



GUIDANCE FOR VERIFICATION AND VALIDATION (V&V) OF REMEDIAL COST ENGINEERING AND REQUIREMENTS SOFTWARE

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1. PURPOSE

The Air Force uses parametric models to estimate future costs used as the basis for reporting environmental liabilities, program estimates and budget estimates. Reference Defense Environmental Restoration Program (DERP) Management Guidance (September 2001), requires that computer models used for estimating costs for environmental liabilities are verified, validated, and accredited in accordance with the requirements specified in Department of Defense Instruction (DoDI) 5000.61, "DoD Modeling and Simulation (M&S) Verification, Validation and Accreditation" (29 April 1996). The purpose of this guidance is to ensure that parametric cost estimating systems are verified, validated and accredited in accordance with the above references, where applicable, and specific requirements described herein.

2. REFERENCES

- a. Defense Environmental Restoration Program (DERP) Management Guidance (September 2001).
- b. Department of Defense Instruction (DoDI) 5000.61, "DoD Modeling and Simulation (M&S) Verification, Validation and Accreditation" (29 April 1996).
- c. Air Force Instruction (AFI) 16-1001, "Verification, Validation and Accreditation" (1 June 1996).

3. APPLICABILITY

Verification, Validation, and Accreditation (VV&A) activities will be applicable to all parametric cost estimating systems used in estimating environmental liabilities, program costs and budgets for the Air Force.

4. RESPONSIBILITIES

A. V&V MANAGER

The Remedial Action Cost Engineering and Requirements (RACER) system program manager is assigned and will execute the duties of the V&V manager. The V&V manager may utilize contract support to fulfill the responsibilities as summarized below:

- i. Oversees all executed V&V activities supporting the model acceptance/accreditation requirements defined by the accreditation authority.

- ii. Provides expertise on current and previous V&V efforts and baseline V&V status (established for legacy models), to all HQ Air Force, MAJCOM, FOA, or any other DoD, federal component, or model's user community.
- iii. Develops a long-range plan that prioritizes V&V activities for known model deficiencies and upcoming model enhancements/upgrades.
- iv. Coordinates the V&V requirements related to proposed model maintenance, upgrade, and configuration changes.
- v. Establishes, operates, or maintains a repository of all current and historic V&V information and provides V&V status updates.
- vi. Acts as advocate for resources needed to carry out the previously described V&V management responsibilities. This could include some "cost sharing" arrangements with the model's user community.
- vii. Maintains all V&V results in a centralized location available via the M&S Resource Repository (MSRR).
- viii. Ensures the MSRR is consistent and compatible to the DoD MSRR and available to all model users. Repository operations must facilitate M&S community queries and data access to establish the current model version's baseline V&V status, model VV&A, and usage history.

B. ACCREDITATION AUTHORITY

The Environmental Program Manager, HQ USAF/ILEVR is assigned and will execute the duties of the Accreditation Authority. The Accreditation Authority may utilize contract support to fulfill the responsibilities as summarized below:

- i. Identifies pertinent parameters and constraints that impact the V&V planning and implementation process, including M&S acceptance and accreditation measures of effectiveness/measures of performance (MOEs/MOPs).
- ii. Determines the need to form a Technical Review Working Group (TRWG) for review of V&V plans and results.
- iii. Selects or approves personnel that are involved in the M&S VV&A activities; i.e., verification, validation, or accreditation Agents, optional TRWG members, other subject matter experts (SME), etc.
- iv. Approves, funds, and monitors the implementation of all V&V activities that directly support the upcoming accreditation decision.

- v. Documents M&S application accreditation decisions after review of supporting accreditation reports.
- vi. Ensures completion and dissemination of appropriate V&V or accreditation reports.
- vii. Makes and documents the model accreditation decision.

C. ACCREDITATION AGENT

The Environmental Program Manager, HQ USAF/ILEVR is assigned and will execute the duties of the Accreditation Agent. The Accreditation Agent will utilize contract support to fulfill the responsibilities as summarized below:

- i. Serves as a source of advice and expertise to the accreditation authority concerning VV&A issues.
- ii. Assists accreditation authority in the identifying M&S acceptance and accreditation MOEs/MOPs.
- iii. Performs M&S accreditation assessment and determines any deficiencies between documented M&S capabilities and accreditation requirements which require further V&V.
- iv. Assists accreditation authority in determining the need to form a TRWG and, as the accreditation authority's representative, chairs subsequent TRWG proceedings.
- v. Ensures, as the accreditation authority's representative during the V&V planning and implementation process, that the approved plan will provide sufficient V&V to support the accreditation decision while remaining within accreditation authority-established constraints.
- vi. Prepares accreditation report documentation, based on the accreditation assessment, along with any additional V&V and Independent Verification and Validation (IV&V) activities and independent endorsements from bodies with appropriate technical/domain expertise, for accreditation decision and afterwards disseminates the completed accreditation report.
- vii. Forwards a copy of the accreditation report to the appropriate M&S V&V Manager for update and archiving purposes.

D. VERIFICATION AGENT AND/OR VALIDATION AGENT

The U.S. Army RACER POC is assigned and will execute the duties of the Verification Agent and/or Validation Agent. The U.S Army RACER POC will

utilize USACE HTRW CX Omaha support to fulfill the responsibilities as summarized below:

- i. Serves as a source of advice and expertise to the accreditation authority and accreditation agent concerning V&V issues.
- ii. Develops a plan, including resource requirements, that addresses the V&V deficiencies identified by the accreditation agent while remaining within the accreditation authority-identified constraints. If this is not possible, the agent(s) will work with the accreditation agent to develop risk reduction and V&V plans that together will meet accreditation authority acceptance criteria and constraints.
- iii. Provides a suggested list of TRWG members to the accreditation authority and accreditation agent, and actively participates in any subsequent TRWG meetings.
- iv. Performs all V&V activities and prepares the final V&V report for submission to the accreditation agent and the V&V Manager.
- v. Forwards the V&V report and supporting documentation to the accreditation agent for inclusion into the accreditation report. A copy of this report and documentation is forwarded to the appropriate M&S V&V Manager for update and archiving purposes.

5. REPORTING (REFERENCE 1.C)

E. V&V REPORT

The V&V report, submitted by the verification or validation agent(s), formally documents V&V activities, their results, and recommendations for major Services M&S. This document, maintained by the V&V Manager as part of the M&S VV&A history, is used to support current and future accreditation decisions, feasibility assessments, and future enhancements using this particular M&S. The report, at a minimum, will:

- i. Specify M&S reference version number, plus all hardware and software identification or version numbers used in supplying model inputs;
- ii. Identify model input data suppliers;
- iii. Identify key V&V planning, technical review, and implementation participants or organizations, and their V&V responsibilities;
- iv. Describe V&V methodologies, implementations, and their results;

- v. Describe verification, validation, and certification (VV&C) activities performed on input data sets used in V&V activities;
- vi. Identify V&V criteria (MOEs/MOPs); and
- vii. Describe any additional model strengths, weaknesses, or limitations identified as a result of the V&V activity, with recommended remedial actions.

F. V&V PLAN

The V&V plan will be an integral part of any Air Force M&S development, enhancement, maintenance, or upgrade activity. The V&V plan will identify input data sources obtained from outside of the “team.” These data sources shall be referenced and documented prior to incorporation and used in a parametric cost estimating system. They must be verified, validated, and certified (VV&C). The plan, at a minimum, will include the following underlying data sources:

- i. Area Cost Factors (ACFs),
- ii. Escalation factors,
- iii. Per diem rates, and
- iv. Unit prices.

G. V&V TECHNICAL REVIEW WORKING GROUP (TRWG) REVIEW

The output of this working group review will be a consensus that will be adequate to support the proposed model accreditation decision, within identified constraints. This group, whose membership is tailored to the model and proposed application, is formed on an as-needed basis. Working group composition includes the following individuals:

- i. Accreditation Agent,
- ii. V&V Agent(s),
- iii. Model Manager,
- iv. V&V Manager (if different from Model Manager),
- v. Executive Agent (EA) (if V&V activities directly involve the EA's problem domain),
- vi. User's group chair (if applicable)*,

- vii. Other technical cognizance (organizational) Representatives*,
- viii. Independent Technical Review Representative*,
- ix. Data Source(s) VV&C Representative*,
- x. HQ USAF/XIWM and other Service Representatives**, and
- xi. Other OSD representatives**.

*Membership optional

**When multi-Service participation required

Upon completion of V&V activities, the committee can be reconvened to review actual versus planned V&V implementation and results. This review process, which will include risk and impact assessments, provides the V&V team the ability to furnish progressive estimates that will help manage the expectations of the software development/maintenance team, end users, and Agency Management; a written summary of their findings will be provided to the V&V Agents, along with recommendations. The V&V Agents will then prepare the V&V report that summarizes overall findings and recommendations.

6. EXCLUSIONS

- a. The following sections in DoDI 5000.61 (Department of Defense Instruction (DoDI) 5000.61, "DoD Modeling and Simulation (M&S) Verification, Validation and Accreditation" (29 April 1996)) are not applicable to VV&A of a parametric cost estimating system:
 - i. Paragraph 6.2.2 requires that Federation of Models "adhere to the principles of fair fight and address the mission objectives." This requirement does not apply to VV&A of a parametric system for estimating environmental restoration liabilities.
- b. The following sections in AFI 16-1001 (Air Force Instruction (AFI) 16-1001, "Verification, Validation and Accreditation" (1 June 1996)) are not applicable to VV&A of a parametric cost estimating system:
 - i. Paragraph 4.6 – joint distributed interactive simulation (DIS) exercises.
 - ii. Paragraph 5.6 – guidance for DIS V&V.
 - iii. Paragraph 13.3.2 – VV&C of input data sources. Section 14 – DIS V&V.
 - iv. Paragraph 15.2.4 V&V Manager for threat M&S.

- v. Paragraph 15.2.5 – DIS or Aggregate Level Simulation Protocol (ALSP)
V&V Focal Point (Manager).

APPENDIX A ACRONYM LIST

Acronym	Description
ACF	Area Cost Factors
DIS	Distributed Interactive Simulation
DoDI	Department of Defense
DoDI	Department of Defense Instruction
EA	Executive Agent
FOA	Field Operation Activity
IV&V	Independent Verification and Validation
MAJCOM	Major Command
MOE	Measures of Effectiveness
MOP	Measures of Performance
M&S	Modeling and Simulation
MSRR	M&S Resource Repository
TRWG	Technical Review Working Group
SME	Subject Matter Experts
SOP	Standard Operating Procedures
V&V	Verification and Validation
VV&C	Verification, Validation, and Certification
VV&A	Verification, Validation and Accreditation