

# AP1000 KA Catalog

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# Changes

- PRA and important industry lessons-learned are incorporated in the AP1000™ K/A catalog and are identified by the terms “PRA related” or “OE related”.
- Tasks are not included in the AP1000™ catalog because the plant specific task list is a better representation of required operator skills and knowledges.
- One importance rating is used for all sections except generics, A2s, and fuel handling.

# Changes

- Asterisks (\*), Question Ratings (?), and Difference Ratings (†) have been removed.
- Section 2, Generic Knowledges and Abilities, importance ratings not applicable to ROs were marked N/A.
- Knowledge and Ability stem statements were revised.
- Reviewed CFRs to ensure each K/A included a reference to all applicable CFRs.

# Section 2

- **Was**
  - Knowledge of operator responsibilities during all modes of plant operation.
- **Is**
  - Knowledge of operator responsibilities during any mode of plant operation.

# Section 2

- **Was**
  - Ability to direct personnel activities inside the control room.
- **Is**
  - Ability to direct licensed personnel activities inside the control room.
  - Ability to direct non-licensed personnel activities inside the control room.

# Section 2

- **Was**
  - Ability to perform specific system and integrated plant procedures during all modes of plant operation.
- **Is**
  - Ability to perform general and/or normal operating procedures during any plant condition.

# Section 2

- **Was**
  - Knowledge of industrial safety procedures (such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen and hydrogen).
- **Is**
  - Knowledge of industrial safety procedures, such as rotating equipment, electrical, high temperature, high pressure, caustic, chlorine, oxygen or hydrogen.

# Section 2

- **Was**
  - Ability to use procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, fuel depletion, etc.
- **Is**
  - Ability to use On-Line Power Distribution Monitoring System and/or procedures to determine the effects on reactivity of plant changes, such as reactor coolant system temperature, secondary plant, or fuel depletion.

# Section 2

- **Was**

- Knowledge of less than or equal to one hour Technical Specification action statements for systems.
- Ability to apply Technical Specifications for a system.

- **Is**

- Knowledge of less than or equal to one hour Technical Specification action statements that require a reactor shutdown.
- Ability to apply Technical Specifications with action statements of less than or equal to one hour that require a reactor shutdown.
- Ability to determine and/or interpret Technical Specifications with action statements of greater than one hour.

# Section 2

- **Was**
  - Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
- **Is**
  - Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, or personnel monitoring equipment.

# Section 2

- **Was**
  - Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.
- **Is**
  - Knowledge of radiation monitoring systems such as fixed radiation monitors and alarms, or personnel monitoring equipment.

# Section 2

- **Was**
  - Knowledge of EOP entry conditions and immediate action steps.
- **Is**
  - Knowledge of Emergency Operating Procedure entry conditions.
- **Was**
  - Knowledge of EOP mitigation strategies.
- **Is**
  - Knowledge of for Emergency Operating Procedures major action categories.

# Section 2

- **Was**
  - Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.
- **Is**
  - Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities, such as analysis and interpretation of radiation and activity readings as they pertain to administrative, normal, abnormal, and emergency procedures, or analysis and interpretation of coolant activity including comparison to emergency plan or regulatory limits.
  - Rating for RO was changed to N/A

# Section 2

- **Deleted**
  - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.
- **Added**
  - Ability to use integrated control systems to operate plant systems or components.

## Section 2

- **RO ratings changed to N/A**
  - Knowledge of the fuel-handling responsibilities of SROs.
  - Knowledge of new and spent fuel movement procedures.
  - Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.
  - Ability to determine operability and/or availability of safety related equipment.
  - Ability to determine and/or interpret Technical Specifications with action statements of greater than one hour.

# Section 3

- Section 3 – Systems
- Changed the systems to reflect those in the AP1000
- Make stems consistent throughout the catalog
- Revised K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>5</sub>, K<sub>6</sub>, A<sub>1</sub> and A<sub>4</sub> stems
- Ensured Knowledge and Ability statements support the stems.

# Systems K1

- **K<sub>1</sub> Was:**
  - Knowledge of the physical connections and/or cause-effect relationships between the (system) and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)
- **K<sub>1</sub> Is:**
  - Knowledge of the physical or control/protection logic relationship between the (system) and the following systems: (CFR: 41.2 to 41.9 / 45.7 to 45.8)
- For mechanical and electrical systems the System Specification Document (SSD) Appendix A, 'Interface Lists,' – list of supporting and dependent systems

# Systems K1

- For I&C systems, the list was developed by reviewing the System Functional Requirements documents and the System Functional Diagrams
- The stem was revised to delete the statement “or cause-effect relationships.” Cause-effect relationships are addressed in K5.
- Identifies the systems that have a direct interaction, either a plant protection/control logic relationship or physical piping relationship

# Systems K1

- Electrical systems typically were not included in K1, they are addressed in K2.
- PLS typically not included in K1 because all systems are controlled through the PLS, and the specific controls and interlocks are listed in K4.
- Relationship to PMS is found in K1 as either RTS (LCO 3.3.1), ESAS (LCO 3.3.2), or PAMS (LCO 3.3.3). For example, the SGS has no piping connection to PXS but does have a plant protection/control logic relationship in that SGS instrumentation provides a reactor trip so RTS is included in K1. SGS instrumentation also provides for several ESAS actuation signals so ESAS is included in K1.

# Systems K2

- **K2 Was:**
  - Knowledge of bus power supplies to the following:  
(CFR: 41.7)
- **K2 Is:**
  - Knowledge of bus or division power supplies to the following: (CFR: 41.7)
- For mechanical systems, K2 comes from the SSD, Appendix B-3, “Electrical Requirements”.

# Systems K3

- **K<sub>3</sub> Was:**
  - Knowledge of the effect that a loss or malfunction of the (system) will have on the following: (CFR: 41.7/45.6)
- **K<sub>3</sub> Is:**
  - Knowledge of the effect that a loss or malfunction of the (system) will have on the following systems or system parameters: (CFR: 41.7 / 45.6)
- K<sub>3</sub> lists the systems included in K<sub>1</sub> that will be affected by a loss of (system) .

# Systems K4

- **K4 Was:**
  - Knowledge of (system) design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
- **K4 Is:**
  - Knowledge of (system) design feature(s) and/or interlock(s) which provide for the following: (CFR: 41.7)
- For mechanical systems the SSD section 1.0, “System Functions”, and section 4.0, “System Operation and Performance”, are the source for these K/As.

# Systems K4

- For I&C systems, the list was developed by reviewing the System Functional Requirements documents and the System Functional Diagrams.
- K4 contains the Safety-Related Functions, Licensing-Related Functions, Defense-in-Depth Functions, and Non-Safety-Related Functions.

# Systems K5

- **K5 Was:**
  - Knowledge of the following operational implications as they apply to the (system): (CFR: 41.5/45.7)
- **K5 Is:**
  - Knowledge of the operational implications or cause and effect relationships of the following as they apply to the (system): (CFR: 41.7 / 45.7)

# Systems K5

- The stem for K<sub>5</sub> was revised to include cause-and-effect relationships. It was moved from the previous K<sub>1</sub>.
- For mechanical systems K<sub>5</sub> comes from section 5.0, “Equipment Requirements” of the SSD.
- Includes application of generic fundamentals.

# Systems K6

- **K6 Was:**
  - Knowledge of the effect of a loss or malfunction on the following (system) components: (CFR: 41.7/45.7)
- **K6 Is:**
  - Knowledge of the effect of a loss or malfunction of the following on (system) components: (CFR: 41.7 / 45.5 TO 45.8)

# Systems K6

- The stem for K6 was modified to address plant conditions, system malfunctions, and component malfunctions on (system).
- K6 lists the systems included in K1 that will have an effect on (system) if the listed system is not operating according to design. It also lists the components of system (system) whose failure can affect the operation of the (system).
- For mechanical systems, the relevant events and malfunctions listed in Section 4.0, “System Operation and Performance,” and components from Section 5.4, “Component Requirements,” of the SSD were included in K6.

# Systems A1

- **A1 Was:**
  - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the (system) controls including: (CFR: 41.5/45.5)
- **A1 Is:**
  - Ability to predict and/or monitor changes in parameters associated with operation of the (system) including: (CFR: 41.7 / 45.5)

# Systems A1

- The stem for A1 was revised by removing reference to exceeding design limits, and now includes any departure beyond normal operating characteristics.
- A1 includes parameters associated with operation of the (system) .

# Systems A2

- **A2 Was:**

- Ability to (a) predict the impacts of the following malfunction or operations on the (system) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5/43.5/45.3/45.13)

- **A2 Is:**

- Ability to (a) predict the impacts of the following malfunctions or operations on the (system) and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: (CFR: 41.5 / 43.5 / 45.3 / 45.5 / 45.13 / 45.13)

# Systems A2

- The stem for A2 was not revised.
- A2 is the ability to mitigate the consequences of selected items from K6.

# Systems A3

- **A3 Was:**
  - Ability to monitor automatic operation of the (system) , including: (CFR: 41.7/45.13)
- **A3 Is:**
  - Ability to monitor automatic operation of the (system) , including: (CFR: 41.7 / 45.5 / 45.13)

# Systems A3

- The stem for A3 was not revised.
- A3 includes the automatic features of the (system) identified in K4.
- A3 also includes related functions listed in LCO 3.3.1, “Reactor Trip Instrumentation,” and 3.3.2, “ESAS Instrumentation.”

# Systems A4

- **A4 Was:**
  - Ability to manually operate and/or monitor in the control room: (CFR: 41.7/45.5 to 45.8)
- **A4Is:**
  - Ability to manually operate and monitor in the control room: (CFR: 41.7 / 45.5 TO 45.8)

# Systems A4

- The A4 stem was revised to read “and” instead of “and/or.”
- A4 includes those systems having manual control functions.
- A4 for the Fuel Handling System (FHS) includes manual operation of refueling equipment from the equipment location.

# Procedures K1

- **K2 Was:**
  - Knowledge of the interrelations between the (event) and the following: (CFR 41.7 / 45.7)
- **K1 Is:**
  - Knowledge of the relationship between the (event) and the following systems or components: (CFR: 41.8 / 41.10 / 45.3)

# Procedures K1

- K1 in the AP1000™ catalog is the equivalent of K2 in the legacy catalogs.
- K1 was revised to identify relationships between events and systems or components.
- K1 includes systems and equipment that are important to successful procedural implementation

# Procedures K2

- **K1 Was:**
  - Knowledge of the operational implications of the following concepts as they apply to the (event): (CFR 41.8 / 41.10 / 45.3)
- **K2 Is:**
  - Knowledge of the operational implications or cause and effect relationships of the following as they apply the (event): (CFR: 41.5 / 41.7 / 45.7 / 45.8)

# Procedures K2

- K2 in the AP1000 catalog is the equivalent of K1 in the legacy catalogs.
- K2 was revised to identify knowledge of operational implications or cause and effect relationships between procedures and systems/components.
- K2 includes concepts important to successful procedural implementation

# Procedures K3

- **K<sub>3</sub> Was:**
  - Knowledge of the reasons for the following as they apply to the (event): (CFR 41.5 / 41.10 / 45.6 / 45.13)
- **K<sub>3</sub> Is:**
  - Knowledge of the reasons for the following actions as they apply to the (event): (CFR: 41.5 / 41.10 / 45.6 / 45.13)
- K<sub>3</sub> was clarified to reflect the basis for operator responses to events.
- K<sub>3</sub> includes the rationale for monitoring and operating specific plant components.

# Procedures A1

- **A1 Was:**
  - Ability to operate and monitor the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)
- **A1 Is:**
  - Ability to operate and monitor the following as they apply to a Reactor Trip or Safeguards Actuation: (CFR: 41.5 / 41.7 / 45.5 to 45.8)
- A1 was not modified.
- A1 includes application of system and component interrelationships identified in K1.

# Procedures A2

- **A2 Was:**
  - Ability to determine or interpret the following as they apply to a reactor trip: (CFR 41.7 / 45.5 / 45.6)
- **A2 Is:**
  - Ability to evaluate the following parameters and/or conditions as they apply to a Reactor Trip or Safeguards Actuation: (CFR: 41.7 / 43.5 / 45.6)
- The A2 stem was revised.
- A2 describes parameters and conditions that determine the effectiveness of procedure actions with respect to plant response.

# Changes to the AP1000 Knowledge's and Ability Catalog

- Section 4 – Abnormal and Emergency Procedures
- Revised EK1, EK2 and EA2 stem statements
  - EA2 change – ‘operate and/or monitor’ to ‘operate and monitor’ – from the control room
- Sections 5 and 6 were not reviewed for changes



Questions?