



# CTF Software Test Plan, Requirements, and Test Report

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## Revision Log

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## EXECUTIVE SUMMARY

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

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# 1 Testing Procedure

## 1.1 Computer Program Tested

### 1.1.1 Program: CTF

Built under VERA Environment with following packages and versions:

#### Listing 1. Software Versions Evaluated

```
*** Base Git Repo: VERA
ab42194 [Fri Oct 25 16:06:29 2019 0400] <bairdml@ornl.gov>
Fixing format error
*** Git Repo: TriBITS
a9e4761 [Thu May 9 09:33:45 2019 0600] <rabartl@sandia.gov>
Merge remote tracking branch 'github/master' into phi 5294 update tribits (PHI 5
*** Git Repo: Trilinos
6c776f5 [Thu Sep 21 10:59:00 2017 0600] <mhoemme@sandia.gov>
Merge remote branch 'intermediate repo/develop' into develop
*** Git Repo: TeuchosWrappersExt
e2a6573 [Thu Nov 9 11:59:24 2017 0700] <rabartl@sandia.gov>
Install CTeuchos_config.h
*** Git Repo: Futility
5b8dbc2 [Wed Oct 30 21:01:00 2019 0400] <collinsbs@ornl.gov>
Merge branch 'master' of https://github.com/CASL/Futility
*** Git Repo: MAMBA
b62cf30 [Fri Nov 1 13:18:52 2019 0400] <collinsbs@ornl.gov>
Merge branch 'master' of code int.ornl.gov:mamba/MAMBA
*** Git Repo: VERAINExt
8edb6d4 [Thu Nov 7 17:07:21 2019 0500] <stimpsonsg@ornl.gov>
Merge branch 'Ticket 5847 fixes' into 'master'
*** 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: Cicada
d63fd34 [Thu Feb 28 21:01:35 2019 0500] <collinsbs@ornl.gov>
Merge branch 'master' of code int.ornl.gov:MSMP/Cicada
*** Git Repo: COBRA TF
9bf2d33 [Fri Nov 1 13:19:10 2019 0400] <collinsbs@ornl.gov>
Merge branch 'master' of code int.ornl.gov:rsk/CTF
*** Git Repo: VERADData
a81122d [Tue Jul 2 16:05:52 2019 0400] <stimpsonsg@ornl.gov>
Merge branch 'endf8.0_impact 51 g-origenlibrary' into 'master'
*** Git Repo: VERADData/CEDData
0bd8fa1 [Mon Aug 19 11:17:56 2019 0400] <pandyatm@ornl.gov>
Reverting the h1 pole data file because the lower bound stuff is wrong
*** Git Repo: MOOSEExt
9100d78 [Fri Aug 23 11:14:56 2019 0400] <stimpsonsg@ornl.gov>
Merge branch 'merge_sync' into 'master'
*** Git Repo: MOOSEExt/MOOSE
4dc6cda [Tue Oct 1 15:20:45 2019 0400] <stimpsonsg@ornl.gov>
Merge branch 'merge_sync' into 'master'
*** Git Repo: SCALE
60083a7 [Wed Oct 9 18:10:16 2019 0400] <pandyatm@ornl.gov>
Merge remote branch 'gitlab/master'
*** Git Repo: XSTools
```

```

59f7ecb [Mon May 7 10:05:50 2018 0400] <kimk1@ornl.gov>
Fixing a bug for epithermal upscatt RI interpolation
*** Git Repo: MPACT
f900278 [Fri Nov 1 21:01:03 2019 0400] <collinsbs@ornl.gov>
Merge branch 'master' of code.int.ornl.gov:MPACT/MPACT
*** Git Repo: VeraShift
635e3f4 [Fri Aug 23 09:00:06 2019 0400] <pandyatm@ornl.gov>
Merge remote branch 'gitlab/master'
*** Git Repo: Tiamat
be65a18 [Mon Mar 4 16:21:24 2019 0500] <roystonke@ornl.gov>
Merge branch 'master' of code.int.ornl.gov:CASL/Tiamat
*** 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

```

In accordance with the VERA Software Quality Assurance Plan [VeraSQA2019], the Software Quality Level (SQL) for these codes is given in ???. The SQL definitions are also given in [VeraSQA2019]. Briefly, they are defined as:

- *SQL1—Software providing one or more core functions that will be used by the nuclear industry design or analysis activities where failure would result in inadequate analysis and/or harm the reputation of ORNL or a VERA partner institution.*
- *SQL2—Software used to support core codes that do not directly implement the theoretical model.*
- *SQL3—Software, utilities and common productivity tools used by the VERA project to implement quality assurance activities and/or support delivery of the product suite that would have minor effect on project activities or delivery to the nuclear industry.*

**Table 1. CTF Dependencies' Software Quality Levels**

VERA	SQL2
TriBITS	SQL2
Trilinos	SQL2
TeuchosWrappersExt	SQL2
Futility	SQL2
MAMBA	SQL2
VERAIO	SQL2
Cicada	SQL2

### 1.1.2 System Software

The operating system on which these tests were performed was: Linux 3.10.0-957.10.1.el7.x86\_64.

### 1.1.3 Test Calibration

None.

### 1.1.4 Computer Hardware used for Testing

james007.ornl.gov

## 1.2 Test Equipment Calibration

None.

## 1.3 Date of Test

Started: Apr 16, 2019 - 05:32 UTC Total Test Time: 19 hours, 18 minutes, 12 seconds

## 1.4 Data Recorder

CTest-3.10.2 and CDash Version trilinos-release-2018-08-prebuilt

## 1.5 Simulation Models Used

The simulation models used are described in the CTF Theory Manual [salko19].

## 1.6 Test Problems

The list of test problems may be found in the ?? of this document.

## 1.7 Results and Applicability

### Results

Results are given in ??.

### Applicability

The test results from ?? satisfy the requirements defined in the 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

Bob Salko

## 1.9 Acceptability

The acceptance criteria is that all tests pass their individual criteria. As evidenced in column 3 of the table in ??, all tests passed their criteria. There are two primary test types in the CTF test matrix: regression tests (tests that compare a test output file to a version-controlled reference file deemed to be correct) and unit tests (fine-grained tests that test specific code procedures/classes directly and assert that a selected output matches a known or expected result).

Regression test reference files will be either the fluid VTK file, rod VTK file, native HDF5 file, or VERA HDF5 file. A custom-developed diffing tool is used to compare test and reference files. The test will pass when the test and reference files are the same to within a tolerance. The relative tolerance is  $1.0\text{e-}3$  and absolute tolerance is  $1.0\text{e-}7$ . At least one (relative tolerance or absolute tolerance) check must pass for each mesh point solution value that is compared. The relative check will be unitless (normalized by the reference solution value). The absolute check will retain the units of the solution value.

The unit tests use a fuzzy-diff procedure that will compare two values to within a relative and absolute tolerance. At least one (relative tolerance or absolute tolerance) check must pass when diffing two values. The absolute tolerance for the fuzzy-diff procedure is  $1.0\text{e-}16$  and the relative tolerance is  $1.0\text{e-}3$ . As with the file diff utility, the relative diff will be unitless and the absolute diff will retain the units of the value being checked.

Unit test can also check that a boolean is true or false, or that an integer value matches a reference value exactly. For a unit test to pass, all assertions evaluate to true. Each assertion is a logical comparison of data in memory to a specific known value. The number of assertions per unit test range from  $O(10)$  to  $O(10,000)$ . The unit test files documented in ?? may be investigated to review the specific assertions for a particular test. The output of the tests is also available on [CDash](#).

The test results were reviewed by the Product Support Manager and the Independent Technical Reviewer who have determined that the computer program is acceptable for integration with the VERA Product Suite. The test results have demonstrated the computer program(s) adequately and correctly performed. The testing covered the specified software requirements, proper handling of abnormal conditions or events, and interfaces with other components. The testing verified the computer program did not introduce unintended consequences or degrade the overall software function. No discrepancies were identified.

## 2 Applicable Standards and Procedures

- NQA-1-2008 with NQA-1a-2009 Addenda [[NQA12008](#)]
- 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 Section ??.

### 3.2 Requirements Traceability Matrix

See Section ??.

## Appendix A CTF Test Report

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 for automatically running tests defined with CMake and sending results to CDash. All tests are included in the git repositories noted in ???. ?? provides a list of the test names along with the test input files and requirements.

**Table 2. CTF Test Report from Gitlab**

No.	Test Name	Details	Status
1	COBRA_TFUtils_CTF_EXACT_DIFF_TOOL_TEST	Completed	Passed
2	COBRA_TFxml2ctf_preproc_tools_unit_tests_MPI1	Completed	Passed
3	COBRA_TFUtils_CTFUtils_unit_tests_MPI1	Completed	Passed
4	COBRA_TFxml2ctf_pwr_tools_unit_tests_MPI1	Completed	Passed
5	COBRA_TFUtils_CTF_MULTISTATE_DIFF_TOOL_TEST	Completed	Passed
6	COBRA_TFxml2ctf_case5-00	Completed	Passed
7	COBRA_TFUtils_CTF_VTU_Diff_Tool_1	Completed	Passed
8	COBRA_TFxml2ctf_case5-02	Completed	Passed
9	COBRA_TFxml2ctf_case5-03	Completed	Passed
10	COBRA_TFxml2ctf_case5-04	Completed	Passed
11	COBRA_TFxml2ctf_case5-05	Completed	Passed
12	COBRA_TFxml2ctf_case5-01	Completed	Passed
13	COBRA_TFUtils_HDF5_diff_test	Completed	Passed
14	COBRA_TFUtils_CTF_VTK_Diff_Tool_2	Completed	Passed
15	COBRA_TFxml2ctf_case5-08	Completed	Passed
16	COBRA_TFxml2ctf_case5-07	Completed	Passed
17	COBRA_TFxml2ctf_case5-06	Completed	Passed
18	COBRA_TFxml2ctf_case5-10	Completed	Passed
19	COBRA_TFxml2ctf_case5-11	Completed	Passed
20	COBRA_TFxml2ctf_case5-09	Completed	Passed
21	COBRA_TFxml2ctf_case5-16	Completed	Passed
22	COBRA_TFxml2ctf_case5-17	Completed	Passed
23	COBRA_TFxml2ctf_case5-12	Completed	Passed
24	COBRA_TFUtils_CTF_VTK_Diff_Tool_1	Completed	Passed
25	COBRA_TFxml2ctf_case5-14	Completed	Passed
26	COBRA_TFxml2ctf_case5-15	Completed	Passed
27	COBRA_TFxml2ctf_case5-19	Completed	Passed
28	COBRA_TFxml2ctf_case5-13	Completed	Passed
29	COBRA_TFxml2ctf_bypass	Completed	Passed
30	COBRA_TFxml2ctf_3x3_w_multistate	Completed	Passed
31	COBRA_TFxml2ctf_Sample_p6a	Completed	Passed
32	COBRA_TFxml2ctf_card19_pwr	Completed	Passed
33	COBRA_TFxml2ctf_Sample_p6a_multifuel	Completed	Passed
34	COBRA_TFxml2ctf_cross_4x_refine	Completed	Passed
35	COBRA_TFxml2ctf_cross_w_baffle	Completed	Passed

No.	Test Name	Details	Status
36	COBRA_TFxml2ctf_chen_3x3	Completed	Passed
37	COBRA_TFxml2ctf_four_grid_types	Completed	Passed
38	COBRA_TFxml2ctf_Sample_qtr_core_inlet_bc	Completed	Passed
39	COBRA_TFxml2ctf_full_sym_4x	Completed	Passed
40	COBRA_TFxml2ctf_VTK_on	Completed	Passed
41	COBRA_TFxml2ctf_Sample_p6a_parallel	Completed	Passed
42	COBRA_TFxml2ctf_iapws_singlerod	Completed	Passed
43	COBRA_TFxml2ctf_hdf5_convergence_edit	Completed	Passed
44	COBRA_TFxml2ctf_grid_enhance	Completed	Passed
45	COBRA_TFxml2ctf_new_conv_metrics_one_term_pwr	Completed	Passed
46	COBRA_TFxml2ctf_par_cross	Completed	Passed
47	COBRA_TFxml2ctf_inlet_flow	Completed	Passed
48	COBRA_TFxml2ctf_default_grid_data	Completed	Passed
49	COBRA_TFxml2ctf_inlet_temp	Completed	Passed
50	COBRA_TFxml2ctf_inlet_bc_rot_sym	Completed	Passed
51	COBRA_TFxml2ctf_mixing_coeff	Completed	Passed
52	COBRA_TFxml2ctf_new_conv_metrics_defaults_pwr	Completed	Passed
53	COBRA_TFxml2ctf_modeling_plenums	Completed	Passed
54	COBRA_TFxml2ctf_new_conv_metrics_off_pwr	Completed	Passed
55	COBRA_TFUtils_utils_test_MPI_1	Completed	Passed
56	COBRA_TFxml2ctf_par_qtr_core_inlet_bc	Completed	Passed
57	COBRA_TFxml2ctf_rotational_4x	Completed	Passed
58	COBRA_TFxml2ctf_rotational_5cross	Completed	Passed
59	COBRA_TFxml2ctf_refined_dom	Completed	Passed
60	COBRA_TFxml2ctf_small_3x3rod_HFP_2fuel	Completed	Passed
61	COBRA_TFxml2ctf_test_cobra_edits	Completed	Passed
62	COBRA_TFxml2ctf_plenum_bug	Completed	Passed
63	COBRA_TFxml2ctf_small_singlerod_HFP	Completed	Passed
64	COBRA_TFxml2ctf_small_5cross_assem_3x3rod_HFP	Completed	Passed
65	COBRA_TFxml2ctf_small_3x3rod_BProd	Completed	Passed
66	COBRA_TFxml2ctf_small_3x3rod_IFBA	Completed	Passed
67	COBRA_TFxml2ctf_small_3x3rod_HFP	Completed	Passed
68	COBRA_TFxml2ctf_small_qtr_core_3x3rod_HFP	Completed	Passed
69	COBRA_TFxml2ctf_Sample_p7	Completed	Passed
70	COBRA_TFxml2ctf_miscellaneous_cobratf_block	Completed	Passed
71	COBRA_TFxml2ctf_w3_correlation	Completed	Passed
72	COBRA_TFxml2ctf_5cross_multiassem	Completed	Passed
73	COBRA_TFxml2ctf_2x2_assem	Completed	Passed
74	COBRA_TFxml2ctf_new_conv_metrics_off	Completed	Passed
75	COBRA_TFxml2ctf_unique_instrument	Completed	Passed
76	COBRA_TFxml2ctf_small_3x3rod_BProd_customname	Completed	Passed
77	COBRA_TFxml2ctf_new_conv_metrics_one_term	Completed	Passed



No.	Test Name	Details	Status
78	COBRA_TFxml2ctf_new_conv_metrics_defaults	Completed	Passed
79	COBRA_TFxml2ctf_cell_large	Completed	Passed
80	COBRA_TFxml2ctf_bwr-peach-6	Completed	Passed
81	COBRA_TFxml2ctf_bwr3x3	Completed	Passed
82	COBRA_TFxml2ctf_par_cross_customname	Completed	Passed
83	COBRA_TFxml2ctf_cell_large_customname	Completed	Passed
84	COBRA_TFxml2ctf_card19	Completed	Passed
85	COBRA_TFxml2ctf_p6_solid_rod	Completed	Passed
86	COBRA_TFxml2ctf_bwr_nogap	Completed	Passed
87	COBRA_TFxml2ctf_annular_test	Completed	Passed
88	COBRA_TFxml2ctf_small_CE_par	Completed	Passed
89	COBRA_TFxml2ctf_small_CE_par4	Completed	Passed
90	COBRA_TFxml2ctf_CE_16x16_quarter_rotational_ppa16	Completed	Passed
91	COBRA_TFxml2ctf_bwr_solid_rod	Completed	Passed
92	COBRA_TFxml2ctf_CE_16x16_quarter_rotational_ppa9	Completed	Passed
93	COBRA_TFxml2ctf_CE_16x16_single_rot	Completed	Passed
94	COBRA_TFxml2ctf_bwr-p6-test	Completed	Passed
95	COBRA_TFxml2ctf_CE_16x16_quarter_rotational	Completed	Passed
96	COBRA_TFxml2ctf_ce3x3	Completed	Passed
97	COBRA_TFxml2ctf_pwr_CE_single_16x16	Completed	Passed
98	COBRA_TFxml2ctf_CE_16x16_quarter_rotational_big	Completed	Passed
99	COBRA_TFxml2ctf_xml2ctf_unit_tests_MPI_1	Completed	Passed
100	COBRA_TFCore_ctf_unit_tests_MPI2_MPI_2	Completed	Passed
101	COBRA_TFxml2ctf_Check_coupling_mesh	Completed	Passed
102	COBRA_TFxml2ctf_2x2_assem_par	Completed	Passed
103	COBRA_TFxml2ctf_qtr_hi2lo5x5	Completed	Passed
104	COBRA_TFxml2ctf_5cross_dynamic	Completed	Passed
105	COBRA_TFxml2ctf_2x2_assem_par_customname	Completed	Passed
106	COBRA_TFxml2ctf_Sample_p6a_ppa4	Completed	Passed
107	COBRA_TFCore_CTF_FluidProps_unit_tests_MPI_1	Completed	Passed
108	COBRA_TFxml2ctf_instrument_tube	Completed	Passed
109	COBRA_TFMultistate_multistate_unit_tests_MPI_1	Completed	Passed
110	COBRA_TFCore_ctf_unit_tests_MPI_1	Completed	Passed
111	COBRA_TFCore_CTF_CladChemistry_unit_tests_MPI_1	Completed	Passed
112	COBRA_TFMultistate_single_rod_CRUD_growth_multiple_calls	Completed	Passed
113	COBRA_TFMultistate_singlerod_transient_ss_small_dt	Completed	Passed
114	COBRA_TFxml2ctf_large_ce	Completed	Passed
115	COBRA_TFMultistate_singlerod_transient_ss	Completed	Passed
116	COBRA_TFfuelSolve_axial_gaphtc	Completed	Passed
117	COBRA_TFfuelSolve_burn_fuel_conductivity	Completed	Passed
118	COBRA_TFMultistate_mcfcr	Completed	Passed
119	COBRA_TFCore_EDITS_BOUNDS_CHECK	Completed	Passed

No.	Test Name	Details	Status
120	COBRA_TFfuelSolve_radial_power_distribution	Completed	Passed
121	COBRA_TFMultistate_qtr_hi2lo5x5	Completed	Passed
122	COBRA_TFMultistate_singlerod_transient_ss_changing_TH	Completed	Passed
123	COBRA_TFMultistate_verain_mamba	Completed	Passed
124	COBRA_TFMultistate_cross_qtr_no_multi	Completed	Passed
125	COBRA_TFCore_massTransport_unit_tests_MPI_1	Completed	Passed
126	COBRA_TFfuelSolve_const_props	Completed	Passed
127	COBRA_TFfuelSolve_const_props_zero_burnup_frap	Completed	Passed
128	COBRA_TFfuelSolve_transient_flow_change	Completed	Passed
129	COBRA_TFfuelSolve_const_props_zero_burnup_escore	Completed	Passed
130	COBRA_TFfuelSolve_u3si2	Completed	Passed
131	COBRA_TFfuelSolve_const_props_zero_burnup_mod_escore	Completed	Passed
132	COBRA_TFfuelSolve_depletion	Completed	Passed
133	COBRA_TFfuelSolve_dynamic_gaphtc_contact	Completed	Passed
134	COBRA_TFfuelSolve_dynamic_gaphtc_nocontact	Completed	Passed
135	COBRA_TFfuelSolve_effects_on_meyer_hardness	Completed	Passed
136	COBRA_TFfuelSolve_fuel_clad_emissivity	Completed	Passed
137	COBRA_TFfuelSolve_gapcriterion_factorization	Completed	Passed
138	COBRA_TFfuelSolve_pressure_vector	Completed	Passed
139	COBRA_TFfuelSolve_surf_tw_transient	Completed	Passed
140	COBRA_TFfuelSolve_therm_exp	Completed	Passed
141	COBRA_TFfuelSolve_therm_exp_const_alpha	Completed	Passed
142	COBRA_TFfuelSolve_uo2Densification_escore	Completed	Passed
143	COBRA_TFfuelSolve_uo2Densification_matpro	Completed	Passed
144	COBRA_TFveraAPI_veraAPI_unit_tests_MPI_1	Completed	Passed
145	COBRA_TF_parse_only_psb_51221	Completed	Passed
146	COBRA_TF_parse_only_psb_51222	Completed	Passed
147	COBRA_TF_parse_only_psb_52111	Completed	Passed
148	COBRA_TF_parse_only_psb_52112	Completed	Passed
149	COBRA_TFMultistate_cross_par_depl	Completed	Passed
150	COBRA_TF_parse_only_psb_52332	Completed	Passed
151	COBRA_TF_parse_only_psb_53442	Completed	Passed
152	COBRA_TF_parse_only_psb_53441	Completed	Passed
153	COBRA_TF_parse_only_psb_52442	Completed	Passed
154	COBRA_TFCore_ctfAPI_unit_tests_MPI3_MPI3	Completed	Passed
155	COBRA_TF_parse_only_psb_54562	Completed	Passed
156	COBRA_TF_parse_only_psb_56322	Completed	Passed
157	COBRA_TF_parse_only_psb_56321	Completed	Passed
158	COBRA_TF_parse_only_psb_56552	Completed	Passed
159	COBRA_TF_parse_only_psb_61121	Completed	Passed
160	COBRA_TF_parse_only_psb_61122	Completed	Passed
161	COBRA_TF_parse_only_psb_61451	Completed	Passed

No.	Test Name	Details	Status
162	COBRA_TF_parse_only_psb.61452	Completed	Passed
163	COBRA_TF_parse_only_psb.62441	Completed	Passed
164	COBRA_TF_parse_only_psb.62442	Completed	Passed
165	COBRA_TFfuelSolve.tk1	Completed	Passed
166	COBRA_TF_parse_only_psb.64561	Completed	Passed
167	COBRA_TF_parse_only_psb.63452	Completed	Passed
168	COBRA_TF_parse_only_psb.64562	Completed	Passed
169	COBRA_TF_parse_only_psb.66561	Completed	Passed
170	COBRA_TF_parse_only_psb.71341	Completed	Passed
171	COBRA_TF_parse_only_psb.66562	Completed	Passed
172	COBRA_TF_parse_only_psb.71121	Completed	Passed
173	COBRA_TF_parse_only_psb.71122	Completed	Passed
174	COBRA_TF_parse_only_psb.71342	Completed	Passed
175	COBRA_TF_parse_only_psb.73121	Completed	Passed
176	COBRA_TF_parse_only_psb.72221	Completed	Passed
177	COBRA_TF_parse_only_psb.73451	Completed	Passed
178	COBRA_TF_parse_only_psb.73452	Completed	Passed
179	COBRA_TF_parse_only_psb.74561	Completed	Passed
180	COBRA_TF_parse_only_psb.74562	Completed	Passed
181	COBRA_TF_parse_only_psb.76322	Completed	Passed
182	COBRA_TF_parse_only_psb.76321	Completed	Passed
183	COBRA_TF_parse_only_bfbt.60003	Completed	Passed
184	COBRA_TF_parse_only_bfbt.60001	Completed	Passed
185	COBRA_TF_parse_only_bfbt.60005	Completed	Passed
186	COBRA_TF_parse_only_bfbt.60007	Completed	Passed
187	COBRA_TF_parse_only_bfbt.60009	Completed	Passed
188	COBRA_TF_parse_only_bfbt.60013	Completed	Passed
189	COBRA_TF_parse_only_bfbt.60015	Completed	Passed
190	COBRA_TF_parse_only_bfbt.60017	Completed	Passed
191	COBRA_TFMultistate_cross_par_mamba	Completed	Passed
192	COBRA_TF_parse_only_bfbt.60022	Completed	Passed
193	COBRA_TF_parse_only_bfbt.60019	Completed	Passed
194	COBRA_TF_parse_only_bfbt.60023	Completed	Passed
195	COBRA_TF_parse_only_bfbt.60024	Completed	Passed
196	COBRA_TF_parse_only_bfbt.60026	Completed	Passed
197	COBRA_TF_parse_only_bfbt.60029	Completed	Passed
198	COBRA_TF_parse_only_bfbt.60025	Completed	Passed
199	COBRA_TF_parse_only_bfbt.60031	Completed	Passed
200	COBRA_TF_parse_only_bfbt.60030	Completed	Passed
201	COBRA_TF_parse_only_bfbt.60032	Completed	Passed
202	COBRA_TF_parse_only_bfbt.70029	Completed	Passed
203	COBRA_TF_parse_only_bfbt.70028	Completed	Passed

No.	Test Name	Details	Status
204	COBRA_TF_parse_only_bfbt_70027	Completed	Passed
205	COBRA_TF_parse_only_bfbt_70031	Completed	Passed
206	COBRA_TF_parse_only_bfbt_70030	Completed	Passed
207	COBRA_TF_parse_only_bfbt_70032	Completed	Passed
208	COBRA_TF_parse_only_bfbt_70033	Completed	Passed
209	COBRA_TF_run_cov01	Completed	Passed
210	COBRA_TF_run_cov02	Completed	Passed
211	COBRA_TF_parse_only_bfbt_70035	Completed	Passed
212	COBRA_TF_parse_only_bfbt_70036	Completed	Passed
213	COBRA_TF_run_cov06	Completed	Passed
214	COBRA_TF_run_cov03	Completed	Passed
215	COBRA_TF_run_cov05	Completed	Passed
216	COBRA_TF_run_cov07	Completed	Passed
217	COBRA_TF_run_cov12	Completed	Passed
218	COBRA_TFMultistate_hi2lo5x5	Completed	Passed
219	COBRA_TF_run_cov10	Completed	Passed
220	COBRA_TFMultistate_cross_par_mass_bal	Completed	Passed
221	COBRA_TF_run_cov04	Completed	Passed
222	COBRA_TF_run_cov14	Completed	Passed
223	COBRA_TF_run_cov17	Completed	Passed
224	COBRA_TF_run_cov11	Completed	Passed
225	COBRA_TF_run_cov09	Completed	Passed
226	COBRA_TFMultistate_crudAPI_verain_mamba	Completed	Passed
227	COBRA_TF_run_cov13	Completed	Passed
228	COBRA_TF_run_cov27	Completed	Passed
229	COBRA_TF_run_cov20	Completed	Passed
230	COBRA_TF_run_cov19	Completed	Passed
231	COBRA_TF_run_cov18	Completed	Passed
232	COBRA_TF_run_cov15	Completed	Passed
233	COBRA_TF_run_cov21	Completed	Passed
234	COBRA_TF_run_cov08	Completed	Passed
235	COBRA_TF_run_cov34	Completed	Passed
236	COBRA_TF_run_cov36	Completed	Passed
237	COBRA_TF_run_cov30	Completed	Passed
238	COBRA_TF_run_cov32	Completed	Passed
239	COBRA_TF_run_cov28	Completed	Passed
240	COBRA_TF_run_cov31	Completed	Passed
241	COBRA_TF_run_cov40	Completed	Passed
242	COBRA_TF_run_cov43	Completed	Passed
243	COBRA_TF_run_cov26	Completed	Passed
244	COBRA_TF_run_cov42	Completed	Passed
245	COBRA_TF_run_cov38	Completed	Passed

No.	Test Name	Details	Status
246	COBRA_TF_run_cov39	Completed	Passed
247	COBRA_TF_run_cov29	Completed	Passed
248	COBRA_TF_run_cov33	Completed	Passed
249	COBRA_TF_run_cov44	Completed	Passed
250	COBRA_TF_run_cov48	Completed	Passed
251	COBRA_TF_run_cov45	Completed	Passed
252	COBRA_TF_run_cov50	Completed	Passed
253	COBRA_TF_run_steam01	Completed	Passed
254	COBRA_TF_run_steam02	Completed	Passed
255	COBRA_TF_run_steam04	Completed	Passed
256	COBRA_TF_run_steam03	Completed	Passed
257	COBRA_TF_run_error01	Completed	Passed
258	COBRA_TF_run_steam06	Completed	Passed
259	COBRA_TF_run_error02	Completed	Passed
260	COBRA_TF_run_steam08	Completed	Passed
261	COBRA_TF_run_steam07	Completed	Passed
262	COBRA_TF_run_steam05	Completed	Passed
263	COBRA_TF_run_cov46	Completed	Passed
264	COBRA_TF_run_inflow_1.out	Completed	Passed
265	COBRA_TF_run_inflow_1.in	Completed	Passed
266	COBRA_TF_run_inflow_3	Completed	Passed
267	COBRA_TF_run_inflow_2.in	Completed	Passed
268	COBRA_TF_run_inflow_2.out	Completed	Passed
269	COBRA_TFCore_ctfAPI_unit_tests_MPI_1	Completed	Passed
270	COBRA_TF_run_arbitrary_conn_plenum	Completed	Passed
271	COBRA_TF_run_rod.in_2	Completed	Passed
272	COBRA_TF_run_cov49	Completed	Passed
273	COBRA_TF_run_cov52	Completed	Passed
274	COBRA_TF_run_cov51	Completed	Passed
275	COBRA_TF_run_annular_mist	Completed	Passed
276	COBRA_TF_run_zero_mgas	Completed	Passed
277	COBRA_TF_run_small_singlerod_HFP	Completed	Passed
278	COBRA_TF_run_cov47	Completed	Passed
279	COBRA_TF_run_small_5cross_qtr	Completed	Passed
280	COBRA_TF_run_3x3_new_stopping_abs	Completed	Passed
281	COBRA_TF_run_small_3x3rod_HFP	Completed	Passed
282	COBRA_TF_run_3x3rod_with_nc0	Completed	Passed
283	COBRA_TF_run_groeneveld_verify_3x3	Completed	Passed
284	COBRA_TF_run_bowring_verify_3x3	Completed	Passed
285	COBRA_TF_run_case5-00	Completed	Passed
286	COBRA_TF_run_case5-03	Completed	Passed
287	COBRA_TF_run_case5-04	Completed	Passed

No.	Test Name	Details	Status
288	COBRA_TF_run_cov37	Completed	Passed
289	COBRA_TF_run_case5-01	Completed	Passed
290	COBRA_TF_run_case5-05	Completed	Passed
291	COBRA_TF_run_case5-02	Completed	Passed
292	COBRA_TF_run_case5-06	Completed	Passed
293	COBRA_TF_run_case5-10	Completed	Passed
294	COBRA_TF_run_case5-07	Completed	Passed
295	COBRA_TF_run_case5-08	Completed	Passed
296	COBRA_TF_run_case5-09	Completed	Passed
297	COBRA_TF_run_case5-11	Completed	Passed
298	COBRA_TF_run_small_5cross_assem_3x3rod_HFP	Completed	Passed
299	COBRA_TF_run_small_5x_assem_3x3rod_HFP	Completed	Passed
300	COBRA_TF_run_singlerod_plenum	Completed	Passed
301	COBRA_TF_run_3x3rod_cosine_power	Completed	Passed
302	COBRA_TF_run_3_sect_model	Completed	Passed
303	COBRA_TF_run_case5-12	Completed	Passed
304	COBRA_TF_run_even_sym_cross	Completed	Passed
305	COBRA_TF_run_iapws_v2_singlerod	Completed	Passed
306	COBRA_TF_run_iapws_singlerod	Completed	Passed
307	COBRA_TF_run_boron_2chan_1phase	Completed	Passed
308	COBRA_TF_run_case5-13	Completed	Passed
309	COBRA_TF_run_boron_ch_split_transport	Completed	Passed
310	COBRA_TF_run_case5-15	Completed	Passed
311	COBRA_TF_run_case5-14	Completed	Passed
312	COBRA_TF_run_boron_u_tube_w_splitting	Completed	Passed
313	COBRA_TF_run_case5-17	Completed	Passed
314	COBRA_TF_run_chen_3x3	Completed	Passed
315	COBRA_TF_run_case5-16	Completed	Passed
316	COBRA_TF_run_ss_chf_chk_w3	Completed	Passed
317	COBRA_TF_run_ss_chf_w3	Completed	Passed
318	COBRA_TF_run_multi_material_rod	Completed	Passed
319	COBRA_TF_run_trans_chf_chk_w3	Completed	Passed
320	COBRA_TF_run_trans_chf_w3	Completed	Passed
321	COBRA_TF_run_ss_chf_biasi	Completed	Passed
322	COBRA_TF_run_ss_chf_chk_biasi	Completed	Passed
323	COBRA_TF_run_case5-18a	Completed	Passed
324	COBRA_TF_run_ss_chf_chk_bowring	Completed	Passed
325	COBRA_TF_run_case5-18b	Completed	Passed
326	COBRA_TF_run_ss_chf_bowring	Completed	Passed
327	COBRA_TF_run_trans_chf_chk_biasi	Completed	Passed
328	COBRA_TF_run_small_singlerod_reverse_flow	Completed	Passed
329	COBRA_TF_run_trans_chf_chk_bowring	Completed	Passed

No.	Test Name	Details	Status
330	COBRA_TF_run.trans.chf.bowring	Completed	Passed
331	COBRA_TF_run.test.irelf	Completed	Passed
332	COBRA_TF_run.case5-18d	Completed	Passed
333	COBRA_TF_run.trans.chf.biasi	Completed	Passed
334	COBRA_TF_run.test.iconf	Completed	Passed
335	COBRA_TF_run.case5-18c	Completed	Passed
336	COBRA_TF_run.ss.chf.chk.groeneveld	Completed	Passed
337	COBRA_TF_run.gc1	Completed	Passed
338	COBRA_TF_run.ss.chf.groeneveld	Completed	Passed
339	COBRA_TF_run.trans.chf.groeneveld	Completed	Passed
340	COBRA_TF_run.gc2	Completed	Passed
341	COBRA_TF_run.gc3	Completed	Passed
342	COBRA_TF_run.salt.small.singlerod.HFP.no.spacers.two.phase	Completed	Passed
343	COBRA_TF_run.trans.chf.chk.groeneveld	Completed	Passed
344	COBRA_TF_run.gc4	Completed	Passed
345	COBRA_TF_run.multiSectionRods	Completed	Passed
346	COBRA_TF_run.tong.verify.singlerod	Completed	Passed
347	COBRA_TF_run.water.faucet.10bar.transient	Completed	Passed
348	COBRA_TF_run.enh.turb.ixflow	Completed	Passed
349	COBRA_TF_run.cc.test1a	Completed	Passed
350	COBRA_TF_run.serial.petsc.solve	Completed	Passed
351	COBRA_TF_run.cc.test1b	Completed	Passed
352	COBRA_TF_run.cc.test1c	Completed	Passed
353	COBRA_TF_run.par.verify	Completed	Passed
354	COBRA_TF_run.cc.test1d	Completed	Passed
355	COBRA_TF_run.tong.verify.coldwall	Completed	Passed
356	COBRA_TF_run.cc.test1e	Completed	Passed
357	COBRA_TF_run.cc.test2a	Completed	Passed
358	COBRA_TF_run.cc.test2b	Completed	Passed
359	COBRA_TF_run.cc.test2c	Completed	Passed
360	COBRA_TF_run.tp.par.verify	Completed	Passed
361	COBRA_TF_run.cc.test2d	Completed	Passed
362	COBRA_TF_run.cc.test2e	Completed	Passed
363	COBRA_TF_run.2x2.small.bwr.assem	Completed	Passed
364	COBRA_TF_run.par.quarter.cross.trilinos	Completed	Passed
365	COBRA_TF_run.cc.test3a	Completed	Passed
366	COBRA_TF_run.cc.test3b	Completed	Passed
367	COBRA_TF_run.cc.test3d	Completed	Passed
368	COBRA_TF_run.cc.test3e	Completed	Passed
369	COBRA_TF_run.cc.test3c	Completed	Passed
370	COBRA_TF_run.cc.test4a	Completed	Passed
371	COBRA_TF_run.cc.test4b	Completed	Passed



No.	Test Name	Details	Status
372	COBRA_TF_run_cc.test4c	Completed	Passed
373	COBRA_TF_run_cc.test4e	Completed	Passed
374	COBRA_TF_run_cc.test4d	Completed	Passed
375	COBRA_TF_run_cc.test5a	Completed	Passed
376	COBRA_TF_run_cc.test5b	Completed	Passed
377	COBRA_TF_run_par_with_unique_filenames	Completed	Passed
378	COBRA_TF_run_rc.test1a	Completed	Passed
379	COBRA_TF_run_cc.test5c	Completed	Passed
380	COBRA_TF_run_cc.test5d	Completed	Passed
381	COBRA_TF_run_msre_par	Completed	Passed
382	COBRA_TF_run_cc.test5e	Completed	Passed
383	COBRA_TF_run_rc.test2b	Completed	Passed
384	COBRA_TF_run_rc.test1d	Completed	Passed
385	COBRA_TF_run_rc.test1c	Completed	Passed
386	COBRA_TF_run_rc.test2a	Completed	Passed
387	COBRA_TF_run_rc.test1b	Completed	Passed
388	COBRA_TF_run_rc.test2c	Completed	Passed
389	COBRA_TF_run.testno1	Completed	Passed
390	COBRA_TF_run_td.test1	Completed	Passed
391	COBRA_TF_run_rc.test2d	Completed	Passed
392	COBRA_TF_run_rc.test3b	Completed	Passed
393	COBRA_TF_run_rc.test3a	Completed	Passed
394	COBRA_TF_run_rc.test3c	Completed	Passed
395	COBRA_TF_run_bgtd.test1a_nful12	Completed	Passed
396	COBRA_TF_run_bgtd.test1a	Completed	Passed
397	COBRA_TF_run_rc.test3d	Completed	Passed
398	COBRA_TF_run_bgtd.test1b	Completed	Passed
399	COBRA_TF_run_bgtd.test3o	Completed	Passed
400	COBRA_TF_run_bgtd.test1h	Completed	Passed
401	COBRA_TF_run_bgtd.test5o	Completed	Passed
402	COBRA_TF_run_bgtd.test4o	Completed	Passed
403	COBRA_TF_run_bgtd.test2o	Completed	Passed
404	COBRA_TF_run_isoadd.cosine	Completed	Passed
405	COBRA_TF_run_isoadd.square	Completed	Passed
406	COBRA_TF_run_isoadd.tanh	Completed	Passed
407	COBRA_TF_horizontal_pipe_zero_pressure_drop	Completed	Passed
408	COBRA_TF_horizontal_pipe_form_pressure_drop	Completed	Passed
409	COBRA_TF_heat_exchanger_solution_verification	Completed	Passed
410	COBRA_TF_run_CE_16x16_single_rot	Completed	Passed
411	COBRA_TF_yhl.coupling	Completed	Passed
412	COBRA_TF_run_patricia_150065.W3	Completed	Passed
413	COBRA_TF_horizontal_pipe_friction_pressure_drop	Completed	Passed



No.	Test Name	Details	Status
414	COBRA_TF_horizontal_pipe_decelerating_pressure_drop	Completed	Passed
415	COBRA_TF_par_mass_transport_tests_MPI_2	Completed	Passed
416	COBRA_TF_custom_fluid_properties	Completed	Passed
417	COBRA_TF_run_flow_split	Completed	Passed
418	COBRA_TF_run_2x3_mixing_1	Completed	Passed
419	COBRA_TF_run_2x3_mixing_2	Completed	Passed
420	COBRA_TF_run_2x3_mixing_3	Completed	Passed
421	COBRA_TF_grid_spacer_solution_verification	Completed	Passed
422	COBRA_TF_run_2x3_mixing_4	Completed	Passed
423	COBRA_TF_run_refined_par_verify	Completed	Passed
424	COBRA_TF_axial_dp_solution_verification	Completed	Passed
425	COBRA_TF_run_tk1	Completed	Passed
426	COBRA_TF_run_atrium10_deck_no_bypass_or_water_rod	Completed	Passed
427	COBRA_TF_mass_transport_tests_MPI_1	Completed	Passed
428	COBRA_TF_turb_mixing_solution_verification	Completed	Passed
429	COBRA_TF_run_bfbt_70027	Completed	Passed
430	COBRA_TF_crud_scrape	Completed	Passed
431	COBRA_TF_run_bfbt_70028	Completed	Passed
432	COBRA_TF_run_bfbt_70030	Completed	Passed
433	COBRA_TF_run_bfbt_70029	Completed	Passed
434	COBRA_TF_run_CE_5x5_TS74_02	Completed	Passed
435	COBRA_TF_run_bfbt_70031	Completed	Passed
436	COBRA_TF_run_CE_5x5_TS74_72	Completed	Passed
437	COBRA_TF_run_bfbt_70032	Completed	Passed
438	COBRA_TF_run_bfbt_70033	Completed	Passed
439	COBRA_TF_run_frigg	Completed	Passed
440	COBRA_TF_run_ge_1B	Completed	Passed
441	COBRA_TF_run_ge_2B2	Completed	Passed
442	COBRA_TF_run_ge_2B3	Completed	Passed
443	COBRA_TF_run_bfbt_70035	Completed	Passed
444	COBRA_TF_run_ge_1C	Completed	Passed
445	COBRA_TF_run_bfbt_70034	Completed	Passed
446	COBRA_TF_run_ge_1D	Completed	Passed
447	COBRA_TF_run_ge_2B4	Completed	Passed
448	COBRA_TF_run_bfbt_70036	Completed	Passed
449	COBRA_TF_run_ge_2C1	Completed	Passed
450	COBRA_TF_run_ge_1E	Completed	Passed
451	COBRA_TF_run_ifa432r1_aflux-a_imox1	Completed	Passed
452	COBRA_TF_run_ifa432r1_aflux-a_imox2	Completed	Passed
453	COBRA_TF_run_ifa432r1_dt10_imox1	Completed	Passed
454	COBRA_TF_run_ifa432r1_aflux-a_matpro	Completed	Passed
455	COBRA_TF_run_ifa432r1_dt10_imox2	Completed	Passed

No.	Test Name	Details	Status
456	COBRA_TF_run_ifa432r1_dt10_matpro	Completed	Passed
457	COBRA_TF_run_ifa610r2_dt50_imox3	Completed	Passed
458	COBRA_TF_run_ge_2D1	Completed	Passed
459	COBRA_TF_run_ge_2E1	Completed	Passed
460	COBRA_TF_run_ifa610r2_dt50_imox4	Completed	Passed
461	COBRA_TF_run_ifa610r2_dt50_imox5	Completed	Passed
462	COBRA_TF_run_ge_2C2	Completed	Passed
463	COBRA_TF_run_ifa610r2_dt50_matpro	Completed	Passed
464	COBRA_TF_run_ifa681r2_dt2_imox1	Completed	Passed
465	COBRA_TF_run_ifa681r2_dt2_imox2	Completed	Passed
466	COBRA_TF_run_ifa681r2_dt2_matpro	Completed	Passed
467	COBRA_TF_run_ge_2G1	Completed	Passed
468	COBRA_TF_run_ge_2E2	Completed	Passed
469	COBRA_TF_run_ge_2D3	Completed	Passed
470	COBRA_TF_run_NUREG_02	Completed	Passed
471	COBRA_TF_run_NUREG_07	Completed	Passed
472	COBRA_TF_run_NUREG_06	Completed	Passed
473	COBRA_TF_run_NUREG_01	Completed	Passed
474	COBRA_TF_run_NUREG_08	Completed	Passed
475	COBRA_TF_run_ge_2G2	Completed	Passed
476	COBRA_TF_run_ge_2E3	Completed	Passed
477	COBRA_TF_run_ge_2G3	Completed	Passed
478	COBRA_TF_run_pnnl_2x6_steady	Completed	Passed
479	COBRA_TF_run_5269	Completed	Passed
480	COBRA_TF_run_TS1_1222	Completed	Passed
481	COBRA_TF_run_pnnl_2x6_transient	Completed	Passed
482	COBRA_TF_run_riso_265	Completed	Passed
483	COBRA_TF_run_riso_265_lane	Completed	Passed
484	COBRA_TF_run_0011-55	Completed	Passed
485	COBRA_TF_run_psbt_52442	Completed	Passed
486	COBRA_TF_run_riso_303	Completed	Passed
487	COBRA_TF_run_riso_261	Completed	Passed
488	COBRA_TF_run_psbt_56552	Completed	Passed
489	COBRA_TF_run_riso_618	Completed	Passed
490	COBRA_TF_run_psbt_62442	Completed	Passed
491	COBRA_TF_run_psbt_66561	Completed	Passed
492	COBRA_TF_run_psbt_73451	Completed	Passed
493	COBRA_TF_run_riso_223	Completed	Passed
494	COBRA_TF_run_psbt_61121	Completed	Passed
495	COBRA_TF_run_psbt_71121	Completed	Passed
496	COBRA_TF_run_psbt_76322	Completed	Passed
497	COBRA_TF_run_riso_217	Completed	Passed

No.	Test Name	Details	Status
498	COBRA_TF_run_psb_t_51221	Completed	Passed
499	COBRA_TF_run_riso_214	Completed	Passed
500	COBRA_TF_run_Sample_p6a	Completed	Passed
501	COBRA_TF_run_siemens_5x5_27	Completed	Passed
502	COBRA_TF_run_0031-21	Completed	Passed
503	COBRA_TF_run_4101-61	Completed	Passed
504	COBRA_TF_run_0021-21	Completed	Passed
505	COBRA_TF_run_1071-61	Completed	Passed
506	COBRA_TF_run_riso_320	Completed	Passed
507	COBRA_TF_run_par_verify_ppa9	Completed	Passed

## Appendix B Requirements and Test Traceability Matrix

For the entries in the Additional Info field, the #NNNN is the CASL PHI Kanban ticket number with a hyperlink to this webpage.

**Table 3. Requirements**

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
1	Multistate_cobra shall accept its own custom input file for driving the simulation.
	multistate/unit_tests/test_InpData_type.f90
	None
2	CTF shall be able to perform a rod surface thermal hydraulics reconstruction using a ROTH-CON data fil
	multistate/tests/hi2lo5x5.verain
	None
3	Mutlistate_cobra shall run a CTF simulation as if CTF was running standalone when only the CTF input file is provided as input
	multistate/tests/cross_qtr_no_multi.inp
	None
4	CTF shall write additional solution data related to DNB to the VERA HDF5 output file when this option is enabled in the CTF input deck
	multistate/tests/cross_qtr_no_multi.inp
	None
5	CTF shall read primary loop input information from the VERAIN input file to set up the mass balance model
	multistate/tests/cross_par_mass_bal.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
6	Multistate_cobra shall change inlet flow conditions in CTF at different state points read from the .mstate.inp file
	multistate/tests/singlerod_transient_ss_changing.TH.mstate.inp
	None
7	CTF shall print the core inlet massflux to the VERA HDF5 file for every state accounting for the relative flow rate during that state
	multistate/tests/singlerod_transient_ss_changing.TH.mstate.inp
	None
8	Multistate_cobra shall drive CTF through a transient solution after it was used to drive CTF through a steady-state solution in a previous state
	multistate/tests/singlerod_transient_ss.mstate.inp
	None
9	Multistate_cobra shall drive CTF through a transient for a timestep size specified in the .mstate.inp file
	multistate/tests/singlerod_transient_ss.mstate.inp
	None
10	CTF shall run a transient for a timestep size specified through the CTF_Coupling_Interface using its internal timestep controls and ending at the precise end time requested by the caller
	multistate/tests/singlerod_transient_ss.mstate.inp
	None
11	CTF shall perform a steady state solution when instructed to do so through the CTF_Coupling_Interface
	multistate/tests/singlerod_transient_ss.mstate.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
12	Xml2ctf shall set crud coupling mesh refinement options in the CTF input deck based on input in the VERAIn input file
	multistate/tests/qtr_hi2lo5x5.verain
	None
13	CTF shall write additional crud solution details when this option is enabled in the VERAIn input file.
	multistate/tests/qtr_hi2lo5x5.verain
	None
14	Multistate_cobra shall subdivide a depletion step so that a crud grow step is less than or equal to the maximum crud growth step size set in the VERAIn input file
	multistate/tests/qtr_hi2lo5x5.verain
	None
15	CTF shall read the option to model lithium in clad corrosion from the VERAIn XML parameter list passed in through the CTF_Coupling_Interface
	multistate/tests/qtr_hi2lo5x5.verain
	None
16	CTF shall read the clad oxide layer thermal conductivity to be used in clad corrosion from the VERAIn XML parameter list passed in through the CTF_Coupling_Interface
	multistate/tests/qtr_hi2lo5x5.verain
	None
17	CTF shall read the option to model clad corrosion from the VERAIn XML parameter list passed in through the CTF_Coupling_Interface
	multistate/tests/qtr_hi2lo5x5.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
18	CTF shall read the option to enable the CTF native HDF5 output file the VERAIn XML parameter list passed in through the CTF_Coupling_Interface
	multistate/tests/qtr_hi2lo5x5.verain
	None
19	CTF shall write rod surface thermal-hydraulics reconstruction data to the native CTF HDF5 output file.
	multistate/tests/qtr_hi2lo5x5.verain
	None
20	CTF shall be able to perform a rod surface thermal hydraulics reconstruction using a ROTH-CON data file for a quarter symmetry model
	multistate/tests/qtr_hi2lo5x5.verain
	None
21	CTF shall be able to perform a coupled crud analysis coupled to MAMBA on the rod surface reconstruction mesh
	multistate/tests/qtr_hi2lo5x5.verain
	None
22	Xml2ctf shall set the fluid properties option in the CTF input deck based on user input in the VERAIn input file.
	multistate/tests/qtr_hi2lo5x5.verain
	None
23	Xml2ctf shall read the parallelization option from the VERAIn input file.
	multistate/tests/qtr_hi2lo5x5.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
24	Multistate_cobra shall drive a crud growth simulation when this option is set in the VERAIn input file.
	multistate/tests/qtr_hi2lo5x5.verain
	None
25	Multistate_cobra shall read the .mstate.inp file to drive a solution in place of the VERAIn input file
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None
26	Multistate_cobra shall set the model boundary conditions in CTF when this information is present in the .mstate.inp file
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None
27	Multistate_cobra shall run multiple CTF solves per state when instructed to do so in the .mstate.inp file
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None
28	Multistate_cobra shall drive CTF through a depletion using the .mstate.inp file as input.
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None
29	Multistate_cobra shall drive CTF crud growth simulation coupled to MAMBA through the .mstate.inp file
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
30	Multistate_cobra shall pass coolant chemistry information to CTF that was read from the .mstate.inp file
	multistate/tests/single_rod_CRUD_growth_multiple_calls.mstate.inp
	None
31	CTF shall use the CrudAPI mass balance model available in MAMBA for performing the source term mass balance solution
	multistate/tests/crudAPI_verain_mamba.verain
	None
32	CTF shall calculate STATE cleanup flow from the rated flow and STATE percent flow given in the VERAIn XML parameter list passed in through CTF_Coupling_Interface
	multistate/tests/verain_mamba.verain
	None
33	CTF shall pass STATE cleanup flow to MAMBA during a crud simulation when the mass balance model is enabled
	multistate/tests/verain_mamba.verain
	None
34	CTF shall pass coolant chemistry data read from the VERAIn XML parameter list for each state to MAMBA during a crud simulation
	multistate/tests/verain_mamba.verain
	None
35	CTF shall pass the reactor coolant system volume read from the VERAIn XML parameter list to MAMBA during a crud simulation when the mass balance model is enabled
	multistate/tests/verain_mamba.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
36	CTF shall calculate turbulent kinetic energy near the rod surfaces to be used in crud simulations for modeling crud erosion
	multistate/tests/verain_mamba.verain
	None
37	CTF shall write the absolute cleanup flowrate to the HDF5 file, properly adjusted for symmetry and core relative filtration rate
	multistate/tests/verain_mamba.verain
	None
38	CTF shall under-relax the fuel gap HTC when the dynamic gap model is used and when the user specifies an under-relaxation coefficient via input
	multistate/tests/verain_mamba.verain
	None
39	CTF shall apply a uniform distribution of inlet and outlet boundary conditions when being driven by an external code and no inlet or outlet boundary condition maps exist in the VERAIn XML parameter list that was set through the CTF_Coupling_Interface. ticket - 570
	multistate/tests/cross_par_depl.verain
	None
40	CTF shall directly read the inlet assembly temperature distribution if available in the VERAIn XML parameter list set through CTF_Coupling_Interface for the current state in the depletion. ticket - 570
	multistate/tests/cross_par_depl.verain
	None
41	CTF shall use the assembly boundary condition distribution map read for the previous state in the depletion when no boundary condition map is available for the current state in the depletion. This applies to when CTF is being driven by an external code and when it is passed a VERAIn XML parameter list through the CTF_Coupling_Interface. ticket - 570
	multistate/tests/cross_par_depl.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
42	Xml2ctf shall enable the fuel rod dynamic gap model when this option is set in the VERAIn input file.
	multistate/tests/cross_par_mamba.verain
	None
43	CTF shall write additional fuel rod solution data to the VERA HDF5 output file when the dynamic gap model is enabled in the CTF input deck. ticket - 573
	multistate/tests/cross_par_mamba.verain
	None
44	Multistate_cobra shall set coolant chemistry data in the CTF crud growth solution when this information is provided in the VERAIn input file
	multistate/tests/cross_par_mamba.verain
	None
45	Multistate_cobra shall use depletion information specified in the VERAIn input file to drive CTF through a depletion simulation
	multistate/tests/cross_par_mamba.verain
	None
46	The user shall be able to toggle the crud thermal feedback option via the VERAIn input file.
	multistate/tests/cross_par_mamba.verain
	None
47	CTF shall be able to couple to MAMBA for rods that fall on a symmetry line in a quarter symmetric model
	multistate/tests/cross_par_mamba.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
48	CTF shall be able to drive a crud simulation using MAMBA when running in parallel.
	multistate/tests/cross_par_mamba.verain
	None
49	CTF shall be able to read model inlet and outlet boundary conditions in any order rather than the user being forced to enter all inlet boundary conditions first and all outlet boundary conditions last
	multistate/tests/mcfr.mstate.inp
	None
50	CTF shall check if the solution is steady when using the steady state change-based convergence criteria even when the CTF timestep size is larger than the steady-state timestep check interval
	multistate/tests/mcfr.mstate.inp
	None
51	CTF shall be able to perform a coupled crud analysis coupled to Cicada on the rod surface reconstruction mesh
	multistate/tests/cicada_qtr_hi2lo5x5.verain
	None
52	CTF shall be able to read Cicada input options from the VERAIn XML parameter list.
	multistate/tests/cicada_qtr_hi2lo5x5.verain
	None
53	xml2ctf shall generate the CTF axial mesh from the coupling mesh instead of the axial edit bounds when it is present in the VERAIn XML parameter list. ticket - 560
	xml2ctf/unit_tests/coupling_mesh_test.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
54	xml2ctf shall create a CTF model so that it uses the change-based stopping criteria when any of those criteria are present in the COBRATF block of VERAIn when a PWR model is being modeled
	xml2ctf/tests/card19_pwr.verain
	None
55	xml2ctf shall pass the change-based stopping criteria specified in the COBRATF block of the VERAIn file to the CTF model being generated when a PWR model is being generated
	xml2ctf/tests/card19_pwr.verain
	None
56	xml2ctf shall create serial multi-assembly models of BWR-style cores from VERAIn.
	xml2ctf/tests/2x2_assem.verain
	None
57	xml2ctf shall generate a CTF model from VERAIn for the Problem 7 progression problem.
	xml2ctf/tests/Sample_p7.verain
	None
58	xml2ctf shall generate a CTF model from VERAIn of the single-assembly, quarter-symmetry Problem 6 progression problem when the parallel option is activated in xml2ctf using four processors per assembly
	xml2ctf/tests/Sample_p6a_ppa4.verain
	None
59	xml2ctf shall default to generating a parallel CTF model using four processors per assembly when no parallel option is given in the VERAIn COBRATF block
	xml2ctf/tests/Sample_p6a_ppa4.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
60	xml2ctf shall generate a serial quarter-rotational-symmetry model of a small core containing assemblies with large water rods
	xml2ctf/tests/CE_16x16_quarter_rotational.verain
	None
61	xml2ctf shall set the fluid property evaluations in the CTF model to the ASME 1968 lookup tables when this option is set in the VERAIn file
	xml2ctf/tests/small_qtr_core_3x3rod_HFP.verain
	None
62	xml2ctf shall generate the Case5-13 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-13.verain
	None
63	xml2ctf shall generate a serial CTF model of a single PWR full-symmetry assembly containing large water rods from a VERAIn file of this model
	xml2ctf/tests/pwr_CE_single_16x16.verain
	None
64	xml2ctf shall generate the Case5-01 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-01.verain
	None
65	xml2ctf shall generate a serial quarter-rotational-symmetry model of a large core containing assemblies with large water rods
	xml2ctf/tests/large_ce.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
66	xml2ctf shall generate a CTF model from VERAIn of the single-assembly, full-symmetry Problem 6 progression problem when the parallel option is activated in xml2ctf using one processor per assembly
	xml2ctf/tests/Sample_p6a_parallel.verain
	None
67	xml2ctf shall generate the Case5-03 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-03.verain
	None
68	xml2ctf shall generate the Case5-11 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-11.verain
	None
69	xml2ctf shall set the flow in the CTF model taking into consideration the bypass flow specified in the first STATE of the VERAIn model
	xml2ctf/tests/bypass.verain
	None
70	xml2ctf shall set the flow in the CTF model taking into consideration the flow percentage specified in the first STATE of the VERAIn model
	xml2ctf/tests/bypass.verain
	None
71	xml2ctf shall generate a CTF model of the CASL single HFP rod benchmark problem starting from a VERAIn model of the benchmark problem
	xml2ctf/tests/small_singlerod_HFP.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
72	xml2ctf shall use the axial edit bounds in the VERAIn file to generate the axial mesh in the CTF model when a coupling mesh is not present in the XML parameter list
	xml2ctf/tests/small_singlerod_HFP.verain
	None
73	xml2ctf shall ignore spacer grids specified in the VERAIn model when they fall outside of the region that will be used to create the CTF model
	xml2ctf/tests/small_singlerod_HFP.verain
	None
74	xml2ctf shall create a CTF model for a PWR assembly that has guide tubes and instrument tubes with different dimensions from each other
	xml2ctf/tests/unique_instrument.verain
	None
75	xml2ctf shall accept the grid blockage ratio as an input from the VERAIn file and use this value to set the grid blockage ratio in the CTF model
	xml2ctf/tests/grid_enhance.verain
	None
76	xml2ctf shall pick the longest axial fuel region as the representative fuel rod geometry for the entire length of the rod when a rod contains multiple fuel regions
	xml2ctf/tests/plenum_bug.verain
	None
77	xml2ctf shall generate a parallel quarter-rotational-symmetry model of a core containing assemblies with large water rods using 16 processors per assembly for the domain decomposition
	xml2ctf/tests/CE_16x16_quarter_rotational_ppa16.verain
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
78	xml2ctf shall generate a CTF model from VERAIn of a BWR assembly containing a large water rod in the lattice
	xml2ctf/tests/cell_large.verain
	None
79	xml2ctf shall generate a CTF model from VERAIn that has fuel rods with no pellet/clad gap.
	xml2ctf/tests/bwr_nogap.verain
	None
80	xml2ctf shall enable the change-based stopping criteria in the CTF model for a BWR model when this option is enabled in the VERAIn file
	xml2ctf/tests/new_conv_metrics_defaults.verain
	None
81	xml2ctf shall generate a CTF model from VERAIn of a single-assembly BWR model containing single pincell guide tubes
	xml2ctf/tests/bwr-peach-6.verain
	None
82	xml2ctf shall pass the heat transfer under-relaxation coefficient from the VERAIn COBRATF block to the CTF model if one is provided
	xml2ctf/tests/bwr-peach-6.verain
	None
83	xml2ctf shall read the BISON block to obtain pellet and clad roughness and use this in creating the CTF input file
	xml2ctf/tests/bwr-peach-6.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
84	xml2ctf shall generate a parallel quarter-rotational-symmetry model of a core containing assemblies with large water rods using 9 processors per assembly for the domain decomposition
	xml2ctf/tests/CE_16x16_quarter_rotational_ppa9.verain
	None
85	xml2ctf shall enable the W-3 CHF correlation during the CTF simulation (enables post-CHF heat transfer) when this option is enabled in VERAIn
	xml2ctf/tests/w3_correlation.verain
	None
86	xml2ctf shall generate the Case5-15 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-15.verain
	None
87	xml2ctf shall enable the change-based stopping criteria in the CTF model for a PWR model when this option is enabled in the VERAIn file
	xml2ctf/tests/new_conv_metrics_defaults_pwr.verain
	None
88	xml2ctf shall generate the Case5-07 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-07.verain
	None
89	xml2ctf shall generate the Case5-19 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-19.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
90	xml2ctf shall include inactive (unheated) regions specified in the VERAIn file when generating the CTF model
	xml2ctf/tests/modeling_plenums.verain
	None
91	xml2ctf shall model IFBA rods so that the IFBA layer is merged into the pellet region of the nuclear fuel rod in the CTF model
	xml2ctf/tests/small_3x3rod_IFBA.verain
	None
92	xml2ctf shall apply inlet boundary condition distribution maps found in the first state of the VERAIn file to the corresponding channels in the CTF model it generates
	xml2ctf/tests/Sample_qtr_core_inlet_bc.verain
	None
93	xml2ctf shall model solid BP rods specified in VERAIn as solid Zircaloy rods in the CTF model
	xml2ctf/tests/small_3x3rod_BProd.verain
	None
94	xml2ctf shall generate a CTF model with no gaps when this option is set in the VERAIn file
	xml2ctf/tests/miscellaneous_cobratf_block.verain
	None
95	xml2ctf shall enable the transient DNB model when this option is set in the VERAIn file
	xml2ctf/tests/miscellaneous_cobratf_block.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
96	xml2ctf shall generate a CTF model from VERAIn that contains solid rods in the lattice for BWR models.
	xml2ctf/tests/bwr_solid_rod.verain
	None
97	xml2ctf shall generate a CTF model for cores containing more than one assembly type.
	xml2ctf/tests/5cross_multiassem.verain
	None
98	xml2ctf shall generate a CTF model from VERAIn containing annular fuel geometry for fuel rods specified in the VERAIn model having this geometry
	xml2ctf/tests/annular_test.verain
	None
99	xml2ctf shall generate a parallel CTF model of a quarter-rotational-symmetric PWR core of assemblies containing large water rods using one processor per assembly when this is modeled in VERAIn
	xml2ctf/tests/small_CE_par.verain
	None
100	xml2ctf shall read the mixing coefficient from the VERAIn file if provided and use it to set the mixing coefficient in the CTF model
	xml2ctf/tests/mixing-coeff.verain
	None
101	xml2ctf shall read the void drift coefficient from the VERAIn file if provided and use it to set the void drift coefficient in the CTF model
	xml2ctf/tests/mixing-coeff.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
102	xml2ctf shall use the inlet boundary condition maps if specified in the VERAIn file to set the inlet boundary conditions in the CTF model for quarter symmetry models
	xml2ctf/tests/inlet_bc_rot_sym.verain
	None
103	xml2ctf shall generate the Case5-05 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-05.verain
	None
104	xml2ctf shall generate the Case5-09 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-09.verain
	None
105	xml2ctf shall generate the Case5-17 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-17.verain
	None
106	xml2ctf shall generate a CTF model from a VERAIn file that contains multiple lattices that contain fuel having the same radial geometry
	xml2ctf/tests/Sample_p6a_multifuel.verain
	None
107	xml2ctf shall generate a CTF model from a VERAIn file that contain different fuel types in the radial direction of the lattice
	xml2ctf/tests/Sample_p6a_multifuel.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
108	xml2ctf shall generate a CTF model from a VERAIn file that models fuel rods using a constant gap conductanc
	xml2ctf/tests/Sample_p6a_multifuel.verain
	None
109	xml2ctf shall create a full symmetry parallel CTF model using four processors per assembly for prototypical PWR geometry when instructed by the VERAIn model
	xml2ctf/tests/full_sym_4x.verain
	None
110	xml2ctf shall generate the Case5-12 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-12.verain
	None
111	xml2ctf shall generate the Case5-00 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-00.verain
	None
112	xml2ctf shall generate a serial CTF model of a quarter-rotational-symmetric PWR core when this is modeled in VERAIn
	xml2ctf/tests/rotational_5cross.verain
	None
113	xml2ctf shall create a CTF model so that it uses the change-based stopping criteria when any of those criteria are present in the COBRATF block of VERAIn when a BWR model is being generated
	xml2ctf/tests/card19.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
114	xml2ctf shall pass the change-based stopping criteria specified in the COBRATF block of the VERAIn file to the CTF model being generated when a BWR model is being generated
	xml2ctf/tests/card19.verain
	None
115	xml2ctf shall enable the fluid VTK edit option in CTF when this option is enabled in the COBRATF block of the VERAIn file
	xml2ctf/tests/VTK_on.verain
	None
116	xml2ctf shall enable the rod VTK edit option in CTF when this option is enabled in the COBRATF block of the VERAIn file
	xml2ctf/tests/VTK_on.verain
	None
117	xml2ctf shall use the original stopping criteria when the change-based criteria are shut off in the VERAIn file for a PWR model
	xml2ctf/tests/new_conv_metrics_off_pwr.verain
	None
118	xml2ctf shall set the CTF model to use the IAPWS fluid property evaluations when this option is set in the VERAIn file
	xml2ctf/tests/iapws_singlerod.verain
	None
119	xml2ctf shall pass the heat transfer coefficient under-relaxation coefficient to the CTF model for PWR models when it is specified in the VERAIn file
	xml2ctf/tests/small_5cross_assem_3x3rod_HFP.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
120	xml2ctf shall generate a parallel CTF model using one processor per assembly for a full-symmetry PWR model when this option is specified in the VERAIn file
	xml2ctf/tests/par_cross.verain
	None
121	xml2ctf shall generate a parallel CTF model of a quarter-rotational-symmetric PWR core of assemblies containing large water rods using four processors per assembly when this is modeled in VERAIn
	xml2ctf/tests/small_CE_par4.verain
	None
122	xml2ctf shall generate the Case5-02 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-02.verain
	None
123	xml2ctf shall generate a parallel CTF model using four processors per assembly for the parallel decomposition when instructed to do so in the VERAIn file
	xml2ctf/tests/cross_4x_refine.verain
	None
124	xml2ctf shall setup a tube geometry in the CTF model when an instrument tube is specified in the lattice in the VERAIn file
	xml2ctf/tests/instrument_tube.verain
	None
125	xml2ctf shall setup the CTF model to use the Chen boiling model when this option is set in the COBRATF block of the VERAIn file
	xml2ctf/tests/chen_3x3.verain
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
126	xml2ctf shall generate the Case5-10 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-10.verain
	None
127	xml2ctf shall generate a parallel CTF model using one processor per assembly for a quarter symmetry PWR model when this option is specified in the VERAIn file
	xml2ctf/tests/par_qtr_core_inlet_bc.verain
	None
128	xml2ctf shall generate a CTF model from VERAIn that contains solid rods in the lattice for PWR models.
	xml2ctf/tests/p6_solid_rod.verain
	None
129	xml2ctf shall disable the VERA HDF5 output file in the CTF model when this option is disabled in the VERAIn file
	xml2ctf/tests/hdf5_convergence_edit.verain
	None
130	xml2ctf shall disable the convergence output file in the CTF model when this option is disabled in the VERAIn file
	xml2ctf/tests/hdf5_convergence_edit.verain
	None
131	xml2ctf shall generate the Case5-14 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-14.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
132	xml2ctf shall generate the Case5-06 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-06.verain
	None
133	xml2ctf shall generate parallel multi-assembly BWR models from VERAIn using one processor per assembly
	xml2ctf/tests/2x2_assem_par.verain
	None
134	xml2ctf shall generate a CTF model from VERAIn of core designs with assemblies containing full large water rods so that they are correctly treated in parallel models
	xml2ctf/tests/ce3x3.verain
	None
135	xml2ctf shall enable the CTF fuel dynamic gap model when this option is enabled in VERAIn
	xml2ctf/tests/5cross_dynamic.verain
	None
136	xml2ctf shall use the fuel rod plenum pressure defined in the Bison block of VERAIn, if available, to define the initial pressure in CTF fuel rods when using the dynamic gap model in CTF
	xml2ctf/tests/5cross_dynamic.verain
	None
137	xml2ctf shall use the pellet surface roughness from the Bison block of VERAIn to specify CTF fuel rod pellet surface roughness when using the dynamic gap model in CTF
	xml2ctf/tests/5cross_dynamic.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
138	xml2ctf shall use the clad surface roughness from the Bison block of VERAIn to specify CTF fuel rod inner clad surface roughness when using the dynamic gap model in CTF
	xml2ctf/tests/5cross_dynamic.verain
	None
139	xml2ctf shall generate the Case5-04 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-04.verain
	None
140	xml2ctf shall enable the rod output file in CTF when this option is enabled in the VERAIn file.
	xml2ctf/tests/test_cobra_edits.verain
	None
141	xml2ctf shall include the baffle gap region in the flow area in the CTF model when a baffle gap is specified in the VERAIn file
	xml2ctf/tests/cross_w_baffle.verain
	None
142	xml2ctf shall include the baffle wetted perimeter in the CTF model when one is included in the VERAIn file
	xml2ctf/tests/cross_w_baffle.verain
	None
143	xml2ctf shall generate the Case5-16 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-16.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
144	xml2ctf shall generate the Case5-08 regression test CTF model from the VERAIn file.
	xml2ctf/tests/case5-08.verain
	None
145	xml2ctf shall generate a parallel CTF model of a quarter-mirror-symmetric PWR core using four processors per assembly when this option is set in the VERAIn file
	xml2ctf/tests/refined_dom.verain
	None
146	xml2ctf shall use the original stopping criteria when the change-based criteria are shut off in the VERAIn file for a BWR model
	xml2ctf/tests/new_conv_metrics_off.verain
	None
147	xml2ctf shall generate a parallel CTF model of a quarter-rotational-symmetric PWR core using four processors per assembly when this model is specified in the VERAIn file
	xml2ctf/tests/rotational_4x.verain
	None
148	xml2ctf shall apply a default grid loss coefficient in the CTF model to all spacer grids defined in the VERAIn file if they are not explicitly defined by the user in the VERAIn file
	xml2ctf/tests/default_grid_data.verain
	None
149	xml2ctf shall apply a default grid blockage ratio in the CTF model to all spacer grids defined in the VERAIn file if they are not explicitly defined by the user in the VERAIn file
	xml2ctf/tests/default_grid_data.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
150	xml2ctf shall support setting up multiple grid types having different geometries in the CTF model when multiple grid types are modeled in VERAIn
	xml2ctf/tests/default_grid_data.verain
	None
151	xml2ctf shall generate a serial CTF model for a single quarter-rotational-symmetric assembly containing large water rods starting from VERAIn
	xml2ctf/tests/CE_16x16_single_rot.verain
	None
152	The CTFFUtils package shall provide a method for performing a 1D linear interpolation
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
153	The CTFFUtils package shall provide a method for performing a 2D linear interpolation
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
154	The CTFFUtils package shall provide a method for determining the number of space-delimited values in a string
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
155	The CTFFUtils package shall provide a method for determining the number of remaining lines in an open file
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
156	The CTFFUtils package shall provide a method for reducing a list of integers to a list of unique integers, where each value appears only once in the reduced list
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
157	The CTFFUtils package shall provide a derived type that is a container for lists of the real values
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
158	The CTFFUtils package shall provide a derived type that is a container for lists of the logical values
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
159	The CTFFUtils package shall provide a derived type that is a container for lists of the integer values
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
160	The CTFFUtils package shall provide a method for finding the first instance of an integer in a list of integers
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
161	The CTFFUtils package shall provide a method for finding the indices of values in a list of integers that satisfy a mask condition
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
162	The CTFFUtils package shall provide a method for performing a numerical integration using Simpson's rule
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
163	The CTFFUtil flip2D procedure shall perform an in-place flip of a matrix over the horizontal symmetry line when the flip axis is set to horizontal. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
164	The CTFFUtil flip2D procedure shall perform an in-place flip of a matrix over the vertical symmetry line when the flip axis is set to vertical. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
165	The CTFFUtils flip2D procedure shall work for a size 1 array. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
166	The CTFFUtils flip2D procedure shall work for a square array with size greater than one. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
167	The CTFFUtils flip2D procedure shall work for a non-square array with size greater than one. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
168	The CTFFUtils flip1D procedure shall work for a size 1 array. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
169	The CTFFUtils flip1D procedure shall work for an array greater than size one. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
170	The CTFFUtils flip1D procedure shall reverse the direction of a 1D integer array.
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
171	The CTFFUtils rotate2DArrayClockwise shall perform an in-place rotation of an integer 2D array of any shape so the result is rotated 90 degrees in the clockwise direction. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
172	The CTFFUtils isQuarterMirrorSymmetric procedure shall return True when a passed 2D integer array is mirror symmetric. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
173	The CTFFUtils isQuarterRotationalSymmetric procedure shall return True when a passed 2D integer array is rotationally symmetric. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
174	The CTFFUtils isMirrorSymmetric procedure shall return .true. for a size 1 vector. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
175	The CTFFUtils isMirrorSymmetric procedure shall correctly identify a mirror symmetric vector. ticket - 570
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
176	The CTFFUtils isQuarterRotationalSymUnique procedure shall correctly identify an even size array as quarter rotational symmetric
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
177	The CTFFUtils isQuarterRotationalSymUnique procedure shall identify a non-square array as not symmetric
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
178	The CTFFUtils isQuarterRotationalSymUnique procedure shall identify a size one array as symmetric
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
179	The CTFFUtils isQuarterRotationalSymUnique procedure shall identify an odd size quarter rotational symmetric array with unique symmetry line index as symmetric
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
180	The CTFFUtils isQuarterRotationalSymUnique procedure shall identify a truly rotational symmetric array as not uniquely rotational symmetric
	Utils/CTFFUtils/unit_tests/Test_CTFFUtils_mod.F90
	None
181	CTF shall allow the user to model dynamic fuel rod pellet/clad gap behavior
	test_matrix/coverage_cases/cov28.inp
	None
182	CTF shall allow the user to specify spacer grid geometry information and calculate form losses from this input geometry
	test_matrix/coverage_cases/cov15.inp
	None
183	CTF shall accept input from the user specifying how lateral momentum convects across a section boundary from one lateral flow path to another lateral flow path in a different axial section
	test_matrix/coverage_cases/cov01.inp
	None
184	CTF shall accept input from the user specifying that the lateral momentum in one lateral flow path in an axial section will dissipate when flowing into an adjacent axial section
	test_matrix/coverage_cases/cov01.inp
	None
185	CTF shall allow a channel in one axial section to split into multiple channels in an adjacent axial section
	test_matrix/coverage_cases/cov01.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
186	CTF shall allow multiple channels in one axial section to coalesce into one channel in an adjacent axial section
	test_matrix/coverage_cases/cov01.inp
	None
187	CTF shall model dispersed flow film boiling heat transfer.
	test_matrix/coverage_cases/cov29.inp
	None
188	CTF shall allow the user to specify a constant gap conductance in a nuclear fuel rod object
	test_matrix/coverage_cases/cov17.inp
	None
189	CTF shall allow the user to specify the orientation of lateral flow paths to one another (how lateral flow paths connect to one another laterally)
	test_matrix/coverage_cases/cov02.inp
	None
190	CTF shall allow user to perform a Gaussian elimination solution of the pressure matrix.
	test_matrix/coverage_cases/cov12.inp
	None
191	CTF shall allow the user to model an unheated solid object in the model.
	test_matrix/coverage_cases/cov12.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
192	CTF shall allow the user to model a solid rod geometry.
	test_matrix/coverage_cases/cov12.inp
	None
193	CTF shall set default stopping criteria if the user does not specify them.
	test_matrix/coverage_cases/cov12.inp
	None
194	CTF shall allow the user to specify a pressure sink boundary condition
	test_matrix/coverage_cases/cov07.inp
	None
195	CTF shall allow the user to model a flat plate geometry object.
	test_matrix/coverage_cases/cov13.inp
	None
196	CTF shall allow the user to select the Rogers and Rosehart model for calculating the turbulent mixing coefficient
	test_matrix/coverage_cases/cov13.inp
	None
197	CTF shall allow the user to specify the two-phase multiplier in the Beus model.
	test_matrix/coverage_cases/cov13.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
198	The user shall be able to specify a mass flow rate and enthalpy injection boundary condition in the interior of the model (not on a model boundary)
	test_matrix/coverage_cases/cov05.inp
	None
199	CTF shall model a phase interface between adjacent control volumes in different axial sections when the control volume in the lower section contains the vapor
	test_matrix/coverage_cases/cov39.inp
	None
200	CTF shall model a phase interface between adjacent control volumes in different axial sections when the control volume in the lower section contains the liquid
	test_matrix/coverage_cases/cov38.inp
	None
201	CTF shall allow the user to model a steady state solution using the mass and energy storage stopping criteria
	test_matrix/coverage_cases/cov10.inp
	None
202	The user shall be able to specify a mass flow rate boundary condition at the channel inlet
	test_matrix/coverage_cases/cov04.inp
	None
203	CTF shall allow the user to disable the solid heat conduction solution so that all energy generated in the rod is deposited directly into the connected channels
	test_matrix/coverage_cases/cov42.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
204	CTF shall model the grid spacer cooling enhancement effect on single-phase liquid heat transfer as modeled by the Yao-Hochreiter-Leech model
	test_matrix/coverage_cases/cov40.inp
	None
205	CTF shall model the grid spacer cooling enhancement effect on single-phase vapor heat transfer as modeled by the Yao-Hochreiter-Leech model
	test_matrix/coverage_cases/cov40.inp
	None
206	CTF shall model steady-state simulations using a solution change-based stopping criteria.
	test_matrix/coverage_cases/cov50.inp
	None
207	CTF shall allow the user to specify spacer grid vane angle when applying the Yao-Hochreiter-Leech grid spacer cooling enhancement model
	test_matrix/coverage_cases/cov44.inp
	None
208	CTF shall allow the user to specify spacer grid blockage ratio to enable the Yao-Hochreiter-Leech grid spacer cooling enhancement model
	test_matrix/coverage_cases/cov44.inp
	None
209	CTF shall model two-phase stratified flow.
	test_matrix/coverage_cases/cov47.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
210	CTF shall allow the user to specify zero mass flow rate boundary conditions to create a wall in the model
	test_matrix/coverage_cases/cov47.inp
	None
211	CTF shall be able to model zero flow in a model.
	test_matrix/coverage_cases/cov47.inp
	None
212	CTF shall allow the user to apply a transient forcing function to the pressure boundary condition
	test_matrix/coverage_cases/cov46.inp
	None
213	CTF shall allow the user to specify a variable size axial mesh.
	test_matrix/coverage_cases/cov09.inp
	None
214	CTF shall allow the user to specify form loss coefficients for specific channel and level combinations
	test_matrix/coverage_cases/cov09.inp
	None
215	CTF shall model nuclear fuel rod geometry.
	test_matrix/coverage_cases/cov09.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
216	CTF shall model tube geometry.
	test_matrix/coverage_cases/cov09.inp
	None
217	CTF shall accept any number of material property tables of temperature dependent thermal conductivity and specific heat
	test_matrix/coverage_cases/cov09.inp
	None
218	CTF shall allow the user to apply a material property table to a region in a solid object in the model.
	test_matrix/coverage_cases/cov09.inp
	None
219	CTF shall accept any number of axial power profile tables.
	test_matrix/coverage_cases/cov09.inp
	None
220	CTF shall allow the user to apply an axial power profile table to any solid object in the model.
	test_matrix/coverage_cases/cov09.inp
	None
221	CTF shall allow the user to change the axial power profile table applied to a rod throughout the transient
	test_matrix/coverage_cases/cov09.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
222	CTF shall allow the user to apply a transient power forcing function to the model power.
	test_matrix/coverage_cases/cov09.inp
	None
223	CTF shall allow the user to change the solid power factors throughout the transient.
	test_matrix/coverage_cases/cov09.inp
	None
224	CTF shall allow the user to specify a constant turbulent mixing coefficient in the turbulent diffusion approximation model
	test_matrix/coverage_cases/cov09.inp
	None
225	CTF shall allow the user to specify a void drift coefficient in the input deck for the void drift model.
	test_matrix/coverage_cases/cov09.inp
	None
226	CTF shall allow the user to specify a combined mass flow rate and enthalpy boundary condition at the inlet of the model
	test_matrix/coverage_cases/cov09.inp
	None
227	CTF shall allow the user to specify a pressure and enthalpy boundary condition at the outlet of the model
	test_matrix/coverage_cases/cov09.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
228	CTF shall allow the user to model a transient.
	test_matrix/coverage_cases/cov09.inp
	None
229	CTF shall model droplet entrainment.
	test_matrix/coverage_cases/cov34.inp
	None
230	CTF shall model droplet deposition.
	test_matrix/coverage_cases/cov34.inp
	None
231	CTF shall be able to model single phase flow that enters the top of the model and leaves the bottom of the model
	test_matrix/coverage_cases/cov08.inp
	None
232	CTF shall be able to model a multi-channel model with no lateral connections between the channels
	test_matrix/coverage_cases/cov08.inp
	None
233	CTF shall model the small bubble flow regime.
	test_matrix/coverage_cases/cov36.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
234	CTF shall model the large bubble flow regime in the control volume next to a pressure sink boundary condition
	test_matrix/coverage_cases/cov36.inp
	None
235	CTF shall model the bottom reflood flow regime.
	test_matrix/coverage_cases/cov37.inp
	None
236	CTF shall model the churn turbulent flow regime in the control volume next to a pressure sink boundary condition
	test_matrix/coverage_cases/cov37.inp
	None
237	CTF shall model subcooled boiling heat transfer between a solid object and connected channel in the model
	test_matrix/coverage_cases/cov37.inp
	None
238	CTF shall model transition boiling heat transfer between a solid object and connected channel in the model
	test_matrix/coverage_cases/cov37.inp
	None
239	CTF shall model the large bubble (slug) flow regime.
	test_matrix/coverage_cases/cov33.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
240	CTF shall model the churn-turbulent flow regime.
	test_matrix/coverage_cases/cov33.inp
	None
241	CTF shall model spacer grid droplet breakup.
	test_matrix/coverage_cases/cov27.inp
	None
242	CTF shall accept channel geometry variation tables from user input
	test_matrix/coverage_cases/cov26.inp
	None
243	CTF shall allow the user to apply a geometry variation table to lateral flow path width along the model axial direction
	test_matrix/coverage_cases/cov26.inp
	None
244	CTF shall allow the user to apply a geometry variation table to a channel flow area along the model axial direction
	test_matrix/coverage_cases/cov26.inp
	None
245	CTF shall allow the user to apply a geometry variation table to a channel wetted perimeter along the model axial direction
	test_matrix/coverage_cases/cov26.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
246	CTF shall model grid re-wetting.
	test_matrix/coverage_cases/cov26.inp
	None
247	CTF shall model model canister re-wetting.
	test_matrix/coverage_cases/cov26.inp
	None
248	CTF shall perform a steady-state solution of the nuclear fuel rod temperature distribution with dynamic gap conductance model enabled. ticket - 288
	test_matrix/coverage_cases/cov32.inp
	None
249	CTF shall model fuel pellet relocation in nuclear fuel rods.
	test_matrix/coverage_cases/cov30.inp
	None
250	CTF shall model fuel pellet degradation in nuclear fuel rods.
	test_matrix/coverage_cases/cov30.inp
	None
251	CTF shall allow the user to disable lateral cross-flow caused by turbulent mixing.
	test_matrix/coverage_cases/cov18.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
252	CTF shall allow the user to specify a transient forcing function on the mass flow rate and enthalpy boundary condition
	test_matrix/coverage_cases/cov18.inp
	None
253	CTF shall allow the user to connect the same two channels with multiple unique lateral flow paths
	test_matrix/coverage_cases/cov19.inp
	None
254	CTF shall allow the user to specify multiple time groups in the transient.
	test_matrix/coverage_cases/cov19.inp
	None
255	CTF shall allow the user to specify that a uniform axial mesh be generated for an axial section
	test_matrix/coverage_cases/cov19.inp
	None
256	CTF shall allow the user to specify a radial power shape in the nuclear fuel rod pellet via the CTF input deck
	test_matrix/coverage_cases/cov31.inp
	None
257	CTF shall allow the user to specify a constant gap conductance in the fuel rod pellet/clad gap as a function of axial location
	test_matrix/coverage_cases/cov31.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
258	CTF shall be capable of modeling BWR geometry with partial length rods ending in a section prior to the top of the model
	test_matrix/large_test_cases/atrium10_deck_no_bypass_or_water_rod.inp
	None
259	CTF shall match the analytical solution for equilibrium flow distribution in a two-channel, single-phase system with no turbulent mixing
	test_matrix/verification/flow_split/flow_split.inp
	None
260	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle with a rough guide tube in the center position (all other rods identical geometry and smooth surface) when using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/cc_test3c.inp
	None
261	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with all rods having identical geometry, a smooth surface, and no wall around the bundle when using the Churchill friction correlation
	test_matrix/verification/friction/rc_test1d.inp
	None
262	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle with a rough guide tube in the center position (all other rods identical geometry and smooth surface) when using the McAdams friction correlation
	test_matrix/verification/friction/cc_test3b.inp
	None
263	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of smooth rods with one larger guide tube in the center position and no wall around the bundle using the Churchill friction correlation
	test_matrix/verification/friction/cc_test2d.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
264	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle with a rough guide tube in the center position (all other rods identical geometry and smooth surface) when using the original CTF friction correlation
	test_matrix/verification/friction/cc_test3a.inp
	None
265	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of smooth rods with one larger guide tube in the center position and no wall around the bundle using a custom friction correlation
	test_matrix/verification/friction/cc_test2e.inp
	None
266	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of smooth rods with one larger guide tube in the center position and no wall around the bundle using the original CTF friction correlation
	test_matrix/verification/friction/cc_test2a.inp
	None
267	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle with a rough guide tube in the center position (all other rods identical geometry and smooth surface) when using a user-defined custom friction correlation
	test_matrix/verification/friction/cc_test3e.inp
	None
268	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with all rods having identical geometry, a smooth surface, and no wall around the bundle when using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/rc_test1c.inp
	None
269	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with all rods having identical geometry, a smooth surface, and no wall around the bundle when using the McAdams friction correlation
	test_matrix/verification/friction/rc_test1b.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
270	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle with a rough guide tube in the center position (all other rods identical geometry and smooth surface) when using the Churchill friction correlation
	test_matrix/verification/friction/cc_test3d.inp
	None
271	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of smooth rods with one larger guide tube in the center position and no wall around the bundle using the McAdams friction correlation
	test_matrix/verification/friction/cc_test2b.inp
	None
272	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with all rods having identical geometry, having a smooth surface, and no wall around the bundle when using the original CTF friction correlation
	test_matrix/verification/friction/rc_test1a.inp
	None
273	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of smooth rods with one larger guide tube in the center position and no wall around the bundle using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/cc_test2c.inp
	None
274	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with a wall around the bundle using the Churchill friction correlation
	test_matrix/verification/friction/cc_test4d.inp
	None
275	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with a wall around the bundle using a user-defined custom CTF friction correlation
	test_matrix/verification/friction/cc_test4e.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
276	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, rough rods with a wall around the bundle using the original CTF friction correlation
	test_matrix/verification/friction/cc_test5a.inp
	None
277	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, rough rods with a wall around the bundle using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/cc_test5c.inp
	None
278	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, rough rods with a wall around the bundle using the McAdams friction correlation
	test_matrix/verification/friction/cc_test5b.inp
	None
279	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with a wall around the bundle using the McAdams friction correlation
	test_matrix/verification/friction/cc_test4b.inp
	None
280	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with a wall around the bundle using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/cc_test4c.inp
	None
281	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, rough rods with a wall around the bundle using a custom user-defined friction correlation
	test_matrix/verification/friction/cc_test5e.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
282	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with a wall around the bundle using the original CTF friction correlation
	test_matrix/verification/friction/cc_test4a.inp
	None
283	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, rough rods with a wall around the bundle using the Churchill friction correlation
	test_matrix/verification/friction/cc_test5d.inp
	None
284	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with no wall around the bundle using the McAdams friction correlation
	test_matrix/verification/friction/cc_test1b.inp
	None
285	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, only the guide tube has a surface roughness, and no wall around the bundle when using the Churchill friction correlation
	test_matrix/verification/friction/rc_test3d.inp
	None
286	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, all rods having a smooth surface, and no wall around the bundle when using the original CTF friction correlation
	test_matrix/verification/friction/rc_test2a.inp
	None
287	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with no wall around the bundle using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/cc_test1c.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
288	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with no wall around the bundle using the original CTF friction correlation
	test_matrix/verification/friction/cc_test1a.inp
	None
289	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, all rods having a smooth surface, and no wall around the bundle when using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/rc_test2c.inp
	None
290	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, all rods having a smooth surface, and no wall around the bundle when using the McAdams friction correlation
	test_matrix/verification/friction/rc_test2b.inp
	None
291	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with no wall around the bundle using the Churchill friction correlation
	test_matrix/verification/friction/cc_test1d.inp
	None
292	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, only the guide tube has a surface roughness, and no wall around the bundle when using the McAdams friction correlation
	test_matrix/verification/friction/rc_test3b.inp
	None
293	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, only the guide tube has a surface roughness, and no wall around the bundle when using the Zigrang-Sylvester friction correlation
	test_matrix/verification/friction/rc_test3c.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
294	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle of identical geometry, smooth rods with no wall around the bundle using a user-specified friction correlation
	test_matrix/verification/friction/cc_test1e.inp
	None
295	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, only the guide tube has a surface roughness, and no wall around the bundle when using the original CTF friction correlation
	test_matrix/verification/friction/rc_test3a.inp
	None
296	CTF shall match the analytical solution for outlet flow distribution in a 3x3 rod bundle modeled using a rod-centered approach with a larger central guide tube, all rods having a smooth surface, and no wall around the bundle when using the Churchill friction correlation
	test_matrix/verification/friction/rc_test2d.inp
	None
297	CTF shall match the analytical solution for the W-3 predicted CHF in a channel adjacent to both a heated surface and an unheated surface with the cold-wall factor enabled
	test_matrix/verification/tong_coldwall/tong_verify_coldwall.inp
	None
298	CTF shall match the analytical solution for turbulent mixing of energy in a system of two identical geometry channels with different inlet enthalpies
	test_matrix/verification/turb_mixing/solutionVerification.master
	None
299	CTF shall match the analytical solution for turbulent mixing of energy in a system of two identical geometry channels with different inlet enthalpies
	test_matrix/verification/turb_mixing/turb_mixing.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
300	CTF shall match the analytical solution for equilibrium quality axial distribution in pin-cell geometry with prescribed cosine power shape
	test_matrix/verification/tong/tong_verify_singlerod.inp
	None
301	CTF shall match the analytical solution for the W-3 model Tong factor in a pin-cell geometry with prescribed cosine power shape
	test_matrix/verification/tong/tong_verify_singlerod.inp
	None
302	CTF shall be able to match the analytical solution of the temperature distribution for flow in a tube that connects to an adiabatic boundary condition on its exterior with constant heat transfer coefficient and bulk temperature
	test_matrix/verification/heat_exchanger/solutionVerification.master
	None
303	CTF shall model advection of a cosine-shaped change to inlet enthalpy in a constant-velocity single channel to within an acceptable accuracy
	test_matrix/verification/isokinetic_advection/isoad_cosine.inp
	None
304	CTF shall model advection of a hyperbolic-tangent-shaped change to inlet enthalpy in a constant-velocity single channel to within an acceptable accuracy
	test_matrix/verification/isokinetic_advection/isoad_tanh.inp
	None
305	CTF shall model advection of a square-shaped change to inlet enthalpy in a constant-velocity single channel to within an acceptable accuracy
	test_matrix/verification/isokinetic_advection/isoad_square.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
306	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with a constant gap conductance specified
	test_matrix/verification/fuel_temp/const_kfuel/testno1.inp
	None
307	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance and 2.5 % gadolinia and burnup of 10 GWd/MTU content when using the Modified NFI correlation
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test1h.inp
	None
308	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance and 0 % gadolinia content when using the Modified NFI correlation
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test1a.inp
	None
309	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance, 5 % gadolinia content, and 50 GWd/MTU exposure when using the Halden correlation
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test2o.inp
	None
310	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance and 5 % gadolinia content when using the Modified NFI correlation
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test1c.inp
	None
311	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance and 2.5 % gadolinia content when using the Modified NFI correlation
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test1b.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
312	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance, 5 % gadolina content, and 50 GWd/MTU exposure when using the Duriez/Modified NFI correlation for MOX fuel
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test3o.inp
	None
313	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance, 5 % gadolina content, and 50 GWd/MTU exposure when using the Halden correlation for MOX fuel
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test4o.inp
	None
314	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance when using the Modified NFI correlation and coarse radial mesh in the pellet region
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test1a_nful12.inp
	None
315	CTF shall match the analytical solution to within acceptable tolerance for centerline temperature in a nuclear fuel rod with constant gap conductance, 5 % gadolina content, and 50 GWd/MTU exposure when using the Amaya correlation for MOX fuel
	test_matrix/verification/fuel_temp/burn_kfuel/bgtd_test5o.inp
	None
316	CTF shall allow the user to use the PETSc BiCGStab solver for solving the linearized pressure matrix in a serial model
	test_matrix/ctf_regression/serial_petsc_solve.inp
	None
317	CTF shall be able to get an identical solution between serial and parallel runs of a PWR two-phase simulation when using a domain decomposition of one processor per physical assembly
	test_matrix/ctf_regression/tp_par_verify.verain
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
318	The user shall be able to disable the gravitational body force in PWR geometry.
	test_matrix/ctf_regression/gc4.inp
	None
319	CTF shall be able to model a quarter-symmetric multi-assembly rod-bundle geometry where the symmetry line runs through the channels in the model
	test_matrix/ctf_regression/even_sym_cross.inp
	None
320	CTF shall model PWR geometry with a non-uniform radial power distribution.
	test_matrix/ctf_regression/case5-18a.inp
	None
321	CTF shall model PWR geometry with a non-uniform axial power distribution.
	test_matrix/ctf_regression/case5-18a.inp
	None
322	CTF shall be capable of reading a VUQ multipliers file for applying multipliers to solution parameters
	test_matrix/ctf_regression/gc1.inp
	None
323	CTF shall be capable of applying a multiplier to disable the gravitational body force in the simulation
	test_matrix/ctf_regression/gc1.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
324	CTF shall allow the user to specify a spacer grid data file for capturing turbulence enhancement due to spacer grid vane effects
	test_matrix/ctf_regression/enh_turb_ixflow.inp
	None
325	CTF shall allow the user to model a heated tube with a single flow channel on the inside of the tube using direct heating. ticket - 527
	test_matrix/ctf_regression/inflow_1_in.inp
	None
326	CTF shall be able to model a pin-cell geometry at nominal PWR operating conditions.
	test_matrix/ctf_regression/small_singlerod_HFP.inp
	None
327	CTF shall be able to model a solid object that connects to only one axial level in an adjacent channel. ticket - 378
	test_matrix/ctf_regression/rod_in_2.inp
	None
328	CTF shall allow the user to model a solid that starts in any axial section in the model. ticket - 375
	test_matrix/ctf_regression/rod_in_2.inp
	None
329	CTF shall allow the user to model a solid that ends in any axial section in the model. ticket - 375
	test_matrix/ctf_regression/rod_in_2.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
330	CTF shall be able to read in an adder on the gravitational body force from the VUQ multipliers file
	test_matrix/ctf_regression/gc2.inp
	None
331	CTF shall be capable of solving the linear pressure matrix using the BiCGStab solver provided in Trilinos
	test_matrix/ctf_regression/par_quarter_cross_trilinos.inp
	None
332	CTF shall model PWR geometry with a larger-than-nominal nuclear fuel rod outer diameter.
	test_matrix/ctf_regression/case5-08.inp
	None
333	CTF shall model PWR geometry with a larger-than-nominal nuclear fuel rod pellet diameter.
	test_matrix/ctf_regression/case5-08.inp
	None
334	CTF shall allow the user to use the Groeneveld lookup tables to calculate the DNBR distribution after a simulation reaches steady-state
	test_matrix/ctf_regression/ss_chf_chk_groeneveld.inp
	None
335	CTF shall model PWR geometry with a larger-than-nominal guide tube outer diameter.
	test_matrix/ctf_regression/case5-09.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
336	CTF shall model PWR geometry with a larger-than-nominal guide tube inner diameter.
	test_matrix/ctf_regression/case5-09.inp
	None
337	CTF shall be capable of reading in a negative multiplier on the gravitational body force from the VUQ multipliers file, which allows the user to change the direction of gravity
	test_matrix/ctf_regression/gc3.inp
	None
338	CTF shall be able to model pin-cell geometry with reversed flow (flow entering the model top and traveling down in the direction of the gravitational body force)
	test_matrix/ctf_regression/small_singlerod_reverse_flow.inp
	None
339	CTF shall be able to model multi-axial-section models in parallel.
	test_matrix/ctf_regression/msre_par.inp
	None
340	CTF shall be able to model a transient in a flow loop.
	test_matrix/ctf_regression/msre_par.inp
	None
341	CTF shall be able to model heat transfer from a solid to an ambient boundary condition.
	test_matrix/ctf_regression/msre_par.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
342	CTF shall be able to model a mass flow rate boundary condition in the interior of the model (rather than at the model boundary)
	test_matrix/ctf_regression/msre_par.inp
	None
343	CTF shall be able to model a series of lateral flow connection paths to simulate horizontal pipe flow
	test_matrix/ctf_regression/msre_par.inp
	None
344	CTF shall write channel area to its native HDF5 file
	test_matrix/ctf_regression/msre_par.inp
	None
345	CTF shall write pin symmetry weight to its native HDF5 file
	test_matrix/ctf_regression/msre_par.inp
	None
346	CTF shall write the pin multiplier to its native HDF5 file
	test_matrix/ctf_regression/msre_par.inp
	None
347	CTF shall write the channel to axial section mapping to its native HDF5 file
	test_matrix/ctf_regression/msre_par.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
348	CTF shall allow the user to specify a boric acid injection boundary condition.
	test_matrix/ctf_regression/boron_ch_split_transport.inp
	None
349	CTF shall allow the user to specify a transient forcing function on the boric acid injection boundary condition
	test_matrix/ctf_regression/boron_ch_split_transport.inp
	None
350	CTF shall allow the user to select the Bowring model for performing the critical heat flux calculation
	test_matrix/ctf_regression/bowring_verify_3x3.inp
	None
351	CTF shall be able to model a PWR rod bundle core geometry with a jagged boundary.
	test_matrix/ctf_regression/small_5cross_assem_3x3rod_HFP.inp
	None
352	CTF shall be able to model a fast-reactivity-insertion-style transient.
	test_matrix/ctf_regression/patricia_150065-W3.inp
	None
353	CTF shall be able to use a transient CHF model when calculating CHF in transients.
	test_matrix/ctf_regression/patricia_150065-W3.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
354	CTF shall produce a VTK file for rod data.
	test_matrix/ctf_regression/rods_vtk.inp
	None
355	CTF shall transport boric acid across section boundaries in multi-section models.
	test_matrix/ctf_regression/boron_u_tube_w_splitting.inp
	None
356	CTF shall write edits at multiple points throughout a transient.
	test_matrix/ctf_regression/tk1.inp
	None
357	CTF shall model post-CHF heat transfer.
	test_matrix/ctf_regression/tk1.inp
	None
358	CTF shall allow the user to specify a solid rod with multiple regions comprised of different materials
	test_matrix/ctf_regression/multi_material_rod.inp
	None
359	CTF shall model boric acid transport in single-phase flow.
	test_matrix/ctf_regression/boron_2chan_1phase.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
360	CTF shall include the effect of boric acid in the fluid density calculation.
	test_matrix/ctf_regression/boron_2chan_1phase.inp
	None
361	CTF shall allow the user to select the Groeneveld lookup tables for performing the CHF calculation
	test_matrix/ctf_regression/groeneveld_verify_3x3.inp
	None
362	CTF shall allow the user to model a heated tube with a single flow channel on the inside of the tube using the heat conduction equation for solving the temperature profile in the tube. ticket - 527
	test_matrix/ctf_regression/inflow_2_in.inp
	None
363	CTF shall allow the user to use the Bowring correlation to calculate the DNBR distribution after a simulation reaches steady-state
	test_matrix/ctf_regression/ss_chf_chk_bowring.inp
	None
364	CTF shall be able to generate a lookup table for water fluid properties using the the IAPWS direct correlation evaluations
	test_matrix/ctf_regression/iapws_v2_singlerod.inp
	None
365	The user shall be able to select the IAPWS lookup tables for calculating water fluid properties
	test_matrix/ctf_regression/iapws_v2_singlerod.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
366	CTF shall allow the user to select the IAPWS direct correlation evaluations for water from the set of intrinsic fluid properties in a simulation
	test_matrix/ctf_regression/iapws_singlerod.inp
	None
367	CTF shall model tube geometry with a single flow channel connected to the outside of the tube with heat conduction modeled in the solid region. ticket - 527
	test_matrix/ctf_regression/inflow_2_out.inp
	None
368	CTF shall allow the user to select the Bowring correlation for calculating the DNBR distribution after the completion of a transient simulation
	test_matrix/ctf_regression/trans_chf_chk_bowring.inp
	None
369	CTF shall be capable of modeling a hypothetical two-phase flow using the intrinsic fluid properties for FLiBe
	test_matrix/ctf_regression/ salt_small_singlerod_HFP_no_spacers_two_phase.inp
	None
370	CTF shall allow the user to select the Groeneveld lookup tables for calculating the DNBR distribution after the completion of a transient simulation
	test_matrix/ctf_regression/trans_chf_chk_groeneveld.inp
	None
371	CTF shall model pressure-driven flow redistribution in BWR models when assemblies do not connect at model plena
	test_matrix/ctf_regression/2x2_small_bwr_assem.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
372	CTF shall perform parallel simulations of BWR models with unconnected assemblies using one processor per assembly
	test_matrix/ctf_regression/2x2_small_bwr_assem.verain
	None
373	CTF shall allow the user to select the Biasi correlation for calculating the DNBR distribution after the completion of a transient simulation
	test_matrix/ctf_regression/trans_chf_chk_biasi.inp
	None
374	CTF shall allow the user to model an unlimited number of connections of channels in one axial section to a single channel in another axial section (model plenum)
	test_matrix/ctf_regression/arbitrary_conn_plenum.inp
	None
375	CTF shall allow the user to select FLiBe from the intrinsic fluid properties.
	test_matrix/ctf_regression/arbitrary_conn_plenum.inp
	None
376	CTF shall be able to model a core of rod bundle assemblies that do not connect to one another
	test_matrix/ctf_regression/small_5x_assem_3x3rod_HFP.inp
	None
377	CTF shall be able to get an identical solution between serial and parallel runs of a PWR single-phase simulation when using a domain decomposition of four processors per physical assembly
	test_matrix/ctf_regression/refined_par_verify.verain
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
378	CTF shall model PWR geometry with a coarse axial mesh.
	test_matrix/ctf_regression/case5-10.inp
	None
379	CTF shall allow the user to disable direct heating so that all energy generated in a solid has to pass through the solid to enter the adjacent fluid channels
	test_matrix/ctf_regression/case5-04.inp
	None
380	CTF shall allow the user to select the W-3 correlation for calculating the DNBR distribution after the completion of a transient simulation
	test_matrix/ctf_regression/trans_chf_chk_w3.inp
	None
381	CTF shall model a rod bundle geometry with non-uniform axial power profile.
	test_matrix/ctf_regression/3x3rod_cosine_power.inp
	None
382	CTF shall model a PWR rod bundle with a higher-than-nominal outlet pressure.
	test_matrix/ctf_regression/case5-05.inp
	None
383	CTF shall model PWR geometry with a higher than nominal grid form loss coefficient.
	test_matrix/ctf_regression/case5-11.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
384	CTF shall allow the user to select the Biasi model for performing the CHF calculation.
	test_matrix/ctf_regression/ss_chf_biasi.inp
	None
385	CTF shall model tube geometry with a single flow channel connected to the outside of the tube using direct heating. ticket - 527
	test_matrix/ctf_regression/inflow_1_out.inp
	None
386	CTF shall be able to model a PWR rod-bundle core geometry with a jagged boundary at quarter symmetry
	test_matrix/ctf_regression/small_5cross_qtr.inp
	None
387	CTF shall model the annular-mist flow regime.
	test_matrix/ctf_regression/annular_mist.inp
	None
388	CTF shall allow the user to use the W-3 correlation to calculate the DNBR distribution after a simulation reaches steady-state
	test_matrix/ctf_regression/ss_chf_chk_w3.inp
	None
389	CTF shall model PWR geometry with a lower-than-nominal assembly pitch.
	test_matrix/ctf_regression/case5-07.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
390	CTF shall model PWR geometry with radial and azimuthal heat conduction modeled in the solid objects
	test_matrix/ctf_regression/case5-13.inp
	None
391	CTF shall be able to model a pin-cell geometry at nominal PWR flow, temperature, and pressure operating conditions and zero power at steady state
	test_matrix/ctf_regression/small_singlerod_HZP_no_spacers.inp
	None
392	CTF shall be able to model PWR geometry with no spacer grid form losses present.
	test_matrix/ctf_regression/small_singlerod_HZP_no_spacers.inp
	None
393	CTF shall allow the user to select the Bowring correlation for performing the CHF calculation.
	test_matrix/ctf_regression/ss_chf_bowring.inp
	None
394	CTF shall model PWR geometry with intermediate spacer grid form losses being skipped.
	test_matrix/ctf_regression/case5-12.inp
	None
395	CTF shall model PWR geometry with lower-than-nominal inlet temperature.
	test_matrix/ctf_regression/case5-06.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
396	CTF shall model PWR geometry with lower-than-nominal inlet flow.
	test_matrix/ctf_regression/case5-02.inp
	None
397	CTF shall model PWR geometry with a finer mesh in the pellet region of the nuclear fuel rods
	test_matrix/ctf_regression/case5-16.inp
	None
398	CTF shall allow the user to model a heated tube with multiple flow channels on the inside of the tube using the heat conduction equation for the solid region. ticket - 527
	test_matrix/ctf_regression/inflow_3.inp
	None
399	CTF shall allow the user to model boiling heat transfer using the Chen correlation.
	test_matrix/ctf_regression/chen_3x3.inp
	None
400	CTF shall model PWR geometry with a lower density in the uranium dioxide pellet of the nuclear fuel rod
	test_matrix/ctf_regression/case5-17.inp
	None
401	CTF shall allow the user to select the McAdams friction correlation for modeling wall shear in the model
	test_matrix/ctf_regression/case5-03.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
402	CTF shall allow the user to disable post-CHF heat transfer regimes.
	test_matrix/ctf_regression/ss_chf_chk_biasi.inp
	None
403	CTF shall allow the user to use the Biasi correlation to calculate the DNBR distribution after a simulation reaches steady-state
	test_matrix/ctf_regression/ss_chf_chk_biasi.inp
	None
404	CTF shall be able to model a single-phase PWR geometry case at nominal PWR conditions with the non-condensable gas content set to zero
	test_matrix/ctf_regression/zero_mgas.inp
	None
405	CTF shall model PWR geometry with higher-than-nominal constant gap conductance in the nuclear fuel rod pellet/clad gap
	test_matrix/ctf_regression/case5-15.inp
	None
406	CTF shall model PWR geometry with higher-than-nominal power.
	test_matrix/ctf_regression/case5-01.inp
	None
407	CTF shall model nominal PWR operating conditions in rod bundle geometry with a mix of guide tube and nuclear fuel rod geometry
	test_matrix/ctf_regression/case5-00.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
408	CTF shall allow the user to select the original CTF friction correlation for modeling wall shear in the model
	test_matrix/ctf_regression/case5-00.inp
	None
409	CTF shall allow the user to set a direct heating fraction that results in a percentage of the energy generated in the rod being directly deposited in adjacent channels
	test_matrix/ctf_regression/case5-00.inp
	None
410	CTF shall model PWR geometry with radial, azimuthal, and axial heat transfer in the solid objects
	test_matrix/ctf_regression/case5-14.inp
	None
411	CTF shall be able to get an identical solution between serial and parallel runs of a PWR single-phase simulation when using a domain decomposition of one processor per physical assembly
	test_matrix/ctf_regression/par_verify.verain
	None
412	CTF shall be able to model the BFBT 70028 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70028.inp
	None
413	CTF shall be able to model the BFBT 70029 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70029.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
414	CTF shall be able to model the BFBT 70036 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70036.inp
	None
415	CTF shall be able to model the BFBT 70035 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70035.inp
	None
416	CTF shall be able to model the BFBT 70034 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70034.inp
	None
417	CTF shall be able to model the BFBT 70030 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70030.inp
	None
418	CTF shall be able to model the BFBT 70031 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70031.inp
	None
419	CTF shall be able to model the BFBT 70033 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70033.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
420	CTF shall be able to model the BFBT 70027 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70027.inp
	None
421	CTF shall be able to model the BFBT 70032 validation test.
	test_matrix/validation/bfbt/p7series/bfbt_70032.inp
	None
422	CTF shall be able to model the BFBT 4101-61 validation case.
	test_matrix/validation/bfbt/void_dist/4101-61.inp
	None
423	CTF shall be able to model the BFBT 1071-61 validation case.
	test_matrix/validation/bfbt/void_dist/1071-61.inp
	None
424	CTF shall be able to model the BFBT 0031-21 validation case.
	test_matrix/validation/bfbt/void_dist/0031-21.inp
	None
425	CTF shall be able to model the BFBT 0011-55 validation case.
	test_matrix/validation/bfbt/void_dist/0011-55.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
426	CTF shall be able to model the BFBT 0021-21 validation case.
	test_matrix/validation/bfbt/void_dist/0021-21.inp
	None
427	CTF shall be able to model the PSBT Case 51221 validation test.
	test_matrix/validation/psbt/series5/psbt_51221.inp
	None
428	CTF shall be able to model the PSBT Case 56552 validation test.
	test_matrix/validation/psbt/series5/psbt_56552.inp
	None
429	CTF shall be able to model the PSBT Case 52442 validation test.
	test_matrix/validation/psbt/series5/psbt_52442.inp
	None
430	CTF shall be able to model the PSBT Case 66561 validation test.
	test_matrix/validation/psbt/series6/psbt_66561.inp
	None
431	CTF shall be able to model the PSBT Case 61121 validation test.
	test_matrix/validation/psbt/series6/psbt_61121.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
432	CTF shall be able to model the PSBT Case 62442 validation test.
	test_matrix/validation/psbt/series6/psbt_62442.inp
	None
433	CTF shall be able to model the PSBT Case 71121 validation test.
	test_matrix/validation/psbt/series7/psbt_71121.inp
	None
434	CTF shall be able to model the PSBT Case 73451 validation test.
	test_matrix/validation/psbt/series7/psbt_73451.inp
	None
435	CTF shall be able to model the PSBT Case 76322 validation test.
	test_matrix/validation/psbt/series7/psbt_76322.inp
	None
436	CTF shall be able to model the Siemens 5x5 Case 27 validation case
	test_matrix/validation/siemens/siemens_inputs/siemens_5x5_27.inp
	None
437	CTF shall be able to model the Harwell Case 5269 validation test.
	test_matrix/validation/harwell/5269.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
438	CTF shall be able to model the RISO Case 303 validation test.
	test_matrix/validation/riso/ctf_runs/riso_303.inp
	None
439	CTF shall be able to model the RISO Case 261 validation test.
	test_matrix/validation/riso/ctf_runs/riso_261.inp
	None
440	CTF shall be able to model the RISO Case 265 validation test.
	test_matrix/validation/riso/ctf_runs/riso_265.inp
	None
441	CTF shall be able to model the RISO Case 214 validation test.
	test_matrix/validation/riso/ctf_runs/riso_214.inp
	None
442	CTF shall be able to model the RISO Case 217 validation test.
	test_matrix/validation/riso/ctf_runs/riso_217.inp
	None
443	CTF shall be able to use the Lane model for modeling the Annular mist flow regime
	test_matrix/validation/riso/ctf_runs/riso_265_lane.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
444	CTF shall be able to model the RISO Case 618 validation test.
	test_matrix/validation/riso/ctf_runs/riso_618.inp
	None
445	CTF shall be able to model the RISO Case 223 validation test.
	test_matrix/validation/riso/ctf_runs/riso_223.inp
	None
446	CTF shall be able to model the RISO Case 320 validation test.
	test_matrix/validation/riso/ctf_runs/riso_320.inp
	None
447	CTF shall be able to model the FRIGG Marviken-style validation test.
	test_matrix/validation/frigg/frigg.inp
	None
448	CTF shall allow the user to lump several rods of similar type into one modeled object.
	test_matrix/validation/frigg/frigg.inp
	None
449	CTF shall be able to model the GE 3x3 1C validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_1C.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
450	CTF shall be able to model the GE 3x3 1B validation test described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_1B.inp
	None
451	CTF shall be able to model the GE 3x3 1E validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_1E.inp
	None
452	CTF shall be able to model the GE 3x3 1D validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_1D.inp
	None
453	CTF shall be able to model the GE 3x3 2G1 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2G1.inp
	None
454	CTF shall be able to model the GE 3x3 2G2 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2G2.inp
	None
455	CTF shall be able to model the GE 3x3 2G3 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2G3.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
456	CTF shall be able to model the GE 3x3 2E1 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2E1.inp
	None
457	CTF shall be able to model the GE 3x3 2E3 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2E3.inp
	None
458	CTF shall be able to model the GE 3x3 2E2 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2E2.inp
	None
459	CTF shall be able to model the GE 3x3 2D3 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2D3.inp
	None
460	CTF shall be able to model the GE 3x3 2D1 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2D1.inp
	None
461	CTF shall be able to model the GE 3x3 2C2 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2C2.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
462	CTF shall be able to model the GE 3x3 2B4 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2B4.inp
	None
463	CTF shall be able to model the GE 3x3 2C1 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2C1.inp
	None
464	CTF shall be able to model the GE 3x3 2B2 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2B2.inp
	None
465	CTF shall be able to model the GE 3x3 2B3 validation test as described in the CTF V&V manual.
	test_matrix/validation/ge_3x3/ge_2B3.inp
	None
466	CTF shall be able to model the NUREG-CR-3373 2x2 air/water Case 1 validation test.
	test_matrix/validation/NUREG/NUREG_01.inp
	None
467	CTF shall be able to model the NUREG-CR-3373 2x2 air/water Case 2 validation test.
	test_matrix/validation/NUREG/NUREG_02.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
468	CTF shall be able to model the NUREG-CR-3373 2x2 air/water Case 7 validation test.
	test_matrix/validation/NUREG/NUREG.07.inp
	None
469	CTF shall be able to model the NUREG-CR-3373 2x2 air/water Case 6 validation test.
	test_matrix/validation/NUREG/NUREG.06.inp
	None
470	CTF shall be able to model the NUREG-CR-3373 2x2 air/water Case 8 validation test.
	test_matrix/validation/NUREG/NUREG.08.inp
	None
471	CTF shall be able to run the CE 5x5 TS74-74 validation case.
	test_matrix/validation/ce/generated_files/CE_5x5_TS74.74.inp
	None
472	CTF shall be able to run the CE 5x5 TS74-02 validation case.
	test_matrix/validation/ce/generated_files/CE_5x5_TS74.02.inp
	None
473	CTFFuel shall obtain the same answer for fuel temperature distribution as CTF when modeling a rod in a flow change transient and using boundary conditions as calculated by CTF
	fuelSolve/tests/transient_flow_change/transient_flow_change.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
474	CTFFuel shall allow the user to set the axial pressure distribution on the fluid side of the clad
	fuelSolve/tests/pressure_vector/pressure_vector.inp
	None
475	CTFFuel shall allow the user to set nonuniform gap conductance using a table that takes axial location and returns the gap conductance at that location
	fuelSolve/tests/axial_gaphtc/axial_gaphtc.inp
	None
476	CTFFuel shall support modeling of a depletion simulation of the fuel rod
	fuelSolve/tests/depletion/depletion.inp
	None
477	CTFFuel shall accept fast flux factor as input and call CTF so this parameter used to calculate the fast flux. - CTFFuel shall accept fast fluence as input and call CTF so this parameter is used to modify elastic and shear modulus in Zirloy ticket - 571
	fuelSolve/tests/depletion/depletion.inp
	None
478	CTF shall consider the effect of pellet and clad surface roughness in calculating the closed gap thickness
	fuelSolve/tests/gapcriterion_factorization/gapcriterion_factorization.inp
	None
479	CTFFuel shall allow the user to set the pellet roughness via input.
	fuelSolve/tests/gapcriterion_factorization/gapcriterion_factorization.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
480	CTFFuel shall allow the user to set the clad roughness via input.
	fuelSolve/tests/gapcriterion_factorization/gapcriterion_factorization.inp
	None
481	CTFFuel shall allow the user to set the closed gap factor used to calculate the closed gap thicknes from the surface roughnesses
	fuelSolve/tests/gapcriterion_factorization/gapcriterion_factorization.inp
	None
482	CTFFuel shall allow the user to set the clad creep model
	fuelSolve/tests/uo2Densification_escore/uo2Densification_escore.inp
	None
483	CTF shall consider the effects of clad creep when modeling the fuel rod gap
	fuelSolve/tests/uo2Densification_escore/uo2Densification_escore.inp
	None
484	CTF shall use the Escore model for calculating fuel pellet densification if this model is selected
	fuelSolve/tests/uo2Densification_escore/uo2Densification_escore.inp
	None
485	CTFFuel shall allow the user to select the pellet thermal conductivity model
	fuelSolve/tests/uo2Densification_matpro/uo2Densification_matpro.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
486	CTF shall use the MATPRO model for calculating fuel pellet densification if this model is selected
	fuelSolve/tests/uo2Densification_matpro/uo2Densification_matpro.inp
	None
487	CTFFuel shall allow the user to set the thermal expansion model to use for the pellet region of the fuel rod
	fuelSolve/tests/therm_exp/therm_exp.inp
	None
488	CTF shall consider pellet thermal expansion when calculating the gap thickness.
	fuelSolve/tests/therm_exp/therm_exp.inp
	None
489	CTF shall use the FRAPCON model to calculate pellet thermal expansion when this model is selected
	fuelSolve/tests/therm_exp/therm_exp.inp
	None
490	CTFFuel shall allow the user to select the dynamic gap conductance model via the input
	fuelSolve/tests/dynamic_gaphtc_contact/dynamic_gaphtc_contact.inp
	None
491	CTF shall model a fuel rod with a closed pellet/clad gap.
	fuelSolve/tests/dynamic_gaphtc_contact/dynamic_gaphtc_contact.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
492	CTFFuel shall allow the user to specify the axial burnup distribution in the fuel rod being modeled.
	fuelSolve/tests/burn_fuel_conductivity/burn_fuel_conductivity.inp
	None
493	CTFFuel shall allow the user to specify the axial gadolinia distribution in the fuel rod being modeled.
	fuelSolve/tests/burn_fuel_conductivity/burn_fuel_conductivity.inp
	None
494	CTFFuel shall apply a uniform axial power distribution in the fuel rod if no axial power distribution is specified
	fuelSolve/tests/burn_fuel_conductivity/burn_fuel_conductivity.inp
	None
495	CTFFuel shall allow the user to enable the constant gap conductance model in CTF.
	fuelSolve/tests/burn_fuel_conductivity/burn_fuel_conductivity.inp
	None
496	CTF shall model the fuel rod temperature distribution using a constant gap conductance specified by the user.
	fuelSolve/tests/burn_fuel_conductivity/burn_fuel_conductivity.inp
	None
497	CTFFuel shall allow the user to set a constant thermal expansion coefficient for the fuel pellet region for calculating pellet thermal expansion
	fuelSolve/tests/therm_exp_const_alpha/therm_exp_const_alpha.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
498	CTFFuel shall accept rod surface temperature as a boundary condition for transient simulations.
	fuelSolve/tests/surf.tw_transient/surf.tw_transient.inp
	None
499	CTFFuel shall allow the user to specify rod surface temperature for a single point in time as a boundary condition
	fuelSolve/tests/surf.tw_transient/surf.tw_transient.inp
	None
500	CTFFuel shall allow the user to specify the clad emissivity via the input.
	fuelSolve/tests/fuel.clad_emissivity/fuel.clad_emissivity.inp
	None
501	CTFFuel shall allow the user to specify the pellet emissivity via the input.
	fuelSolve/tests/fuel.clad_emissivity/fuel.clad_emissivity.inp
	None
502	CTF shall model the radiative heat transfer in the fuel rod gap.
	fuelSolve/tests/fuel.clad_emissivity/fuel.clad_emissivity.inp
	None
503	CTF shall model a fuel rod with an open gap between the clad and fuel pellet.
	fuelSolve/tests/dynamic_gaphtc_nocontact/dynamic_gaphtc_nocontact.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
504	CTFFuel shall allow the user to set the fast neutron fluence in the input.
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None
505	CTF shall include the effect of neutron fluence on gap closure in the fuel rod gap model.
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None
506	CTF shall include the effect of cold work on the calculation of clad Meyer hardness
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None
507	CTFFuel shall allow the user to specify clad cold work as input.
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None
508	CTF shall include the effect of clad oxidation on the calculation of clad Meyer hardness
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None
509	CTFFuel shall allow the user to specify clad oxidation via input.
	fuelSolve/tests/effects_on_meyer_hardness/effects_on_meyer_hardness.inp
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
510	CTFFuel shall obtain the same answer for fuel temperature distribution as CTF when modeling the TK1 test and using the fluid side boundary conditions calculated by CTF
	fuelSolve/tests/tk1/tk1.inp
	None
511	CTF shall calculate the time-dependent gap conductance when performing a transient when the dynamic gap model is enabled
	fuelSolve/tests/tk1/tk1.inp
	None
512	CTF shall calculate the time-dependent temperature distribution in the fuel rod when performing a transient
	fuelSolve/tests/tk1/tk1.inp
	None
513	CTFFuel shall accept time- and space-dependent liquid heat transfer coefficient as a boundary condition.
	fuelSolve/tests/tk1/tk1.inp
	None
514	CTFFuel shall accept time- and space-dependent vapor heat transfer coefficient as a boundary condition.
	fuelSolve/tests/tk1/tk1.inp
	None
515	CTFFuel shall accept time- and space-dependent liquid bulk temperature as a boundary condition.
	fuelSolve/tests/tk1/tk1.inp
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
516	CTFFuel shall accept time- and space-dependent vapor bulk temperature as a boundary condition.
	fuelSolve/tests/tk1/tk1.inp
	None
517	CTF shall predict fuel rod clad/pellet gap heat transfer due to thermal resistance of the fill gas
	ctf_src/unit_tests/test_dynamic_gap_htc.F90
	None
518	CTF shall predict the fuel rod pellet/clad gap heat transfer due to contact of the pellet and clad
	ctf_src/unit_tests/test_dynamic_gap_htc.F90
	None
519	CTF shall predict nuclear fuel rod pellet/clad gap heat transfer due to radiative heat transfer between the pellet and clad
	ctf_src/unit_tests/test_dynamic_gap_htc.F90
	None
520	CTF shall implement the McAdams friction factor model.
	ctf_src/unit_tests/test_fricfactor.F90
	None
521	CTF shall implement the Zigrang-Sylvester friction factor model.
	ctf_src/unit_tests/test_fricfactor.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
522	CTF shall implement the Churchill friction factor model.
	ctf_src/unit_tests/test_fricfactor.F90
	None
523	CTF shall implement a user defined friction factor model.
	ctf_src/unit_tests/test_fricfactor.F90
	None
524	CTF shall remap internal rod data to the format required by the VERA HDF5 file so that it is organized by assembly number, row in the assembly, column in the assembly, and axial level before writing solution data to the VERA HDF5 file
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
525	CTF shall correctly map rod solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter mirror symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and in which the symmetry line runs through the rods
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
526	CTF shall remap internal channel data to the format required by the VERA HDF5 file so that it is organized by assembly number, row in the assembly, column in the assembly, and axial level before writing solution data to the VERA HDF5 file
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
527	CTF shall correctly map channel solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter mirror symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and in which the symmetry line runs through the rods
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
528	CTF shall correctly weight channel multiplication factors for inter-assembly channels that are written to the VERA HDF5 file and used for calculating derived quantities (e.g., averages) so that solution data can be correctly averaged
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
529	CTF shall correctly map rod solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter rotational symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and in which the symmetry line runs through the rods
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
530	CTF shall correctly map channel solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter rotational symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and the symmetry line runs through the rods
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
531	CTF shall correctly map rod solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter rotational symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and in which the symmetry line runs through the channels
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
532	CTF shall correctly map channel solution data from the solved portion of the model to the unsolved portion of the model on the other side of a symmetry line in quarter rotational symmetric models when writing data to the VERA HDF5 file for assemblies that are divided by the symmetry line and in which the symmetry line runs through the channels
	ctf_src/unit_tests/HDF5_remap_tests_mod.F90
	None
533	CTF shall calculate the dimensions of a bounding box around a pin in the model
	ctf_src/unit_tests/Test_RodMesh_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
534	CTF shall implement the MATPRO-11 model for thermal conductivity of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
535	CTF shall implement the Modified NFI model for thermal conductivity of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
536	CTF shall implement the Modified NFIR model for thermal conductivity of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
537	CTF shall implement the Halden model for thermal conductivity of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
538	CTF shall correct the density of uranium dioxide as a function of the theoretical density of the material
	ctf_src/unit_tests/test_uo2_properties.F90
	None
539	CTF shall predict the thermal expansion of the uranium dioxide pellet.
	ctf_src/unit_tests/test_uo2_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
540	CTF shall predict the thermal expansion of the Zircaloy clad.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
541	CTF shall predict the spectral emissivity of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
542	CTF shall predict the melting temperature of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
543	CTF shall predict the linear strain of uranium dioxide.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
544	CTF shall predict the linear strain of MOX fuel.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
545	CTF shall implement the MATPRO-11 model for prediction of irradiation induced densification.
	ctf_src/unit_tests/test_uo2_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
546	CTF shall implement the FRAPCON-4.0 model for prediction of irradiation induced densification.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
547	CTF shall implement the Escore model for prediction of irradiation induced densification.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
548	CTF shall implement the FRAPCON-4.0 model for prediction of fuel pellet relocation.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
549	CTF shall implement the Escore model for prediction of fuel pellet relocation.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
550	CTF shall implement the MATPRO-11 model for prediction of fuel pellet solid swelling.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
551	CTF shall implement the MATPRO-11 model for prediction of fuel pellet gaseous swelling.
	ctf_src/unit_tests/test_uo2_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
552	CTF shall implement the FRAPCON-4.0 model for prediction of fuel pellet solid swelling.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
553	CTF shall implement the FRAPCON-4.0 model for prediction of fuel pellet gaseous swelling.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
554	CTF shall implement the Escore model for prediction of clad creep.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
555	CTF shall implement the Bison model for prediction of clad creep.
	ctf_src/unit_tests/test_uo2_properties.F90
	None
556	CTF shall predict transient CHF.
	ctf_src/unit_tests/test_tr_liq_thickness.F90
	None
557	CTF shall use the IAPWS 1997 reference for calculating the thermophysical properties of water
	ctf_src/unit_tests/plot_derivatives.F90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
558	CTF shall map fluid solution data to the solid surface mesh to be used as boundary conditions in the solid energy solution
	ctf_src/unit_tests/Test_FuelRod.F90
	None
559	CTF shall place an extra mesh level at the bottom of a solid object with the node at the bottom edge of the mesh level so that solution data is available at the bottom of the solid
	ctf_src/unit_tests/Test_FuelRod.F90
	None
560	CTF shall place an extra mesh level at the top of a solid object with the node at the top edge of the mesh level so that solution data is available at the top of the solid
	ctf_src/unit_tests/Test_FuelRod.F90
	None
561	CTF shall provide a model to capture the effect of degradation on uranium dioxide thermal conductivity
	ctf_src/unit_tests/Test_FuelRod.F90
	None
562	CTF shall provide a model to capture the effect of pellet relocation on uranium dioxide thermal conductivity
	ctf_src/unit_tests/Test_FuelRod.F90
	None
563	CTF shall use a parabolic curve fit of the first node temperature nearest the centerline and the pellet surface temperature to estimate the centerline temperature of a fuel rod
	ctf_src/unit_tests/Test_FuelRod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
564	CTF shall use the inner surface temperature of the voided region of the pellet in a fuel rod as the fuel centerline temperature for fuel rods containing a void in the center of the pellet
	ctf_src/unit_tests/Test_FuelRod.F90
	None
565	CTF shall apply uniform radial power distribution in the pellet region of a nuclear fuel rod by default
	ctf_src/unit_tests/Test_FuelRod.F90
	None
566	CTF shall apply zero power in the clad region of a nuclear fuel rod by default
	ctf_src/unit_tests/Test_FuelRod.F90
	None
567	CTF shall normalize a radial power distribution for the pellet region of the fuel rod provided by the user
	ctf_src/unit_tests/Test_FuelRod.F90
	None
568	CTF shall accept a radial power distribution table for a solid geometry type to be applied to all solid instances of that geometry type
	ctf_src/unit_tests/Test_FuelRod.F90
	None
569	The CTF fuel rod model shall provide a steady state solver
	ctf_src/unit_tests/Test_FuelRod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
570	CTF shall determine the CHF temperature by finding the temperature at the intersection of the critical heat flux and the nucleate boiling heat flux
	ctf_src/unit_tests/test_tchf.F90
	None
571	CTF shall numerically integrate multiplier data from a ROTHCON data file to the CTF rod surface mesh
	ctf_src/unit_tests/test_RothconMap.f90
	None
572	CTF shall implement a method for performing a 1D numerical integration using the Trapezoidal approach
	ctf_src/unit_tests/test_lookup_tables.F90
	None
573	CTF shall implement a method for performing a 1D linear interpolation.
	ctf_src/unit_tests/test_lookup_tables.F90
	None
574	The CoreMap class shall return the first solved row/column in the index map based on map symmetry when a full symmetry case is modeled
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
575	The CoreMap class shall return the location of an assembly given its index in a full model. ticket - 570
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
576	The CoreMap type-bound procedures shall return the correct information for a model that is rotational symmetric with unique indices on the symmetry lines
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
577	The CoreMap type-bound procedures shall return correct information for a model which is quarter mirror symmetric. ticket - 570
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
578	The CoreMap class shall return the correct first solved assembly for a core map with an even number of assemblies in a row for a full symmetry model. ticket - 570
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
579	The CoreMap class shall return the correct first solved assembly for a core map with an even number of assemblies in a row for a quarter mirror symmetry model. ticket - 570
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
580	The CoreMap class shall return the correct first solved assembly for a core map with an even number of assemblies in a row for a quarter rotational symmetry model. ticket - 570
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
581	CTF shall track pin locations in the core.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
582	CTF shall track which assembly owns a pin.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
583	CTF shall track pin locations in the core for quarter symmetry models.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
584	CTF shall track which assembly owns a pin for quarter symmetry models.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
585	CTF shall track pin locations in the core when assemblies have an even number of rods in the assembly lattice
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
586	CTF shall track which assembly owns a pin for models where assemblies have an even number of rods in the assembly lattice
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
587	CTF shall track pin locations in the core for models containing a single pin.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
588	CTF shall track which assembly owns a pin for models containing a single pin.
	ctf_src/unit_tests/Test_ModelMap_mod.F90
	None
589	CTF shall implement the Thom model for predicting boiling heat transfer
	ctf_src/unit_tests/test_thom.F90
	None
590	The CTF ChGeom class shall return the correct axially-dependent geometry information for a channel with no axial geometry modification tables specified
	ctf_src/unit_tests/Test_ChGeom.F90
	None
591	The CTF ChGeom class shall return the correct axially-dependent geometry information for a channel with an axial cross-sectional scalar area modification table specified
	ctf_src/unit_tests/Test_ChGeom.F90
	None
592	The CTF ChGeom class shall return the correct axially-dependent geometry information for a channel with an axial cross-sectional momentum area modification table specified
	ctf_src/unit_tests/Test_ChGeom.F90
	None
593	The CTF ChGeom class shall return the correct axially-dependent geometry information for a channel with an axial wetted perimeter modification table specified
	ctf_src/unit_tests/Test_ChGeom.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
594	The CTF ChGeom class shall return the correct axially-dependent geometry information for a channel with a bottom and top area specified
	ctf_src/unit_tests/Test_ChGeom.F90
	None
595	CTF shall track connections between solids and channels in the model in multisection models
	ctf_src/unit_tests/Test_SurfMap_type.F90
	None
596	CTF shall implement the Yao-Hochreiter-Leech model for predicting grid spacer cooling enhancement
	ctf_src/unit_tests/test_grid_enhance.F90
	None
597	CTF shall remap coolant-centered channel solution data to pin-centered channel solution data
	ctf_src/unit_tests/Test_coupling_class_mod.F90
	None
598	CTF shall calculate the volume-averaged fuel temperature for each rod axial level from the CTF solution
	ctf_src/unit_tests/Test_coupling_class_mod.F90
	None
599	CTF shall implement the Duriez/Modified NFI correlation for predicting thermal conductivity of MOX fuel as documented in the CTF Theory Manual
	ctf_src/unit_tests/test_mox_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
600	CTF shall implement the Halden correlation for predicting thermal conductivity of MOX fuel as documented in the CTF Theory Manual
	ctf_src/unit_tests/test_mox_properties.F90
	None
601	CTF shall implement the Amaya correlation for predicting thermal conductivity of MOX fuel as documented in the CTF Theory Manual
	ctf_src/unit_tests/test_mox_properties.F90
	None
602	CTF shall calculate fluid properties from a lookup table that it generates from the IAPWS correlations for calculating thermophysical properties of water
	ctf_src/unit_tests/Test_PropertyLookup.F90
	None
603	CTF shall calculate thermophysical properties of fluid using a constant set of properties independent of temperature and pressure that are defined in the source code when the code is compiled to use this option
	ctf_src/unit_tests/Test_PropertyLookup.F90
	None
604	The CTF fuel rod gap model shall estimate the fast flux from rod power when the fast flux is not explicitly provided to the class when solving for clad creep
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
605	The CTF nuclear fuel rod model shall calculate the hoop stress in the clad.
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
606	The CTF nuclear fuel rod model shall calculate the hoop elastic strain in the clad.
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
607	The CTF fuel rod gap model shall calculate gap thickness as a function of rod neutronic history and current thermal characteristics
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
608	The CTF fuel rod gap model shall provide a procedure for getting gap model restart data.
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
609	The CTF fuel rod gap model shall provide a procedure for setting gap model restart data obtained from the gap model restart data getter
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
610	The CTF fuel rod gap model shall provide a capability to rewind the solution to a solution checkpoint set by the user
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
611	The CTF fuel rod gap model shall allow the user to set a current irradiation time for the fuel.
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
612	The CTF fuel rod gap model shall remap restart data to a mesh that is different from the mesh from which the restart data was written when the total rod length does not change after the restart
	ctf_src/unit_tests/Test_FuelRodGap.f90
	None
613	The CTF ChanMap class shall provide a unique index that sequentially increases from 1 to the total number of channels in the model for each solved channel in the model that is identified in the channel map passed in to the class
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
614	The CTF ChanMap class shall return the row of a channel in the assembly in which it resides.
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
615	The CTF ChanMap class shall return the column of a channel in the assembly in which it resides.
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
616	The CTF ChanMap class shall convert a local channel row in an assembly to a global channel row in the core
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
617	The CTF ChanMap class shall convert a local channel column in an assembly to a global channel column in the core
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
618	The CTF ChanMap class shall take a channel location in the core map and return the same channel location if the channel is on the solved side of a symmetry line
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None
619	The CTF ChanMap class shall take a channel location in the core map and return the channel location it is mirroring if the channel is on the unsolved side of a symmetry line
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None
620	The CTF ChanMap class shall take a channel location in the core map and return a multiplication factor of 1.0 if the channel is solved by CTF and is not divided by a symmetry line
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None
621	The CTF ChanMap class shall take a channel location in the core map and return a multiplication factor of 0.0 if the channel is not solved by CTF
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None
622	The CTF ChanMap class shall take a channel location in the core map and return a multiplication factor of 0.5 if the channel is divided in half by a symmetry line
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None
623	The CTF ChanMap class shall take a channel location in the core map and return a multiplication factor of 0.25 if the channel is divided in quarter by a symmetry line
	ctf_src/unit_tests/Test_ChanMap.mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
624	The CTF ChanMap class shall support full symmetric models.
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
625	The CTF ChanMap class shall support quarter mirror symmetric models containing assemblies with an odd number of rods in the lattice (symmetry line divides the rods)
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
626	The CTF ChanMap class shall support quarter mirror symmetric models containing assemblies with an even number of rods in the lattice (symmetry line divides the channels)
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
627	The CTF ChanMap class shall support a model of a single rod.
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
628	The CTF ChanMap class shall support a core containing isolated assemblies (not connected by gaps) of different sizes
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
629	The CTF ChanMap class shall provide a unique index that sequentially increases from 1 to the total number of channels in the model for each solved channel in the model that is identified in the channel map passed in to the class when modeling a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
630	The CTF ChanMap class shall be able to convert a local channel row in an assembly to a global channel row in the core when modeling a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
631	The CTF ChanMap class shall be able to convert a local channel column in an assembly to a global channel column in the core when modeling a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
632	The CTF ChanMap class shall return the row of a channel in the assembly in which it resides when modeling a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
633	The CTF ChanMap class shall return the column of a channel in the assembly in which it resides when modeling a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
634	The CTF ChanMap class shall take a channel location in the core map and return the channel it mirrors when the channels is on the unsolved side of the symmetry line in a quarter mirror symmetric model
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None
635	The CTF ChanMap class shall take a channel location in the core map and return a multiplication factor of 0.0 if the channel is in an assembly divided by a symmetry line and the channel is on the unsolved side of the symmetry line
	ctf_src/unit_tests/Test_ChanMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
636	CTF shall implement the Ahmad model for predicting near-rod bubble condensation in subcooled boiling
	ctf_src/unit_tests/test_qhn_Ahmad.F90
	None
637	CTF shall predict thermophysical properties of FLiBe salt.
	ctf_src/unit_tests/test_salt_properties.F90
	None
638	CTF shall perform a solution of a linear system of equations.
	ctf_src/unit_tests/Test_pressureMatrixSolver.f90
	None
639	CTF shall predict cladding elastic deformation for Zircaloy.
	ctf_src/unit_tests/test_zirc_properties.F90
	None
640	CTF shall predict the spectral emissivity of Zircaloy.
	ctf_src/unit_tests/test_zirc_properties.F90
	None
641	CTF shall predict the Meyer hardness of Zircaloy.
	ctf_src/unit_tests/test_zirc_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
642	CTF shall calculate gas properties of helium.
	ctf_src/unit_tests/test_gas_properties.F90
	None
643	CTF shall calculate gas properties of air.
	ctf_src/unit_tests/test_gas_properties.F90
	None
644	CTF shall calculate gas properties of argon.
	ctf_src/unit_tests/test_gas_properties.F90
	None
645	CTF shall calculate gas properties of hydrogen.
	ctf_src/unit_tests/test_gas_properties.F90
	None
646	CTF shall calculate gas properties of krypton.
	ctf_src/unit_tests/test_gas_properties.F90
	None
647	CTF shall calculate gas properties of nitrogen.
	ctf_src/unit_tests/test_gas_properties.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
648	CTF shall calculate gas properties of oxygen.
	ctf_src/unit_tests/test_gas_properties.F90
	None
649	CTF shall calculate gas properties of xenon.
	ctf_src/unit_tests/test_gas_properties.F90
	None
650	CTF shall calculate gas mass fraction from gas volume fraction in the fuel rod fill gas.
	ctf_src/unit_tests/test_gas_properties.F90
	None
651	CTF shall calculate gas properties of a nuclear fuel rod fill gas mixture.
	ctf_src/unit_tests/test_gas_properties.F90
	None
652	CTF shall calculate the temperature jump distance in the fuel rod gap for a fill gas mixture.
	ctf_src/unit_tests/test_gas_properties.F90
	None
653	CTF shall store channel axial connection information for multisection models.
	ctf_src/unit_tests/Test_FluidMesh.F90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
654	CTF shall store channel lateral connection information for multisection models.
	ctf_src/unit_tests/Test_FluidMesh.F90
	None
655	CTF shall discretize a solid cylinder geometry so that nodes are placed at material region boundaries.
	ctf_src/unit_tests/Test_SolidGeom_mod.f90
	None
656	CTF shall discretize a nuclear fuel rod geometry so that nodes are placed at region boundary surfaces.
	ctf_src/unit_tests/Test_SolidGeom_mod.f90
	None
657	CTF shall discretize a tube geometry rod so that nodes are placed at region boundary surfaces.
	ctf_src/unit_tests/Test_SolidGeom_mod.f90
	None
658	CTF shall allow the user to enable the standard CTF output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
659	CTF shall allow the user to enable the VERA HDF5 file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
660	CTF shall allow the user to enable the rod solution VTK file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
661	CTF shall allow the user to enable the channel output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
662	CTF shall allow the user to enable the gap output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
663	CTF shall allow the user to enable the channel solution vtk file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
664	CTF shall allow the user to enable the DNB output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
665	CTF shall allow the user to enable the mass conservation output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
666	CTF shall allow the user to enable the energy conservation output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
667	CTF shall allow the user to enable the mass and energy balance output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
668	CTF shall allow the user to enable the pressure summary output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
669	CTF shall allow the user to enable the native CTF HDF5 file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
670	CTF shall allow the user to enable the timestep summary text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
671	CTF shall allow the user to enable the convergence summary text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
672	CTF shall allow the user to disable the standard CTF output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
673	CTF shall allow the user to disable the VERA HDF5 file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
674	CTF shall allow the user to disable the rod solution VTK file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
675	CTF shall allow the user to disable the channel output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
676	CTF shall allow the user to disable the gap output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
677	CTF shall allow the user to disable the channel solution vtk file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
678	CTF shall allow the user to disable the DNB output text file via the input file.
	ctf_src/unit_tests/Test_IO_files.f90
	None
679	CTF shall disable the mass conservation output file by default.
	ctf_src/unit_tests/Test_IO_files.f90
	None
680	CTF shall disable the pressure summary output file by default.
	ctf_src/unit_tests/Test_IO_files.f90
	None
681	CTF shall disable the native CTF HDF5 file by default.
	ctf_src/unit_tests/Test_IO_files.f90
	None
682	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for mirror and rotational quarter symmetry models
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None
683	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for assemblies that have an even number of rods in the assembly lattice
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
684	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for assemblies that have a single rod
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None
685	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for models using quarter rotational symmetry
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None
686	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for models using quarter rotational symmetry and having an even number of rods in the assembly lattice
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None
687	CTF shall unfold assemblies divided by a symmetry line to the full symmetry representation for models containing a large water rod in the lattice where the large water rod is divided by the symmetry line
	ctf_src/unit_tests/Test_RodMap_mod.F90
	None
688	CTF shall provide a capability to check if the transient solution can be considered steady due to the solution no longer changing to within a tolerance
	ctf_src/unit_tests/Test_Convergence.F90
	None
689	The CTF convergence checker shall ignore vapor velocity when evaluating steady state convergence and the model is considered to be single phase
	ctf_src/unit_tests/Test_Convergence.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
690	The CTF convergence checker shall ignore droplet velocity when evaluating steady state convergence and the model is considered to be single phase
	ctf_src/unit_tests/Test_Convergence.F90
	None
691	The CTF convergence checker shall ignore vapor void when evaluating steady state convergence and the model is considered to be single phase
	ctf_src/unit_tests/Test_Convergence.F90
	None
692	CTF shall assign a unique index for each scalar volume in the mesh
	ctf_src/unit_tests/Test_ModelIdx.F90
	None
693	CTF shall assign a unique index for each scalar volume in the mesh for parallel models so that the index is unique to all solution domains
	ctf_src/unit_tests/Test_ModelIdx.F90
	None
694	CTF shall include a clad surface oxidation model
	ctf_src/unit_tests/cladChemistry/test_CladCorrosion.f90
	None
695	The CTF clad surface corrosion solution shall offer a procedure for setting a solution checkpoint to which the solution can later be rewound
	ctf_src/unit_tests/cladChemistry/test_CladCorrosion.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
696	CTF shall produce a rod surface coupling mesh for performing the rod surface chemistry calculations that is conformal with the original CTF rod surface mesh but may be more refined than the original CTF rod surface mesh
	ctf_src/unit_tests/cladChemistry/test_CladChemistry.f90
	None
697	CTF shall surface average rod surface coupling mesh data onto the CTF rod surface mesh.
	ctf_src/unit_tests/cladChemistry/test_CladChemistry.f90
	None
698	CTF shall expand rod surface coupling mesh data to full symmetry before sending it to the coupled rod chemistry codes when modeling a rod divided by one or more symmetry lines
	ctf_src/unit_tests/cladChemistry/test_CladChemistry.f90
	None
699	CTF shall pass boundary conditions needed for a crud simulation to the rod surface chemistry code when modeling a crud simulation
	ctf_src/unit_tests/cladChemistry/test_CladChemistry.f90
	None
700	The CTF TransportedSpecies class shall allow the caller to set constant volumetric source terms at a location in the model
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
701	The CTF TransportedSpecies class shall allow the caller to set variable source terms that depends on other species concentrations
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
702	The CTF TransportedSpecies class shall allow the caller to run an explicit time marching solution
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
703	The CTF TransportedSpecies class shall allow the caller to run a steady state solution
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
704	The CTF TransportedSpecies class shall allow the caller to add an arbitrary number of species to the model
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
705	The CTF TransportedSpecies class shall allow the caller to set a solution save point for all transported species
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
706	The CTF TransportedSpecies class shall allow the caller to rewind the transported species solution to a save point set by the caller
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
707	The CTF TransportedSpecies class shall allow the caller to set a species boundary condition
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
708	The CTF TransportedSpecies class shall model axial advection of species using the internal velocity distribution calculated by CTF
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
709	The CTF TransportedSpecies class shall model advection of species in the lateral direction using the internal velocity distribution calculated by CTF
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
710	The CTF mass transport feature shall transport species in the axial direction in models where one channel connects to many channels above
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
711	The CTF mass transport feature shall advect transported species in the axial direction in models where multiple channels coalesce into one channel in the section above
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
712	The CTF mass transport capability shall properly advect species through a 90 degree bend in the model
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
713	The CTF mass transport capability shall model species transport when phase change is occurring in the carrier fluid
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
714	The CTF TransportedSpecies class shall allow the user to set a specific list of species to solve
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
715	The CTF TransportedSpecies class shall allow the user to model a single non-condensable gas in the model
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
716	The CTF TransportedSpecies class shall allow the user to set a boundary condition for the transported non-condensable gas in the model
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
717	The CTF mass transport feature shall support modeling of species migration between liquid and gas phases
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
718	The CTF mass transport feature shall allow the user to set a removal location in the model for the non-condensable carrier gas
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
719	The CTF mass transport feature shall consider the temperature effect on the non-condensable carrier gas volume
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
720	The CTF mass transport feature shall consider the pressure effect on the non-condensable carrier gas volume
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
721	The CTF mass transport feature shall consider the mass transfer effect on the non-condensable carrier gas volume
	ctf_src/unit_tests/massTransport/Test_TransportedSpecies.F90
	None
722	CTF shall read a custom fluid properties data file for subcooled fluid.
	ctf_src/unit_tests/fluidProps/test_FluidProps.f90
	None
723	xml2ctf shall use the coupling mesh in place of the axial edits mesh if it is available in the VERA IN XML parameter list to generate the axial mesh in the CTF model
	ctf_src/unit_tests/editsBounds/editsBounds_test.f90
	None
724	CTF shall use the axial edits mesh to choose the locations in the model from which data should be written to the VERA HDF5 file
	ctf_src/unit_tests/editsBounds/editsBounds_test.f90
	None
725	The CTF_Coupling_Interface shall accept burnup on a per-rod, per-level basis
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
726	The CTF_Coupling_Interface shall accept Zernike polynomial coefficients for the radial power distribution
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
727	The CTF_Coupling_Interface shall accept Zernike polynomial coefficients for the radial burnup distribution. ticket - 575
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
728	The CTF_Coupling_Interface shall provide Zernike polynomial coefficients for the radial temperature shape so that when applied to the volume-averaged pellet temperature provided by CTF_Coupling_Interface, the pellet temperature distribution calculated by CTF can be reconstructed. ticket - 572
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
729	CTF shall use Zernike polynomial coefficients passed in through the CTF_Coupling_Interface to reconstruct the radial power shape onto the CTF mesh
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
730	CTF shall use Zernike polynomial coefficients passed in through the CTF_Coupling_Interface to reconstruct the radial burnup shape onto the CTF mesh. ticket - 575
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
731	The CTF_Coupling_Interface shall accept a core inlet temperature.
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
732	The CTF_Coupling_Interface shall apply a passed core inlet temperature as the inlet temperature of all channels in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
733	The CTF_Coupling_Interface shall accept a core inlet flow rate.
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
734	The CTF_Coupling_Interface shall use the passed core flow rate to set the inlet flow of all channels in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
735	The CTF_Coupling_Interface shall accept a core outlet pressure.
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
736	The CTF_Coupling_Interface shall use the passed core outlet pressure to set the outlet pressure of all channels in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
737	CTF shall be capable of using the dynamic gap model when more than one fuel rod type exists in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
738	The CTF_Coupling_Interface shall provide a procedure for getting the azimuthally averaged fuel pellet surface temperature for a passed pin index and pin level
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
739	The CTF_Coupling_Interface shall accept a linear heat rate for the pellet region of the fuel rod for a passed pin index and pin level
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
740	The CTF_Coupling_Interface shall accept a linear heat rate for the clad region of the fuel rod for a passed pin index and pin level
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
741	CTF shall disable the global direct heating fraction used for depositing a portion of fuel energy generation directly to the coolant when the clad or moderator direct heating is set directly through the CTF_Coupling_Interface
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
742	The CTF_Coupling_Interface shall accept a linear heat rate that is deposited in the moderator for a passed pin index and pin level
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
743	The CTF_Coupling_Interface shall distribute direct moderator heating power passed in through the CTF_Coupling_Interface to the channels that are adjacent to the pin to which it was passed
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
744	The CTF_Coupling_Interface shall provide a procedure for accepting direct heating in the guide tube for a passed pin index and pin level
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
745	CTF shall use the guide tube direct heating power as an energy source term in the solid energy equation solved for the guide tube in which the power was passed
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
746	CTF shall map direct moderator heating set in the CTF_Coupling_Interface to the correct domain that owns the channel and in which the power is deposited when a parallel model is being run
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
747	CTF shall map direct guide tube heating set in the CTF_Coupling_Interface to the correct domain that owns the guide tube in which the power is deposited when a parallel model is being run
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
748	CTF shall map direct fuel rod clad heating set in the CTF_Coupling_Interface to the correct domain that owns the fuel rod in which the power is deposited when a parallel model is being run
	ctf_src/unit_tests/ctfAPI/Test_interfaces.F90
	None
749	CTF shall provide an interface for coupling with a systems code.
	ctf_src/unit_tests/ctfAPI/Test_SystemCoupling.f90
	None



Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
750	CTF shall provide core model boundary conditions to the systems code coupling interface
	ctf_src/unit_tests/ctfAPI/Test_SystemCoupling.f90
	None
751	CTF shall accept core model boundary conditions from the systems code coupling interface
	ctf_src/unit_tests/ctfAPI/Test_SystemCoupling.f90
	None
752	The VERAInXML class shall extract the boundary condition modifier maps for the specified STATE path. ticket - 570
	ctf_src/unit_tests/ctfAPI/Test_VERAInXML_type.f90
	None
753	The CTF_Coupling_Interface shall provide a procedure for determining the total number of channels in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
754	The CTF_Coupling_Interface shall provide a procedure for determining the spatial locations of the bounds of the channel in the lateral directions (x-y plane) given the channel index
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
755	The CTF_Coupling_Interface shall provide a procedure for determining the axial mesh of a channel given the channel index
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
756	The CTF_Coupling_Interface shall provide a procedure for setting the volumetric power generation in a channel level
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
757	The CTF_Coupling_Interface shall provide a procedure for getting the channel pressure distribution in a channel given the channel index
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
758	The CTF_Coupling_Interface shall provide a procedure for getting the channel temperature distribution in a channel given the channel index
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
759	CTF shall include a term for volumetric energy generation in the fluid energy equation
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
760	The CTF_Coupling_Interface channel coupling procedures shall support parallel solutions
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None
761	The CTF_Coupling_Interface channel coupling procedures shall support flow loop geometry
	ctf_src/unit_tests/ctfAPI/Test_channel_coupling.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
762	CTF shall calculate the same answer when solved for steady state multiple times through the CTF_Coupling_Interface when model boundary conditions remain the same
	ctf_src/unit_tests/ctfAPI/Consistency_check.F90
	None
763	The CTF_Coupling_Interface shall provide a procedure for cleaning up allocated memory and re-initializing global data that will allow a user to run a simulation, clean up after the simulation, run the same simulation again and obtain the exact same solution as the first simulation
	ctf_src/unit_tests/ctfAPI/Consistency_check.F90
	None
764	The CTF_Coupling_Interface shall provide an option to write every power distribution passed into CTF to a debug HDF5 file in the VERA HDF5 format
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None
765	The CTF_Coupling_Interface shall provide a procedure to read a pin power distribution from an HDF5 file written in the VERA HDF5 file format into CTF
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None
766	The CTF_Coupling_Interface shall accept an HDF5 filetype handle to which CTF will write solution data in the HDF5 file format
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None
767	The CTF_Coupling_Interface shall accept a list of datasets which it should skip writing to the VERA HDF5 file
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
768	CTF shall write all normal datasets to the debug HDF5 file even when those datasets appear in the list of datasets to skip writing to the VERA HDF5 file
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None
769	CTF shall provide an option for writing the solution for each call to one of the solve procedures in the CTF_Coupling_Interface to a debug HDF5 file
	ctf_src/unit_tests/ctfAPI/Test_hdf5_restart.F90
	None
770	The CTF_Coupling_Interface shall provide a means of obtaining a unique pin index for each pin solved by CTF when given the pin assembly index and location in the core map as defined in the VERAIn XML parameter list
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None
771	The CTF_Coupling_Interface shall allow the user to check if the conduction model is enabled in the CTF simulation
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None
772	The CTF_Coupling_Interface shall allow the user to disable warning messages produced from CTF
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None
773	The CTF_Coupling_Interface shall allow the user to reduce the verbosity of information printed from CTF to the screen during a coupled solution
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
774	The CTF_Coupling_Interface shall support coupling to CTF for flow loop models that contain multiple axial sections in the CTF model
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None
775	The CTF_Coupling_Interface shall support models of BWR geometry with multiple assemblies.
	ctf_src/unit_tests/ctfAPI/Test_CTF_Coupling_Interface.F90
	None
776	CTF shall print the Git description to the VERA HDF5 file when Git is available during configure time
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
777	CTF shall print the Git description to the native HDF5 file when Git is available during configure time
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
778	CTF shall print the Git description to the CTF log file when Git is available during configure time
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
779	The CTF_Coupling_Interface shall accept fast flux for each rod level and use this information to calculate clad creep in the fuel rod gap model
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
780	The CTF_Coupling_Interface shall accept core irradiation time as input.
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
781	The CTF_Coupling_Interface shall allow the user to obtain restart data for each fuel rod in the model
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
782	The CTF_Coupling_Interface shall allow the user to restart a fuel rod solution from restart data that was obtained from the CTF_Coupling_Interface
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
783	CTF shall model the clad creep affect due to fuel irradiation.
	ctf_src/unit_tests/ctfAPI/Test_FuelRodGap_restart.f90
	None
784	The CTF_Coupling_Interface shall return the MAMBA pin object for the requested pin when a crud simulation using MAMBA is being modeled
	ctf_src/unit_tests/ctfAPI/Test_mamba_coupling.F90
	None
785	The CTF_Coupling_Interface shall calculate the temperature rise of the moderator inside of the guide tube using a simple model based on local core inlet and outlet temperature and a user-defined modeling coefficient
	ctf_src/unit_tests/ctfAPI/Test_mamba_coupling.F90
	None

Req. ID	Requirement Description
	Test Name
	Test Input
	Additional Info
786	The CTF_Coupling_Interface shall provide a procedure for setting the guide tube coefficient that is used in the simple guide tube moderator temperature model
	ctf_src/unit_tests/ctfAPI/Test_mamba_coupling.F90
	None
787	The CTF_Coupling_Interface shall provide a procedure for getting the guide tube coefficient that is used in the simple guide tube moderator temperature model
	ctf_src/unit_tests/ctfAPI/Test_mamba_coupling.F90
	None