

AP1000 KA Catalog Development

Charles Sawyer
Duke Energy

Project Manager for APOG KA Catalog Project



History of the AP1000 KA Catalog Development

- 2007 - Started discussions with NRC on the need for new or modified KA catalogs
- December 2008 - Issued Knowledge's and Ability Catalog Revision Plan – NEI initiative
- January 2009 - First meeting to work on KA catalog
- February 2009 - Westinghouse developed proposal
- March 2009 - APOG executives approved proposal, KA team had the first meeting with Westinghouse and developed milestones



History Continued

- September 2009 - Changed the process – describe later
- November 18, 2010 – Draft of new KA catalog complete!
- January 6, 2011 - Delivered the draft KA catalog to the NRC



Future Activities

- 2011 Respond to NRC and public comments
- Mid to late 2011 published as a draft for use in developing NRC exams
- Future of the catalog – resurvey at a later time – possibly remove all items less than 2.5



Process

- Used Chemical Volume and Control System as the pilot
- Based on the pilot we had a rule of thumb established
- APOG team comprised of personnel from Southern Nuclear, Progress Energy, South Carolina Electric and Gas and Duke Energy.
- Westinghouse hired a project manager and the team utilized instructor SMEs
- NRC observed most of the meetings – key to success
- INPO also observed



Process

- Initially looked at each KA and it would be dispositioned in one of three ways 1) keep as it, 2) delete, and or 3) modify
- Added new KA's as appropriate
- March 2009 until August 2009 – process
- August 2009 – decision point
- September 2009 until August 2010 – new process
- Mid 2010 began surveying the new KA's – all surveys completed in October 2010
- Used same criteria as in current KA catalog 1-5 scale



Process

- Qualification of survey participants
 - AP1000 Training and,
 - Current or previous RO or SRO, SRO Certified or,
 - Ap1000 Subject Matter Expert, or
 - NRC
- July to November 2010
 - Reviewed survey results – team was surprised at results
 - Compared average results of RO and SRO and average of the RO and SRO surveys to the SME

Finalized the catalog



Significant Changes to AP1000 Knowledge's and Abilities Catalog

- Added a background document - explains who, how, why and when – historical narrative
- Changes stem statements where it made sense
- Removed the task list at the top of the systems
- Added OE and PRA related to applicable KA's
- Removed symbols for KA's that had questionable results
- One importance number for all sections except A2's and Fuel Handling System
- Knowledge and Ability Statements tie back to plant reference documents – background document



Changes to the AP1000 Knowledge's and Abilities Catalog

- Section 2 – added new KA's and tried to clarify items of confusion
- Draw a 'box' around KA's – example is the 1 hour technical specification – 'that require a unit shutdown'
- Utilized the SRO guidance document
- Example – 2.4.33 Knowledge of the emergency action level thresholds and classifications.
- RO the importance value is N/A
- Six RO KA's in section 2 have N/A based on the SRO guidance document



Changes to the AP1000 Knowledge's and Abilities Catalog

- Section 3 – Systems
- Changed the systems to reflect those in the AP1000
- Make stems consistent throughout the catalog
- Revised K₁, K₂, K₃, K₅, K₆, A₁ and A₄ stems
- Ensured every Knowledge and Ability statement supported the stem. Example System CRDS K_{5.39}
 - Old K₅ Stem – Knowledge of the following operational implications as they apply to the CRDS.
 - K_{5.39} – Definition and units of reactivity



Changes to AP1000 Knowledge's and Abilities Catalog

- Section 3 Systems – Changed the wording of some of the stem statements
- Example – K1 – used to have the words ‘cause and effect relationships’ – that phrase is now included in K5.
- K1 now identifies the systems that have a direct interaction with the system XXS topic.
- Either a plant protection/control logic relationship or a physical piping relationship to system XXS.



Section 3 Continued

- New KA catalog - Stem K5- Knowledge of the operational implications or cause and effect relationships of the following as they apply to the Digital Rod Control System.
- K5.05 – Control rod position and core poison redistribution effect on AFD.



Changes to the AP1000 Knowledge's and Abilities Catalog

- K1 – Knowledge of the physical or control/protection logic relationship between the (system) and the following systems:
- System Specification Document (SSD) Section 8.o, ‘Interfacing System Requirements,’ and Appendix A, ‘Interface Lists,’ – list of supporting and dependent systems
- Example – Steam Generator System has no piping connection to PMS, but it does have a plant protection/control logic relationship in that SGS instrumentation provides for a reactor trip and ESAS, so they are included in K1.



Changes to the AP1000 Knowledge's and Ability Catalog

- New KA catalog - Stem K5– Knowledge of the operational implications or cause and effect relationships of the following as they apply to the Digital Rod Control System
- K5 comes from Section 5.0 'Equipment Requirements' of the SSD and some application of generic fundamental concepts
- Example - K5.05 – Control rod position and core poison redistribution effect on AFD
- Each K and A stem has reference point to aid the exam writer – information is in the background document



Changes to the AP1000 Knowledge's and Ability Catalog

- Section 4 – Abnormal and Emergency Procedures
- Includes only AP1000 specific procedures
- New category – Shutdown 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



Summary

- Two year project – the team met monthly
- Must have a plan – but be willing to change
- The AP1000 KA catalog is a significant improvement over current PWR catalog – specific to the systems and procedures of the AP1000
- AP1000 specific documents are the basis of the catalog
- Consistent application of stems and statements
- OE and PRA items are identified (OE Related) or (PRA Related)
- NRC observation of process is key to success



Alignment with STP catalog – Stems and Section 2