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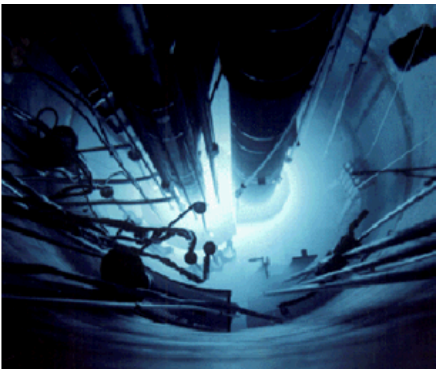

TA-V Nuclear Facility SCAMPI^{SM} B

Final Briefing Presentation

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Software Engineering Institute | Carnegie Mellon

U.S. DEPARTMENT OF ENERGY | NNSA

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Final Briefing Presentation

- Objectives of Appraisal
- Scope of the Appraisal
- Appraisal Activities
- Findings
- Practice Characterizations
- Next Steps

Business Objectives

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- Improve understanding of configuration management of all safety software items including hardware, data, software, and work products.
- Increase verification and validation consistencies across different groups of analysis and design software (i.e. between safety and engineering analyses).
- Have the organization value the results of a SCAMPI appraisal and use it as a tool to drive improvement in other program areas of TA-V.

Appraisal Objectives

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- Demonstrate that we have a competent understanding of software practices spread across analyses and system software.
- Identify a path towards continuous improvement of software practices.
- Utilize a third-party appraiser in order to objectively identify gaps.
- Identify best practices and opportunities for improvement that could impact the rest of the TA-V enterprise.

Organizational Scope of the Appraisal

- Organization undergoing appraisal:
  - Organization 1380, Nuclear Facilities and Applied Technologies
    - ACRR/PMAC LabVIEW
    - Safety Software SolidWorks for Engineering Design
    - MELCOR Accident Consequence Code System (WinMACCS/MACCS2)
- Appraisal Sponsor:
  - Dave Wheeler, Nuclear Quality and Requirements

Appraisal Team & Project Team Participants

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Appraisal Team

- *Robert Butler, Team Lead, 6923*
- *Ann Hodges, Team Member, 5212*
- *Jeni Turgeon, Observer, 6923*

Project Participants

- *Michael Black, SolidWorks, 1385*
- *Jim Dahl, MACCS2,1383*
- *Paul Helmick, ACRR PMAC/LabVIEW, 1385*
- *Ken Mulder, ACRR PMAC/LabVIEW, 1385*
- *Anthony Matta, Software Quality, 1382*

High Level Appraisal Activities

- Appraisal Planning
- Appraisal and Project Team Training
- Readiness Review
- Appraisal Team and Project Team review of the artifacts presented in the Practice Implementation Indicator Descriptions (PIIDs)
- Independent review of the PIIDs by the Appraisal Team
- Appraisal Out-brief

What is CMMI?

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- Capability Maturity Model Integration (CMMI) models are collections of best practices that help organizations to improve their processes.
- These models are developed by product teams with members from industry, government, and the Software Engineering Institute.
- CMMI contains 22 process areas that can be addressed all at once or at the individual process area level.

Source: CMMI for Development, Third Edition

What is SCAMPI?

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- The Standard CMMI Appraisal Method for Process Improvement (SCAMPI) is designed to provide benchmark-quality ratings relative to Capability Maturity Model Integration (CMMI) models.
- A SCAMPI B appraisal enables a sponsor to
  - gain insight into an organization's capability by identifying the strengths and weaknesses of its current processes relative to appraisal reference model(s)
  - prioritize improvement plans
  - focus on improvements (correct weaknesses that generate risks) that are most beneficial to the organization given its current level of organizational maturity or process capabilities

Source: *Standard CMMI® Appraisal Method for Process Improvement (SCAMPI^{SM}) A, Version 1.3: Method Definition Document*

Model Scope: Continuous Representation

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Category	Process Areas
Process Management	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Performance Management
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management Risk Management Quantitative Project Management Requirements Management
Engineering	Requirements Development Technical Solution Product Integration Verification Validation
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Causal Analysis and Resolution Decision Analysis and Resolution

Red-colored process areas were reviewed during the appraisal

Model Scope: Staged Representation

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Level	Focus	Process Areas
5	*Continuous Process Improvement*	Organizational Performance Management Causal Analysis and Resolution
4	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution
2	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1		

Red-colored process areas were reviewed during the appraisal

Continuous Representation: Generic Goals

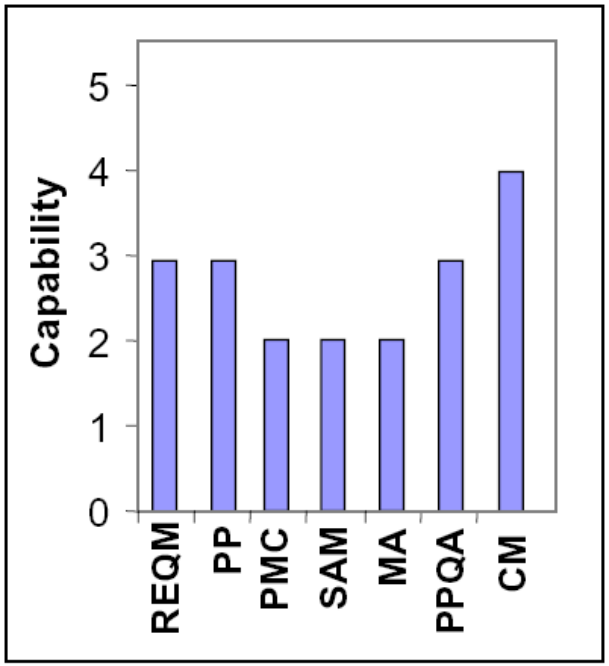
Generic Goals	Generic Practices
GG1: Achieve Specific Goals	GP 1.1: Perform Base Practices
GG2: Institutionalize a Managed Process	GP 2.1: Establish an Organizational Policy GP 2.2: Plan the Process GP 2.3: Provide Resources GP 2.4: Assign Responsibility GP 2.5: Train People GP 2.6: Manage Configurations GP 2.7: Identify and Involve Relevant Stakeholders GP 2.8: Monitor and Control the Process GP 2.9: Objectively Evaluate Adherence GP 2.10: Review Status with Higher Level Management
GG3: Institutionalize a Defined Process	GP 3.1: Establish a Defined Process GP 3.2: Collect Improvement Information
GG4: Institutionalize a Quantitatively Managed Process	GP 4.1: Establish Quantitative Objectives for the Process GP 4.2: Stabilize Subprocess Performance
GG5: Institutionalize an Optimizing Process	GP 5.1: Ensure Continuous Process Improvement GP 5.2: Correct Root Causes of Problems

All process areas were reviewed through a Capability Level 1

The Difference in Formal Appraisal Results

Staged Representation

Continuous Representation



Final Results Summary

- Global Strengths and Weaknesses
- Engineering Process Areas
- Support Process Areas
- Project-Specific Results
- Practice Characterizations
- Improvement Suggestions

Final Results Summary

Global Strengths and Weaknesses

Global Strength

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Strength

- *Management support of process implementation and process improvement is clearly evident.*

Final Results Summary

Support Process Areas

Configuration Management

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Description

- The purpose of Configuration Management is to establish and maintain the integrity of work products using configuration identification, configuration control, configuration status accounting, and configuration audits.

Strengths

- *Available CM tool (eB) supports the industry standard CMII approach.*
- *The Engineering Changes process is strong, and included impact analysis is valuable.*
- *The CM tool (eB) reflects the TA-V Management System hierarchy.*

Weaknesses

- *Configuration audits are not conducted.*
- *Baselines are not utilized for the analysis process.*
- *With some projects, the configuration management process is ad hoc until items reach the Document Safety Analysis (DSA).*
- *Configuration Management needs exceed current available resources dedicated to the support area.*

Final Results Summary

Engineering Process Areas

Verification

Description

- The purpose of Verification is to ensure that selected work products meet their specified requirements.

Strengths

- *The Engineering Changes process clearly defines verification procedures needed for a change.*

Weaknesses

- *The verification process relies upon the expert's knowledge of current implementation and the associated changes.*
- *Verification entry and exit criteria are not always clearly defined.*

Validation

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Description

- The purpose of Validation is to demonstrate that a product or product component fulfills its intended use when placed in its intended environment.

Weaknesses

- *The validation process relies upon the expert's knowledge of current implementation and the associated changes.*
- *Organizational validation procedures are not clearly defined.*

Suggestions

- Use the verification processes in the Engineering Changes section as an example for improvements for Validation.

Final Results Summary

Project Specific Results

MACCS Summary

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Weaknesses

- *(VAL) Evidence of validation activities is not strong but may not be as formal for COTS modeling tool.*
- *(CM) Location of artifacts in legacy Configuration Management tool.*

Suggestions

- *(CM) Improve Configuration Management practices during the analysis phase.*
- *(CM) Consider the use of a central registry/repository to ensure change control on inputs to analysis.*
- *(CM) Develop a strategy for maintaining intermediate results of analyses that may or may not become part of Safety Bases.*
- *(CM) Consider the use of eB to track comments that are normally kept on comment sheets to improve change control and traces to changes.*
- *(VAL) The validation procedures for COTS modeling tools and their analysis should be explicitly defined.*

SolidWorks Summary

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Strengths

- *(VER) Verification processes associated with the SolidWorks software are thorough and well defined.*

Weaknesses

- *(CM) Evidence for control of changes is not strong but may not be applicable for COTS modeling tool.*
- *(VAL) Evidence of validation activities is not strong but may not be as formal for COTS modeling tool.*

Suggestions

- *(CM) Improve how baselines are used during analysis. Consider a method to manage revisions and deliverables SolidWorks analyses.*
- *(CM) Consider the use of a central registry/repository to ensure change control on inputs to analysis.*

ACRR Summary

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Strengths

- *(CM/VER/VAL) The Engineering Changes process and associated processes are clearly defined and understood by members of the organization.*
- *(VER/VAL) The Acceptance Test Plan is a robust tool well utilized by the organization.*

Weaknesses

- *(VER/VAL) Heavy reliance upon expert knowledge to review and determine adequate for needs.*

Suggestions

- (VER/VAL) Cross training to ensure there are always at least 2 experts in the org.
- (VER/VAL) Add detail to existing checklists to walk individuals through what the "expert" does as they review and determine adequate needs. For example, each checklist item could have "issues to consider" with respect to past experience with a particular issue.

Final Results Summary

Practice Characterizations

SCAMPI^{SM} B: Practice Characterization

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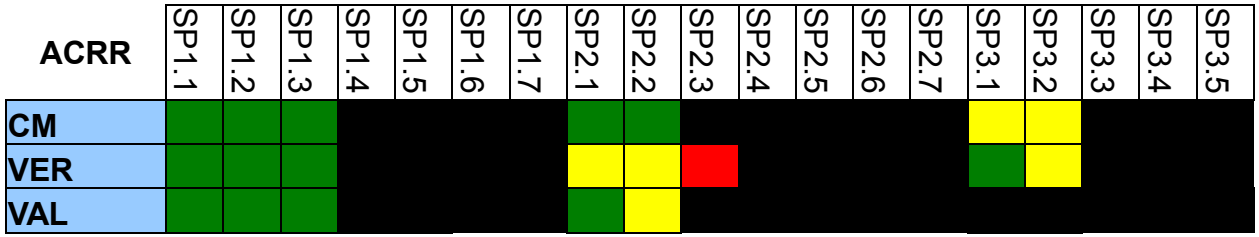
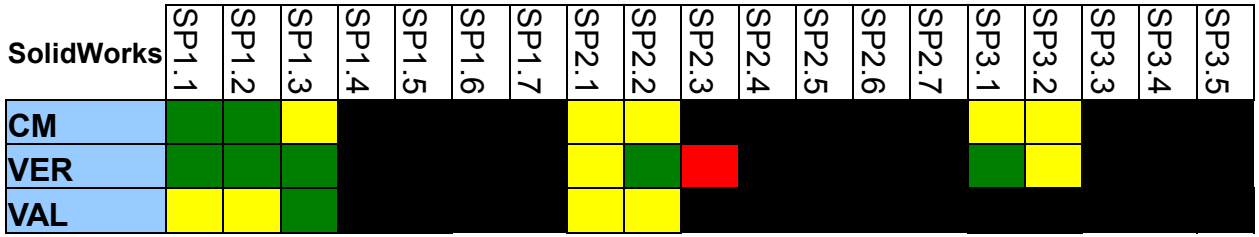
Label	Meaning (for project's intended practice implementation approach)
Red	The intent of the model practice is judged absent or inadequately addressed in the approach; goal achievement is judged unlikely because of this absence or inadequacy.
Yellow	The intent of the model practice is judged to be partially addressed in the approach, and only limited support for goal achievement is evident.
Green	The intent of the model practice is judged to be adequately addressed in the set of practices (planned or deployed) in a manner that supports achievement of the goal in the given process context.

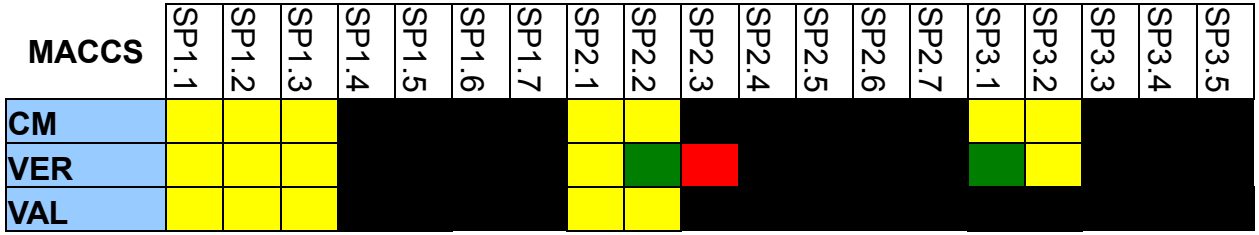
Practice Characterization



Total Areas	20
Green	13
Yellow	6
Red	1



Total Areas	20
Green	8
Yellow	11
Red	1



Total Areas	20
Green	2
Yellow	17
Red	1

Note: The black squares note a Specific Practice (SP) number that does not apply to the given process area.

Final Results Summary

Improvement Suggestions

Overall Improvement Recommendations

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Implementation

- Ensure staff has a common understanding of how all the processes and procedures fit together and which repositories are applicable throughout the lifecycle.
- Use PIIDs as a tool for organizing “project” objective evidence to track project level improvements and to be prepared for future SCAMPIs, SAI assessments, and external audits.

Overall Improvement Recommendations

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Process Improvement Management

- Establish an engineering process group (EPG) within the quality group
  - Overall purpose is to ensure that processes integrate well and are appropriate for different types of projects
    - Utilize Process Engineers
  - Facilitates and manages process improvements
  - Individuals have dedicated time to focus on process improvements for projects in the organization
  - Provides guidance on the selection of appropriate CMMI process areas relevant to the nature of the organization's work
- Conduct annual appraisals
  - Measure improvements on process areas implemented
  - Compare current results from this SCAMPI B to future appraisals

Next Steps - Infrastructure

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Task	Responsibility	Priority
Identify sponsorship • Willingness to drive improvements to completion, fund, and incentivize • Typically at level 2 management or above	Sponsor	1
Establish a steering committee (oversight) • Include line management • Establish accountability	Sponsor	2
Establish Engineering Process Group (EPG) • Ensure collaboration with other staff members	Sponsor / Steering Committee	2
Determine the tools to implement processes	Steering Committee / EPG	2
Identify Process Area champions	Steering Committee / EPG	2

Next Steps – Education

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Task	Responsibility	Priority
Develop an education plan • Schedule, content, budget	Sponsor / EPG	2
Prioritize CMMI Process Areas • Choose which process areas will benefit 1380 the most	Sponsor / Steering Committee	2
Educate the EPG • CMMI, engineering best practices	Sponsor / Steering Committee	2
Educate management • CMMI, process improvement, project management, organizational process improvement goals	Sponsor / Steering Committee	2
Educate staff • CMMI, organizational process improvement goals, engineering best practices	Sponsor / Steering Committee	2

Next Steps - Tracking & Oversight

Task	Responsibility	Priority
Ensure there is a frequent progress reporting mechanism to the sponsor and the steering committee	Sponsor / Steering Committee	3
Communicate progress with staff	Sponsor / Steering Committee	3
Monitor the multi-year plan and update to reflect progress and lessons learned	Steering Committee / EPG	3
Conduct annual appraisals to measure improvements on process areas that have been implemented	Steering Committee / EPG	3

Questions?