VERA Virtual Environment for Reactor Applications

ORNL/SPR-2022/2530

VERAIn Software Requirements, Test Plan, and Test Report

July 27, 2022

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Revision Log

Revision	Date	Affected Pages	Revision Description
0	6/25/2022	All	Implements new template and editorial updates for VERA 4.3 release. This version supersedes previous document version CASL-U-2019-1891-002.

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VERAIn Software Requirements, Test Plan, and Test Report

Approvals:

Erik Walker	08/09/2022
Erik Walker, VERAIO Product Software Manager	**Date**
Aaron Graham	Aug 9, 2022
Aaron Graham, Independent Reviewer	**Date**

EXECUTIVE SUMMARY

This document describes the software test plan for VERAIn and provides appendices for the software requirements and software test report. In this document, the test platform hardware and software are described. Appendix A provides a list of the tests run and their acceptability as a test report, and Appendix B provides the list of low-level software requirements as a requirements traceability matrix.

CONTENTS

1. TESTING PROCEDURE

1.1 COMPUTER PROGRAM TESTED

1.1.1 Program: VERAIn

Built under VERA Environment with following packages and versions:

Listing 1. Software Versions Evaluated

```
*** Base Git Repo: VERA
a896f8f [Thu Jul 7 13:20:22 2022 -0400] <bairdml@ornl.gov>
Adjusting checkout and submodule command fort production pipelines
*** Git Repo: TriBITS
9d0198a [Tue Apr 6 18:41:53 2021 +0000] <collinsbs@ornl.gov>
Merge branch 'timeout_issues' into 'master'
*** Git Repo: Trilinos
3b9c7e3 [Thu Jan 30 00:18:02 2020 -0500] <collinsbs@ornl.gov>
Merge pull request #1 from bartlettroscoe/casl-phi-6249-upgrade-tribits-trilinos
*** Git Repo: TeuchosWrappersExt
781aae8 [Fri May 10 09:51:36 2019 -0600] <rabartl@sandia.gov>
Add missing std include (PHI-5294)
*** Git Repo: Futility
2c86eec [Wed Jun 15 20:55:43 2022 +0000] <salkork@ornl.gov>
Fix to the requirements generator script
*** Git Repo: MAMBA
ad795e0 [Thu Sep 16 04:00:43 2021 -0400] <collinsbs@ornl.gov>
Merge branch 'master' of code-int.ornl.gov:mamba/MAMBA
*** Git Repo: VERAIO
2ceb8d2 [Wed Jul 13 11:26:28 2022 -0400] <ew4@ornl.gov>
Add tech reviewer changes to VERAIn User's Manual
*** Git Repo: DataTransferKit
19526ab [Fri Aug 18 09:14:16 2017 -0400] <dalg24@gmail.com>
Merge pull request #297 from naughtont3/tjn-fortran-off
*** Git Repo: COBRA-TF
69e3e14 [Mon Jul 11 12:32:30 2022 +0000] <salkork@ornl.gov>
Updates to the CTF documentation for the 4.3 release
*** Git Repo: VERAData
eb21c20 [Thu Jun 3 13:29:31 2021 +0000] <grahamam@ornl.gov>
Merge branch '4251_MPACT_v5.1m0_60n19g' into 'master'
*** Git Repo: VERAData/CEData
8252504 [Wed Jul 8 20:44:25 2020 -0400] <pandyatm@ornl.gov>
Merge branch 'update-hydrogen-pole-data' into 'master'
*** Git Repo: VERAOneWay
6af5147 [Tue Sep 14 13:46:59 2021 +0000] <collinsbs@ornl.gov>
Merge branch 'bison_post_states' into 'master'
*** Git Repo: SCALE
1a8cd5c [Tue Aug 17 12:12:19 2021 +0000] <pandyatm@ornl.gov>
Merge branch 'sync-scale' into 'master'
```

```
*** Git Repo: XSTools
08adb77 [Mon May 24 20:33:17 2021 +0000] <collinsbs@ornl.gov>
Merge branch '4874_XSTools_wrong_backXS_5x' into 'master'
*** Git Repo: MPACT
ad94f0c [Thu Jul 21 10:44:35 2022 -0400] <grahamam@ornl.gov>
Fix bad rebaseline of ge14_single_ARI
*** Git Repo: VeraShift
767cddc [Fri Aug 27 10:44:46 2021 -0400] <bairdml@ornl.gov>
Updating trigger for DownStream testing.
*** Git Repo: DakotaExt
afd354f [Tue Aug 1 19:36:55 2017 -0400] <rhoope@sandia.gov>
Fix tarball installation
*** Git Repo: DakotaExt/Dakota
7415238 [Thu Jun 15 12:40:49 2017 -0400] <rhoope@sandia.gov>
Triage static builds of Dakota 6.6
*** Git Repo: VUQDemos
b2d0175 [Tue Oct 8 14:13:19 2019 -0400] <salkork@ornl.gov>
Merge branch '1-correcting-hardcoded-python-paths-in-vuq-core' into 'master'
*** Git Repo: VERAView
28e0f8a [Thu Mar 31 16:53:16 2016 -0400] <leerw@ornl.gov>
Sync from code.ornl.gov for version 1.0
```

VERAIn has no dependencies on any other code package contained within VERA.

1.1.2 System Software

These tests were performed on the Centos 7.9.2009 Linux 3.10.0-1160.66.1.el7.x86_64 operating system.

1.1.3 Test Calibration

None.

1.1.4 Computer Hardware Used for Testing

casl-vera01.ornl.gov

1.2 TEST EQUIPMENT CALIBRATION

None.

1.3 DATE OF TEST

Started: July 21, 2022 - 15:18:34 UTC
Total Test Time: 2 minutes, 30 seconds

1.4 DATA RECORDER

ctest-3.17.3 and CDash Version 2.5.0

1.5 SIMULATION MODELS USED

Because VERAIn is only an input parser, it contains no simulation models.

1.6 TEST PROBLEMS

A list of test problems and their requirements may be found in Appendix B of this document.

1.7 RESULTS AND APPLICABILITY

Results

Results are given in Appendix A.

Applicability

The test results from Appendix A satisfy the defined software requirements.

1.8 ACTION TAKEN IN CONNECTION WITH NOTED DEVIATIONS

There were no noted deviations. Therefore, no actions were taken.

1.8.1 Person Evaluating Results

Erik Walker

1.9 ACCEPTABILITY

The acceptance criterion is that all tests pass their individual criteria. As evidenced in column 4 of the table in Appendix A, all tests passed their criteria. The primary type of test performed, as shown in the VERAIn test matrix, was a regression test to compare a test output file to a version-controlled reference file deemed to be correct.

Regression test reference files are XML.gold files that have been generated and reviewed for correctness. Once the VERAIn parser is run on an input, the resulting XML file is compared to the corresponding XML.gold file using a straight diff. If the files are identical, then the test passes. If any differences exist in the files, then the test fails.

A few tests are designed to intentionally fail to capture common input mistakes and to ensure that the parser fails hard when these mistakes are encountered.

The test results were reviewed by the product support manager and the independent technical reviewer, who determined that the computer program is acceptable for integration with the VERA product suite. The test results demonstrated that the computer program(s) performed adequately and correctly. Testing covered the specified software requirements, the proper handling of abnormal conditions or events, and the interfaces with other components. Testing verified that the computer program did not introduce unintended consequences which degraded the overall software function. No discrepancies between expected and observed software functioning were identified.

2. APPLICABLE STANDARDS AND PROCEDURES

- NQA-1-2008 with NQA-1a-2009 Addenda [1]
- VERA-QA-004, VERA Software Configuration and Control
- VERA-QA-006, VERA Software Requirements, Design, and Testing

3. REQUIRED RECORDS

3.1 CDASH TEST RESULTS

See Appendix A.

3.2 REQUIREMENTS TRACEABILITY MATRIX

See Appendix B.

4. ACKNOWLEDGMENTS

This research was supported by the US Department of Energy and the Nuclear Energy Advanced Modeling and Simulation Program.

REFERENCES

[1] Quality Assurance Requirements for Nuclear Facility Applications. Standard ASME-NQA-1-2008 with NQA-1a-2009 Addenda, American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016-5990, 2009.

APPENDIX A. CDASH TEST RESULTS

APPENDIX A. CDASH TEST RESULTS

The following table was obtained from a CDash report. CDash is a web application included with CMake and CTest. CMake is the VERA build system, and CTest is a program that automatically runs the tests defined with CMake and sends results to CDash. All tests are included in the Git repositories as noted in List 1. Appendix B provides a list of the test names, along with the test input files and requirements.

Table 1. VERAIn Test Report from CDash

No.	Test Name	Details	Status
1	VERAIn_react2xml_bwr-peach-2	Completed	Passed
2	VERAIn_react2xml_bwr-peach-1	Completed	Passed
3	VERAIn_react2xml_bwr-peach-4	Completed	Passed
4	VERAIn_react2xml_bwr-ge9	Completed	Passed
5	VERAIn_react2xml_bwr-peach-5	Completed	Passed
6	VERAIn_react2xml_bwr-peach-3	Completed	Passed
7	VERAIn_react2xml_bwr-thickthincb	Completed	Passed
8	VERAIn_react2xml_bwr-peach-6	Completed	Passed
9	VERAIn_react2xml_bwr-plr	Completed	Passed
10	VERAIn_react2xml_bwr-azixs	Completed	Passed
11	VERAIn_react2xml_bwr-hetblade	Completed	Passed
12	VERAIn_react2xml_bwr-p6-test	Completed	Passed
13	VERAIn_react2xml_bwr_jagged	Completed	Passed
14	VERAIn_react2xml_bwr-axialvoid	Completed	Passed
15	VERAIn_react2xml_ex7_bwr	Completed	Passed
16	VERAIn_react2xml_apr1400-cyc1	Completed	Passed
17	VERAIn_react2xml_FAST_input_block	Completed	Passed
18	VERAIn_react2xml_chen_3x3	Completed	Passed
19	VERAIn_react2xml_cross_w_baffle	Completed	Passed
20	VERAIn_react2xml_MSED	Completed	Passed
21	VERAIn_react2xml_default_density_change	Completed	Passed
22	VERAIn_react2xml_fast_3x3rod_HFP	Completed	Passed
23	VERAIn_react2xml_p6a_sa_1300_vuq	Completed	Passed
24	VERAIn_react2xml_mspc	Completed	Passed
25	VERAIn_react2xml_fuel_options	Completed	Passed
26	VERAIn_react2xml_ctf_convergence_terms	Completed	Passed
27	VERAIn_react2xml_mox1	Completed	Passed
28	VERAIn_react2xml_mamba_mass_bal	Completed	Passed
29	VERAIn_react2xml_detector_edits	Completed	Passed
30	VERAIn_react2xml_par_cross	Completed	Passed
31	VERAIn_react2xml_misc_options	Completed	Passed
32	VERAIn_react2xml_pwr-CE-2a	Completed	Passed
33	VERAIn_react2xml_pwr_CE_single_16x16	Completed	Passed
34	VERAIn_react2xml_pwr-CE-2b	Completed	Passed
35	VERAIn_react2xml_Sample_3x3	Completed	Passed
36	VERAIn_react2xml_Sample_7x7	Completed	Passed
37	VERAIn_react2xml_Sample_3x3_multistate	Completed	Passed
38	VERAIn_react2xml_Sample_full_core_maps	Completed	Passed

No.	Test Name	Details	Status
39	VERAIn_react2xml_Sample_full_core	Completed	Passed
40	VERAIn_react2xml_Sample_full_core_matmix	Completed	Passed
41	VERAIn_react2xml_Sample_full_core_wsym_assm_even	Completed	Passed
42	VERAIn_react2xml_Sample_full_core_fuelmix	Completed	Passed
43	VERAIn_react2xml_Sample_full_core_reflector	Completed	Passed
44	VERAIn_react2xml_Sample_full_core_wsym	Completed	Passed
45	VERAIn_react2xml_Sample_full_core_wsym_even	Completed	Passed
46	VERAIn_react2xml_Sample_full_core_wsym_state_assm	Completed	Passed
47	VERAIn_react2xml_Sample_full_core_wsym_state_dsym	Completed	Passed
48	VERAIn_react2xml_Sample_full_core_wsym_state_assm_matopt	Completed	Passed
49	VERAIn_react2xml_Sample_p3	Completed	Passed
50	VERAIn_react2xml_Sample_p3_Anderson	Completed	Passed
51	VERAIn_react2xml_Sample_p3_mpact	Completed	Passed
52	VERAIn_react2xml_Sample_p3_unit_test	Completed	Passed
53	VERAIn_react2xml_Sample_p4a_unit_test	Completed	Passed
54	VERAIn_react2xml_Sample_full_core_wsym_state	Completed	Passed
55	VERAIn_react2xml_Sample_p4	Completed	Passed
56	VERAIn_react2xml_Sample_p6a	Completed	Passed
57	VERAIn_react2xml_Sample_p6a_multifuel	Completed	Passed
58	VERAIn_react2xml_Sample_p4_mpact	Completed	Passed
59	VERAIn_react2xml_Sample_p7	Completed	Passed
60	VERAIn_react2xml_Seabrook_5x5rod_HFP	Completed	Passed
61	VERAIn_react2xml_Sample_qtr_core_wsym_3x3_standalone	Completed	Passed
62	VERAIn_react2xml_Sample_p9_shuffle	Completed	Passed
63	VERAIn_react2xml_Sample_p9_restart	Completed	Passed
64	VERAIn_react2xml_Sample_p9_jumpin	Completed	Passed
65	VERAIn_react2xml_small_3x3rod_Bison	Completed	Passed
66	VERAIn_react2xml_small_3x3rod_HFP_2fuel	Completed	Passed
67	VERAIn_react2xml_small_3x3rod_Bison_standalone	Completed	Passed
68	VERAIn_react2xml_small_3x3rod_BProd	Completed	Passed
69	VERAIn_react2xml_small_3x3rod_HFP	Completed	Passed
70	VERAIn_react2xml_small_3x3rod_HFP_8g	Completed	Passed
71	VERAIn_react2xml_small_3x3rod_HZP	Completed	Passed
72	VERAIn_react2xml_small_5cross_assem_3x3rod_HFP	Completed	Passed
73	VERAIn_react2xml_small_multibundle	Completed	Passed
74	VERAIn_react2xml_small_3x3rod_IFBA	Completed	Passed
75	VERAIn_react2xml_small_qtr_core_3x3rod_HFP	Completed	Passed
76	VERAIn_react2xml_small_multibundle_par	Completed	Passed
77	VERAIn_react2xml_small_singlerod_HFP_8gb	Completed	Passed
78	VERAIn_react2xml_small_singlerod_HFP_8g	Completed	Passed
79	VERAIn_react2xml_small_singlerod_HFP	Completed	Passed
80	VERAIn_react2xml_5cross_nodal_par_qtr	Completed	Passed
81	VERAIn_react2xml_decreasing-axial	Completed	Passed
82	VERAIn_react2xml_front-dash	Completed	Passed
83	VERAIn_react2xml_disable_xml2ctf	Completed	Passed

No.	Test Name	Details	Status
84	VERAIn_veradiff_match	Completed	Passed
85	VERAIn_veradiff_fail	Completed	Passed
86	VERAIn_react2xml_test_cobra_edits	Completed	Passed
87	VERAIn_react2xml_test_cobra_edits_inimat	Completed	Passed
88	VERAIn_react2xml_test_verashift_3a	Completed	Passed
89	VERAIn_react2xml_test-short	Completed	Passed
90	VERAIn_react2xml_test_verashift_3a_forward	Completed	Passed
91	VERAIn_react2xml_smr-7x7	Completed	Passed
92	VERAIn_react2xml_test_verashift_3a_cadis	Completed	Passed
93	VERAIn_react2xml_with-dash	Completed	Passed
94	VERAIn_react2xml_test_verashift_4mini_nonunique	Completed	Passed
95	VERAIn_react2xml_2a_LS	Completed	Passed
96	VERAIn_react2xml_2a_LS_default	Completed	Passed
97	VERAIn_react2xml_5cross_multiassem	Completed	Passed
98	VERAIn_react2xml_multi_scalar_error	Completed	Passed
99	VERAIn_react2xml_test_verashift_small_core_bioshield_no_pv	Completed	Passed
100	VERAIn_react2xml_test_verashift_4mini_nonunique_bioshield	Completed	Passed
101	VERAIn_xmlthexp_Sample_p6a	Completed	Passed
102	VERAIn_react2xml_test_verashift_small_core_bioshield	Completed	Passed
103	VERAIn_testVERAInMan	Completed	Passed

APPENDIX B. REQUIREMENTS AND TEST TRACEABILITY MATRIX

APPENDIX B. REQUIREMENTS AND TEST TRACEABILITY MATRIX

For entries in the *Additional Info* field, the #NNNN is the VERA ticket number hyperlinked to the appropriate webpage.

Table 2. Requirements

Req. ID	*Requirement Description* *Test Name* *Test Input* *Additional Info*
1	The VERAIn package shall be able to parse VERA Progression Problem 2A with specified linear source options VERAIn_react2xml_2a_LS 2a_LS.inp None
2	The VERAIn package shall be able to parse VERA Progression Problem 2A with default linear source options VERAIn_react2xml_2a_LS_default 2a_LS_default.inp None
3	React2xml shall support definition of a channel-dependent form loss coefficient map for each spacer grid in the model VERAIn_react2xml_5cross_multiassem 5cross_multiassem.inp # 3547
4	React2xml shall allow spacer grid channel-dependent form loss coefficient maps to be defined using octant symmetry VERAIn_react2xml_5cross_multiassem 5cross_multiassem.inp None
5	React2xml shall allow the user to set modeling coefficients in the Yao-Hochreiter-Leech model for each spacer grid definition VERAIn_react2xml_5cross_multiassem 5cross_multiassem.inp None
6	VERAIO shall support the user inputting a domain decomposition map that can be used by CTF for decomposing the model for parallel solution VERAIn_react2xml_5cross_nodal_par_qtr 5cross_nodal_par_qtr.inp None
7	The VERAIn package shall be able to parse all FAST input options correctly FAST_input_block.inp None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
8	The VERAIn package shall be able to parse inputs in which multigrid solver options are specified
	VERAIn_react2xml_MSED
	MSED.inp
	None
9	The VERAIn package shall be able to parse a full 3D core with an even core size
	S_even.inp
	None
10	The VERAIn package shall be able to parse 9 3D 17x17 assemblies with feedback enabled in full symmetry
	VERAIn_react2xml_Sample_3x3
	Sample_3x3.inp
	None
11	The VERAIn package shall be able to parse multiple state blocks containing differing options selected for the tinlet card and table input for inlet temperature as a function of power
	VERAIn_react2xml_Sample_3x3_multistate
	Sample_3x3_multistate.inp
	None
12	The VERAIn package shall be able to parse 49 3D 17x17 assemblies with feedback enabled in full symmetry
	VERAIn_react2xml_Sample_7x7
	Sample_7x7.inp
	None
13	The VERAIn package shall be able to parse a full 3D core
	VERAIn_react2xml_Sample_full_core
	Sample_full_core.inp
	None
14	The VERAIn package shall be able to parse a full 3D core with fuel mixing
	VERAIn_react2xml_Sample_full_core_fuelmix
	Sample_full_core_fuelmix.inp
	None
15	The VERAIn package shall be able to parse a full 3D core with a combination of full, quarter, and octant symmetric maps
	VERAIn_react2xml_Sample_full_core_maps
	Sample_full_core_maps.inp
	None
16	The VERAIn package shall be able to parse a full 3D core with material mixing
	VERAIn_react2xml_Sample_full_core_matmix
	Sample_full_core_matmix.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
17	The VERAIn package shall be able to parse a full 3D core with upper and lower reflector regions
	VERAIn_react2xml_Sample_full_core_reflector
	Sample_full_core_reflector.inp
	None
18	The VERAIn package shall be able to parse a full 3D core with numerous BISON parameters enabled
	VERAIn_react2xml_Sample_full_core_wsym
	Sample_full_core_wsym.inp
	None
19	The VERAIn package shall be able to parse a full 3D core with 18x18 assemblies
	VERAIn_react2xml_Sample_full_core_wsym_assm_even
	Sample_full_core_wsym_assm_even.inp
	None
20	The VERAIn package shall be able to parse a full 3D core of size 16 with numerous BISON parameters enabled
	VERAIn_react2xml_Sample_full_core_wsym_even
	Sample_full_core_wsym_even.inp
	None
21	The VERAIn package shall be able to parse a full 3D core with numerous BISON parameters enabled with multiple states
	VERAIn_react2xml_Sample_full_core_wsym_state
	Sample_full_core_wsym_state.inp
	None
22	The VERAIn package shall be able to parse a full 3D core with numerous BISON parameters enabled with multiple states where the assemblies are defined over multiple ASSEMBLY blocks rather than all being defined in the same ASSEMBLY block
	VERAIn_react2xml_Sample_full_core_wsym_state_assm
	Sample_full_core_wsym_state_assm.inp
	None
23	The VERAIn package shall be able to parse a full 3D core with numerous BISON parameters, including material thermal expansion options
	VERAIn_react2xml_Sample_full_core_wsym_state_assm_matopt
	Sample_full_core_wsym_state_assm_matopt.inp
	None
24	The VERAIn package shall be able to parse a full 3D core with numerous BISON parameters enabled with multiple states in which one of the lattice definitions is twice as large as the others
	VERAIn_react2xml_Sample_full_core_wsym_state_dsym
	Sample_full_core_wsym_state_dsym.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
25	The VERAIn package shall be able to parse Problem 3, which is a single 3D 17x17 assembly at BOL without feedback
	VERAIn_react2xml_Sample_p3
	Sample_p3.inp
	None
26	The VERAIn package shall be able to parse nonlinear Anderson Acceleration input options
	VERAIn_react2xml_Sample_p3_Anderson
	Sample_p3_Anderson.inp
	None
27	The VERAIn package shall be able to parse Problem 3, which is a single 3D 17x17 assembly at BOL without feedback with numerous MPACT options
	VERAIn_react2xml_Sample_p3_mpact
	Sample_p3_mpact.inp
	None
28	The VERAIn package shall be able to parse Problem 3, which is a single 3D 17x17 assembly at BOL without feedback, where the materials are defined using an include statement
	VERAIn_react2xml_Sample_p3_unit_test
	Sample_p3_unit_test.inp
	None
29	The VERAIn package shall be able to parse Problem 4, which comprises 9 3D 17x17 assemblies at BOL without feedback
	VERAIn_react2xml_Sample_p4
	Sample_p4.inp
	None
30	The VERAIn package shall be able to parse Problem 4, which comprises 9 3D 17x17 assemblies at BOL without feedback with numerous MPACT options
	VERAIn_react2xml_Sample_p4_mpact
	Sample_p4_mpact.inp
	None
31	The VERAIn package shall be able to parse Problem 4a, which is a single 3D 17x17 assembly with a control rod at BOL without feedback
	VERAIn_react2xml_Sample_p4a_unit_test
	Sample_p4a_unit_test.inp
	None
32	The VERAIn package shall be able to parse Problem 6a, which is a single 3D 17x17 assembly at BOL with feedback
	VERAIn_react2xml_Sample_p6a
	Sample_p6a.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
33	The VERAIn package shall be able to parse a modified Problem 6a, which is a single 3D 17x17 assembly at BOL with feedback with more complicated fuel types
	VERAIn_react2xml_Sample_p6a_multifuel
	Sample_p6a_multifuel.inp
	# 757
34	The VERAIn package shall be able to parse Problem 7, which is a full core 3D problem with feedback
	VERAIn_react2xml_Sample_p7
	Sample_p7.inp
	None
35	The VERAIn package shall be able to parse Problem 9, which is a full core 3D problem with feedback and depletion, using the jumpin capability
	VERAIn_react2xml_Sample_p9_jumpin
	Sample_p9_jumpin.inp
	None
36	The VERAIn package shall be able to parse Problem 9, which is a full core 3D problem with feedback and depletion, using the restart capability
	VERAIn_react2xml_Sample_p9_restart
	Sample_p9_restart.inp
	None
37	The VERAIn package shall be able to parse Problem 9, which is a full core 3D problem with feedback and depletion, using the fuel shuffle capability
	VERAIn_react2xml_Sample_p9_shuffle
	Sample_p9_shuffle.inp
	None
38	The VERAIn package shall be able to parse a 3D core of 3x3 assemblies
	VERAIn_react2xml_Sample_qtr_core_wsym_3x3_standalone
	Sample_qtr_core_wsym_3x3_standalone.inp
	None
39	The VERAIn package shall be able to parse a 3D Seabrook 5x5 assembly to test DNB runs
	VERAIn_react2xml_Seabrook_5x5rod_HFP
	Seabrook_5x5rod_HFP.inp
	None
40	The VERAIn package shall be able to parse a 2D APR1000 Initial core in quarter symmetry
	VERAIn_react2xml_apr1400-cyc1
	apr1400-cyc1.inp
	None
41	The VERAIn package shall be able to parse inputs in which a BWR axial_void distribution is specified
	VERAIn_react2xml_bwr-axialvoid
	bwr-axialvoid.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
42	The VERAIn package shall be able to process the azimuthal XS option
	VERAIn_react2xml_bwr-azixs
	bwr-azixs.inp
	# 3806
43	The VERAIn package shall be able to parse a 2D GE9 BWR lattice
	VERAIn_react2xml_bwr-ge9
	bwr-ge9.inp
	None
44	VERAIn shall accept specification of the two-phase friction model which CTF shall use
	VERAIn_react2xml_bwr-p6-test
	bwr-p6-test.inp
	None
45	VERAIn shall accept specification of the flow regime map to use in CTF
	VERAIn_react2xml_bwr-p6-test
	bwr-p6-test.inp
	None
46	VERAIn shall accept specification of the interfacial drag model to use in CTF
	VERAIn_react2xml_bwr-p6-test
	bwr-p6-test.inp
	None
47	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 7x7 assembly with an 80 mil channel in full symmetry with no gad and no water rods
	VERAIn_react2xml_bwr-peach-1
	bwr-peach-1.inp
	None
48	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 7x7 assembly with an 80 mil channel in full symmetry with 3% gad pins and no water rods
	VERAIn_react2xml_bwr-peach-2
	bwr-peach-2.inp
	None
49	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 7x7 assembly with an 80 mil channel in full symmetry with 3 and 4% gad pins and no water rods
	VERAIn_react2xml_bwr-peach-3
	bwr-peach-3.inp
	None
50	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 8x8 assembly with a 100 mil channel in full symmetry with 3% gad pins and large water rods
	VERAIn_react2xml_bwr-peach-4
	bwr-peach-4.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
51	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 8x8 assembly with a 100 mil channel in full symmetry with 2% gad pins and large water rods
	VERAIn_react2xml_bwr-peach-5
	bwr-peach-5.inp
	None
52	VERAIO shall support setting the tolerance for the BWR pressure balance iteration loop that is performed by CTF
	VERAIn_react2xml_bwr-peach-6
	bwr-peach-6.inp
	None
53	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 8x8 assembly with a 100 mil channel in full symmetry with 2% gad pins and two large water rods
	VERAIn_react2xml_bwr-peach-6
	bwr-peach-6.inp
	None
54	The VERAIn package shall be able to parse the default material name 'cool'
	VERAIn_react2xml_bwr-plr
	bwr-plr.inp
	# 4306
55	The VERAIn package shall be able to parse a 2D BWR Peach Bottom 2 8x8 assembly with 100 mil corners and 80 mil channels in full symmetry with 2% gad pins and large water rods
	VERAIn_react2xml_bwr-thickthincb
	bwr-thickthincb.inp
	None
56	VERAIn shall allow the user to specify an orifice map for BWR models which allows for the definition of inlet form losses and flow areas
	VERAIn_react2xml_bwr_jagged
	bwr_jagged.inp
	None
57	The VERAIn package shall be able to parse a single 3D 3x3 assembly with TH feedback enabled
	VERAIn_react2xml_chen_3x3
	chen_3x3.inp
	None
58	The VERAIn package shall be able to parse five 3D 3x3 assemblies with TH feedback enabled arranged in a cross with a baffle
	VERAIn_react2xml_cross_w_baffle
	cross_w_baffle.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
59	The VERAIn package shall be able to parse a single 3D 17x17 assembly with TH feedback enabled and CTF convergence criteria specified
	VERAIn_react2xml_ctf_convergence_terms
	ctf_convergence_terms.inp
	None
60	The VERAIn package shall throw an error for an input in which the axial heights are listed in descending order; the parser shall appropriately fail and describe input error
	VERAIn_react2xml_decreasing-axial
	decreasing-axial.inp
	None
61	The VERAIn package shall be able to parse inputs in which the default density has been changed
	VERAIn_react2xml_default_density_change
	default_density_change.inp
	None
62	VERAIn shall properly parse input cards for a user-specified detector edits mesh
	VERAIn_react2xml_detector_edits
	detector_edits.inp
	# 3620
63	The VERAIn package shall be able to parse inputs in which xml2ctf is disabled during VERA init
	VERAIn_react2xml_disable_xml2ctf
	disable_xml2ctf.inp
	None
64	VERAIn shall process BWR blade and detector maps
	VERAIn_react2xml_ex7_bwr
	ex7_bwr.inp
	None
65	The VERAIn package shall be able to parse a single 3D 3x3 assembly at hot full power
	VERAIn_react2xml_fast_3x3rod_HFP
	fast_3x3rod_HFP.inp
	None
66	The VERAIn package shall throw an error for an input in which a hyphen is given before the assembly name in the assembly map. The parser shall appropriately fail and describe the input error
	VERAIn_react2xml_front-dash
	front-dash.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
67	The VERAIn package shall be able to parse inputs with complex fuel and material specifications
	VERAIn_react2xml_fuel_options
	fuel_options.inp
	None
68	The VERAIn package shall be able to parse inputs in which the COBRATF/crud and mass balance/steam generator cards are specified
	VERAIn_react2xml_mamba_mass_bal
	mamba_mass_bal.inp
	None
69	The VERAIn package shall be able to parse inputs in which numerous miscellaneous options are enabled simultaneously
	VERAIn_react2xml_misc_options
	misc_options.inp
	None
70	The VERAIn package shall be able to parse a single MOX PWR assembly with three different plutonium enrichment zones
	VERAIn_react2xml_mox1
	mox1.inp
	# 2226
71	The VERAIn package shall be able to parse inputs in which multigrid solver options are specified
	VERAIn_react2xml_mspc
	mspc.inp
	None
72	The VERAIn package shall not be able to parse an input in which multiple scalar parameters are specified on the same line. The parser shall appropriately fail and describe the input error
	VERAIn_react2xml_multi_scalar_error
	multi_scalar_error.inp
	None
73	The VERAIn package shall be able to parse a single 3D 17x17 assembly with feedback enabled with 1,300 ppm boron
	VERAIn_react2xml_p6a_sa_1300_vuq
	p6a_sa_1300_vuq.inp
	None
74	The VERAIn package shall be able to parse 5 3D 17x17 assemblies with feedback enabled arranged in a cross with parallel 1 set in the COBRATF block.
	VERAIn_react2xml_par_cross
	par_cross.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
75	The VERAIn package shall be able to parse a single 16x16 CE design PWR assembly with Erbia and two enrichments
	VERAIn_react2xml_pwr-CE-2a
	pwr-CE-2a.inp
	None
76	The VERAIn package shall be able to parse a single 16x16 CE design PWR assembly with Erbia and three enrichments
	VERAIn_react2xml_pwr-CE-2b
	pwr-CE-2b.inp
	None
77	The VERAIn package shall be able to parse a single 16x16 CE design PWR assembly
	VERAIn_react2xml_pwr_CE_single_16x16
	pwr_CE_single_16x16.inp
	None
78	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP with a natural blanket
	VERAIn_react2xml_small_3x3rod_BProd
	small_3x3rod_BProd.inp
	None
79	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP with numerous BISON options enabled.
	VERAIn_react2xml_small_3x3rod_Bison
	small_3x3rod_Bison.inp
	None
80	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP with numerous BISON options enabled with solve_type=standalone
	VERAIn_react2xml_small_3x3rod_Bison_standalone
	small_3x3rod_Bison_standalone.inp
	None
81	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP
	VERAIn_react2xml_small_3x3rod_HFP
	small_3x3rod_HFP.inp
	None
82	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP with two fuel enrichments
	VERAIn_react2xml_small_3x3rod_HFP_2fuel
	small_3x3rod_HFP_2fuel.inp
	None
83	The VERAIn package shall be able to parse a single 3D 3x3 assembly at 10% power
	VERAIn_react2xml_small_3x3rod_HFP_8g
	small_3x3rod_HFP_8g.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
84	The VERAIn package shall allow the user to set the solve_heat_end option in the COBRATF input block
	VERAIn_react2xml_small_3x3rod_HFP_8g
	small_3x3rod_HFP_8g.inp
	None
85	The VERAIn package shall be able to parse a single 3D 3x3 assembly at hot zero power
	VERAIn_react2xml_small_3x3rod_HZP
	small_3x3rod_HZP.inp
	None
86	The VERAIn package shall be able to parse a single 3D 3x3 assembly at HFP with IFBA pins
	VERAIn_react2xml_small_3x3rod_IFBA
	small_3x3rod_IFBA.inp
	None
87	The VERAIn package shall be able to parse a five 3D 3x3 assemblies at HFP when arranged in a cross
	VERAIn_react2xml_small_5cross_assem_3x3rod_HFP
	small_5cross_assem_3x3rod_HFP.inp
	None
88	The VERAIn package shall be able to parse a five 3D 3x3 assemblies at 10% power when arranged in a cross with numerous COUPLING block options
	VERAIn_react2xml_small_multibundle
	small_multibundle.inp
	None
89	The VERAIn package shall be able to parse a five 3D 3x3 assemblies at 10% power when arranged in a cross in quarter symmetry with numerous COUPLING block options and when CTF is run in parallel
	VERAIn_react2xml_small_multibundle_par
	small_multibundle_par.inp
	None
90	The VERAIn package shall be able to parse a full core of 3D 3x3 assemblies at HFP in quarter symmetry
	VERAIn_react2xml_small_qtr_core_3x3rod_HFP
	small_qtr_core_3x3rod_HFP.inp
	None
91	The VERAIn package shall be able to parse a single 3D fuel pin at HFP in full symmetry
	VERAIn_react2xml_small_singlerod_HFP
	small_singlerod_HFP.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
92	The VERAIn package shall be able to parse a single 3D fuel pin at HFP in full symmetry with materials defined in an include file
	VERAIn_react2xml_small_singlerod_HFP_8g
	small_singlerod_HFP_8g.inp
	None
93	The VERAIn package shall be able to parse a single 3D fuel pin at HFP in full symmetry with materials defined in an include file with a boron search enabled
	VERAIn_react2xml_small_singlerod_HFP_8gb
	small_singlerod_HFP_8gb.inp
	None
94	The VERAIn package shall be able to parse a full 3D SMR core in quarter symmetry with feedback enabled
	VERAIn_react2xml_smr-7x7
	smr-7x7.inp
	None
95	The VERAIn package shall be able to parse a single 3D fuel pin at HFP in full symmetry with a shortened height
	VERAIn_react2xml_test-short
	test-short.inp
	None
96	The VERAIn package shall be able to parse a 3D 3x3 assembly at HFP in full symmetry with CTF edits enabled
	VERAIn_react2xml_test_cobra_edits
	test_cobra_edits.inp
	None
97	The VERAIn package shall be able to parse a 3D 3x3 assembly at HFP in full symmetry with CTF edits enabled when material definitions are increased by 100
	VERAIn_react2xml_test_cobra_edits_inimat
	test_cobra_edits_inimat.inp
	None
98	The VERAIn package shall be able to parse a 3D 17x17 assembly with no feedback in quarter symmetry and with VERASHIFT options enabled
	VERAIn_react2xml_test_verashift_3a
	test_verashift_3a.inp
	None
99	The VERAIn package shall be able to parse a 3D 17x17 assembly with no feedback in quarter symmetry and with VERASHIFT CADIS options enabled
	VERAIn_react2xml_test_verashift_3a_cadis
	test_verashift_3a_cadis.inp
	None

Req. ID	*Requirement Description*
	Test Name
	Test Input
	Additional Info
100	The VERAIn package shall be able to parse a 3D 17x17 assembly with no feedback in quarter symmetry and with VERASHIFT problem_mode=forward enabled
	VERAIn_react2xml_test_verashift_3a_forward
	test_verashift_3a_forward.inp
	None
101	The VERAIn package shall be able to parse nine 3D 17x17 assemblies with no feedback in quarter symmetry and with VERASHIFT options enabled
	VERAIn_react2xml_test_verashift_4mini_nonunique
	test_verashift_4mini_nonunique.inp
	None
102	The VERAIn package shall throw an error for an input modeled in quarter symmetry with VERAShift options enabled and with detectors and a bioshield defined; the vera2omn script shall produce the following— Error: core_translate parameter should match outer vessel radius. Writing Omnibus excore input file Error: detector cannot extend into vessel VERA2OMN failed
	VERAIn_react2xml_test_verashift_4mini_nonunique_bioshield
	test_verashift_4mini_nonunique_bioshield.inp
	None
103	The VERAIn package shall be able to parse a 5x5 mini core with no feedback in quarter symmetry and with automated ex-core detector and bioshield setup with a vessel; the vera2omn script should be triggered and should produce the proper ex-core geometry input file
	VERAIn_react2xml_test_verashift_small_core_bioshield
	test_verashift_small_core_bioshield.inp
	None
104	The VERAIn package shall throw an error for an input modeled in quarter symmetry and with automated ex-core detector and bioshield without a vessel definition; the vera2omn script should be triggered, and the following error message produced— Error: vera_pressure_vessel is False but automated excore generator will only define the geometry beyond the vessel. VERA2OMN failed
	VERAIn_react2xml_test_verashift_small_core_bioshield_no_pv
	test_verashift_small_core_bioshield_no_pv.inp
	None
105	The VERAIn package shall be able to parse inputs that have dashes in the assembly names within the assm_map
	VERAIn_react2xml_with-dash
	with-dash.inp
	None