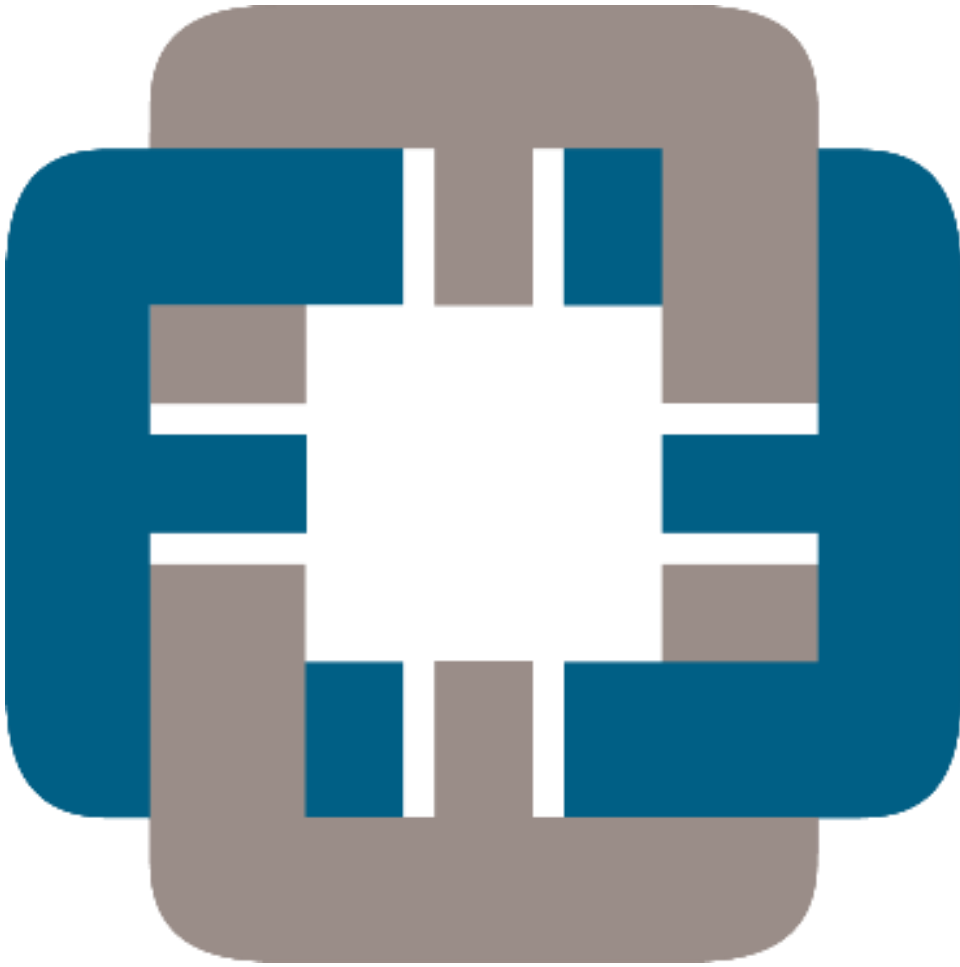




Engineering Study For PVGS RMS

By: Jason Gasque
Design I&C Manager

Topics for discussion:

- Background Information
- Existing System
- Design Inputs
- Vendor Support
- Design Options
- Margin Evaluation
- Assumptions
- Operating Experience
- Conclusions and Recommendations

Background Information

- Address Obsolescence for Palo Verde Generating Station (PVGS) Radiation Monitoring System (RMS)
- OEM Is Kaman, System is ~40 years old
- Four (4) RMS Vendors Evaluated
- Walkdown with All Vendors Performed Together
- Interviews Performed
- Team Effort With Various PVGS Groups and Vendor Support
- Provided Options/Recommendations/Strategies
- Vendors Evaluated Using a Graded Approach
- Biggest Issues:
 1. Computer board obsolescence
 2. Lack of OEM support

Existing System

- 161 Total Monitors for Three (3) Units + Auxiliary
 - Area monitors
 - Particulate/Iodine monitors
 - Skid based with different combinations of Particulate, Iodine, Gas (PIG) monitors
 - Liquid monitors
 - Portable monitors
- Spare Parts Evaluation
 - CPU boards largest failure
 - Smallest inventory
- In-house QAG (Quality Augmented) Software/Hardware In Use Currently
- In-house Q (Quality) Software/Hardware Potential Bridging Strategy

Design Inputs

- System Functions/Parameters
- Technical Specifications (TS)
- Technical Requirements Manual (TRM)
- Updated Final Safety Analysis Report (UFSAR)
- Offsite Dose Calculation (ODCM)
- Regulatory Requirements
 - Regulatory Guides (RG)/ Nuclear Regulatory Report (NUREG)
 - Code Of Federal Regulations (CFR)

Design Inputs

- Use of 10CFR50.69
 - Evaluation of Future RMS Upgrades
 - PVGS Procedure, RISC-3 Components Can Be Removed From The Scope of The Following Special Treatment Requirements:
 - Maintenance Rule (10CFR50.65; except for Paragraph [a][4])
 - Environmental Qualification (10CFR50.49)
 - Seismic Qualification (Portions of Appendix A 10CFR Part 100)
 - Applicable portions of ASME XI repair & replacements, with limitations
 - (10CFR50.55a[g])
 - Applicable Portions of IEEE standards (10CFR50.55a[h])
 - In-service Testing (10CFR50.55a[f])
 - In-service Inspection (10CFR50.55a[g])
 - Local Leak Rate Testing (10CFR50 Appendix J)
 - Quality Requirements (10CFR50 Appendix B)
 - Deficiency Reporting (10CFR Part 21)
 - Impose 10CFR50 Appendix B Requirements (10CFR50.46a[b])
 - Event Reporting (10CFR50.55[e])
 - Notification Requirements (10CFR50.72)
 - License Event Reporting (10CFR50.73)

Vendor Support Evaluated

- Detector Replacement
- Power Supply Arrangement
- Uncertainty Quality Assurance
- IEEE Std. 603-1991 and IEEE Std. 7-4.3.2-2003
- Qualifications
- Failure Modes Effects Analysis
- Equipment Lifecycle
- 10CFR50.69 Benefits
- Nuclear Plant Customer Base
- Support Locations for PVGS
- Operating Experience
- Scheduling
- Looked at Competitor Advantage Between Vendors

RMS Replacement Impacted Departments

- Systems Engineering
 - Post Modification Testing (PMT)
 - Maintenance Support
- Design Engineering
 - Development of a Procurement Requirements Specification for selected monitors
 - Engineering Change Packages
 - Civil, Mechanical, Electrical and I&C calculations
 - Revision of Setpoint Alarms for new equipment
 - Revision of output drawings
 - Approval of Vendor drawings
 - Justification of deletion of identified Iodine monitors
 - Revision of the SQ Design Basis Manual
 - Performing the 10CFR50.59 screens and/or evaluations
 - Performing 10CFR50.69 alternative treatment support and evaluations
 - UFSAR Changes
 - Determination of new PM requirements/recommendation

RMS Replacement Impacted Departments

- Cyber Security
 - Evaluation of digital assets, classifications and mitigation requirements
 - Implementation of PVGS Cyber Security program
 - Perform monitoring of CDAs.
- Operations
 - Revision of Operating procedures
 - Determinations of operability for new monitors
 - Training for new monitors
 - Setpoint changes
 - Any new functions
 - Alarms
 - Review of Human Factor Engineering analysis

RMS Replacement Impacted Departments

- Radiation Protection
 - Revision of the ODCM
 - Revision of the RP procedures for the new detectors
- Chemistry
 - Revision of Chemistry procedures for changes in detector sensitivities
- Modifications
- Planning
- Maintenance
 - Surveillance Frequencies
 - Calibration procedures
 - Performing calibration and surveillance

RMS Design Options

- Maintaining Detectors
- Replacing Detectors
- Maintaining/ Replacing Detector Cables
- Use of Ovation Screens
- Maintaining Fixed Particulate Filters
- Utilizing Existing Post Accident Monitoring Unit (PAMU) Wiring/Terminations
- Maintaining Existing DAS
- Replacing Server with Ovation
- Replacing Server with Vendor Hardware

RMS Design Options

- Xserver Replacement
- Refurbishing Steam Generator Blowdown monitor (RU-200)
- Moving RU-200 (electronics) Wiring to PAMU
- Maintenance of In-House Design and/or Use of Third Parties
- Removal of Iodine Channels

Margin Evaluation

Calculations were reviewed to ensure margins are not exceeded

- Electrical
 - Panel Margins
 - Monitor Component Margins
 - Cable Ampacity Analysis
- Mechanical
 - Heat Loads
 - Combustible Loading
- Civil
 - Monitor and Component Supports/Mounting
- I&C
 - Existing Margin in Calculations for Safety Related/1.97
 - Actuation Setpoint Calculations
 - Accuracy of New Vendor Systems
 - TS/TRM/UFSAR Monitor Setpoint Requirements

Assumptions

- Bounding Assumptions
 - It is assumed that the communication protocol used in the current RMS will or can be shared with vendors if needed to successfully integrate their system with the Kaman system communications. Vendors have communicated that this is possible, but confirmation is required via specification development.
 - Based on Electrical, Mechanical, Civil and I&C Evaluations
 - While not able to provide exact specifications of their system and equipment, the vendors have all expressed their confidence Factor of 2 for accuracy of all radiation monitors based upon Regulatory Guide 1.97 requirements.
 - All vendor equipment runs on either 120VAC power or 480VAC power like PVGS's current set up.
 - Additional information is needed from PVGS, concerning civil/structural impacts to the system since large amounts of information seemed not be available/analyzed. However, due to the large spaces and development of technology, vendor equipment is not anticipated to over boundaries of weight, vibration, etc.
 - No combustible load changes are anticipated with the new vendor equipment and heat loads are expected either to stay the same or decrease due to upgrades in new RMS technology.

Assumptions

- Unverified Assumptions
 - TS or SR monitors can only be replaced during outages unless they are necessary to be operational during outage activities, such as moving fuel. Further verification from operators and/or modifications will be necessary to finalize an installation plan for the RMS.
- Unknown Information
 - Communication output protocol from Two Vendors' equipment and servers.
 - Communication requirements between units
 - Usability of existing network infrastructure
 - Human Factors
 - It is unknown whether vendor equipment that can automate grab sample analysis and document results or not. This is something RP wished to have in the future system but information from the vendors did not indicate if this is possible.

Operating Experience

- Reviewed Industry OE Searches for Each Vendor
- Benchmarked Utilities for Vendor OE
- Looked For Positives and Negatives
- Documented Relevance Into Study

Conclusion and Recommendations

- Graded Approach Scoring System

Objective Scoring Scale	
0	Cannot meet the Objective
1	Can meet/complete the objective with maximum resources
2	Can meet/complete the objective with average resources
3	Can meet/complete the objective with minimum resources

Conclusion and Recommendations

1. Implementation Feasibility

- Constructability
- NRC Involvement
- Vendor Expertise

2. Design Complexity

- Retrofitting
- Procurement (Stage of Life of Equipment)
- Calculation Impacts

3. Future Update Support

- Lifecycle Management
- Maintainability
- Leadtime Advantage

4. Cost Management

- Project Planning
- Equipment Cost
- Training Cost

5. Site Requirements

- Vendor Availability
- Unit Communication
- Site Integration

Conclusion and Recommendations

Overall Objective Evaluation Scoring

1. Implementation Feasibility
2. Design Complexity
3. Future Update Support
4. Cost Management
5. Site Requirements

Mirion Scoring Summary

Ranked 1st or 2nd in each Critical Objective Evaluated on previous slide

Provided extensive information to prove compatibility with PVGS's RMS

Has experience working with Kaman RMS at other plants

Lowest overall cost even without considering 10CFR50.69

Can procure under 10CFR50.69 with a cost savings

Flexibility of design options and training

Large customer base in the U.S. Will allow for extensive industry OE

Based on the study and recommendations would be the vendor of choice

A background image showing a group of people in a professional setting. In the foreground, a person's hand holds a smartphone. In the middle ground, a person's hand points at a technical drawing on a table. The table is covered with various engineering documents, including a map, a technical drawing of a facility, and a book titled "GUINNELL • PIPING DESIGN AND ENGINEERING". There are also pencils, a ruler, and a rolled-up document on the table. The overall atmosphere is one of collaborative work and problem-solving.

Questions?



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