gas treatment system ventilation pipe)		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
	2) Any structure, system or component which is specially important to respond to the abnormal situations	1) Function to grasp the conditions of the plant when an accident happens	Some monitoring instruments at the time of an accident Note 2)		Some monitoring instruments at the time of an accident Note 2)		applicable.
		2) Function for mitigation of abnormal situations	Pressurizer relief valve (manual open/close function), pressurizer heater (backup heater), main valve of pressurizer relief valve				

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		3) Remote safe shutdown function	Remote reactor shutdown system (related with safety shutdown)		Remote reactor shutdown system (related with safety shutdown)		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
PS-3	1)Any structure, system or component which can be an initiating event for abnormal situations, but which are not the structures, systems and components of PS-1 or PS-2	1) Reactor coolant preserving function (excluding PS-1 and PS-2)	Instrumentation piping, sampling tube		Instrumentation piping, sampling tube		Note 3) Under the current conditions, liquid and solid radioactive waste treatment systems may be applicable.
		2) Reactor coolant circulation function	Reactor coolant pump and its related system		Reactor coolant recirculation system		
		3) Radioactive materials storage function	Radioactive waste treatment facility (for waste with small radioactive inventory) Note 3)		Suppression pool water drainage system, condensate water storage tank and radioactive waste treatment facility (for waste with small radioactive inventory) Note 3)		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		4) Power supply function (excluding emergency power supply)	Power steam system (downstream of isolation valve), feedwater system (upstream of isolation valve), transmission line, transformer and switchgear		Turbine, generator and its excitation system, condensate water system (including condenser), feedwater system, circulation system, transmission line, transformer and switchgear		
		5) Instrumentation and control functions of the plant (excluding safety protection function)	Reactor control system, reactor instrumentation and process instrumentation		Reactor control system (including control rod worth minimizer), reactor nuclear instrumentation, and reactor plant process instrumentation		

Classification	System for preventing the occurrence of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
		6) Plant operation supporting functions	Auxiliary steam system and instrumentation air system (excluding MS-1)		House boiler and instrumentation air system		
	2) Any structure, system or component which keeps the reactor coolant radioactivity concentration sufficiently low so as not to disturb normal operation	1) Function to prevent fission products from diffusing into the reactor coolant	Fuel cladding		Fuel cladding		
		2) Reactor coolant purification function	Purification system of chemical & volume control system (purification function)		Reactor water cleanup system and condensate cleanup system		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
MS-3	1) Any structure, system or component which will mitigate the events, combined with MS-1 and/or MS-2, even if an abnormal transient occurs during operation	1) Mitigation function for the increase of reactor pressure	Pressurizer relief valve (automatic operation)		Relief safety valve (relief valve function) and turbine bypass valve		
		2) Function to control the power increase	Turbine runback system and control rod block interlock		Reactor coolant recirculation system (recirculation pump trip function) and control rod withdrawal monitoring system		
		3) Reactor coolant make-up function	Chemical & volume control system charging system and primary water make-up system		Control rod drive hydraulic control system		

Classification	System for mitigating the impact of abnormalities						
	Definition	Function	Structure, system or component (PWR)	Related system to be noted (PWR)	Structure, system or component (BWR)	Related system to be noted (BWR)	Remarks
	2) Any structure, system or component which is necessary to respond to abnormal situations	1) Functions necessary for emergency response and functions to grasp abnormal situations	On-site emergency station, sampling system, communications equipment, radiation monitoring equipment, part of monitoring instruments at the time of an accident, fire protection system, safety evacuation route and emergency lighting		On-site emergency station, sampling system, communications equipment, radiation monitoring equipment, part of monitoring instruments at the time of an accident, fire protection system, safety evacuation route and emergency lighting		