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1. SCOPE

This test plan defines the detailed requirements, beyond those already identified in GE Spec 25A5587, for the PANDA transient integral system Test M6/8. This Test Plan specifically covers the test program objectives, the experimental facility configuration, the test facility control, the test instrumentation, the data acquisition, processing and analysis, the test initial and boundary conditions and the test reports for Test M6/8.

This test plan is applicable to the SBWR Design Certification project only.

2. APPLICABLE DOCUMENTS

a. PANDA Test Specification, GE Spec 25A5587.

This document provides the general specification of requirements for tests in the PANDA facility to support SBWR Design Certification.

b. PANDA Steady State Tests- - PCC Performance Test Plan & Procedure,
PSI Doc. TM-42-94-11/ALPHA 410.

This document provides a general description of the PANDA test facility and the specific plan and procedure for steady state tests of the PCC condenser performance.

c. PANDA PROJECT CONTROL PLAN, GE Doc. PPCP-QA-01.

This document describes the organization, quality related activities, events and procedures necessary to ensure and verify that the PANDA project at PSI is conducted under the provisions of the GE SBWR Quality Assurance Plan as described in NEDG-31831.

d. PANDA Test Plan-Tests M3,M3A,M3B,M4&M7, GE Spec 25A5764

This test plan defines the detailed requirements, beyond those already identified in GE Spec 25A5587, for the PANDA transient integral system tests M3, M3A, M3B, M4 and M7.

3. TEST OBJECTIVES

The objectives of the PANDA integral systems tests are to provide additional data to: (a) provide a sufficient database to confirm the capability of TRACG to predict SBWR containment system performance, including potential systems interaction effects. (Integral Systems Tests) and (b) Demonstrate startup and long-term operation of a passive containment cooling system. (Concept Demonstration).

The specific objectives a[illegible]proach for test M6/8 covered by this test plan are:

a) Perform a test with nominal post-LOCA initial conditions* with the IC initially operating in parallel with the three PCC condensers. This test will provide data showing the interaction between the PCC condensers and the IC, as well as the effect of the additional heat removal by the IC on containment and reactor system performance(M6).

b) Study the effect of drywell-to-wetwell bypass leakage on containment performance ,the bypass leakage area will be set at ten times the allowable SBWR value as scaled to PANDA(M8).

The objectives discussed above have been combined into sequential stages in a single test plan.

* "Nominal post-LOCA initial conditions" are those used for test M3 which are derived from the SBWR main steam line break LOCA analysis at one hour after LOCA initiation.

4. TEST FACILITY CONFIGURATION

The PANDA test facility is described in detail in Section 3 of PSI report ALPHA 410. For Tests M6/8 the PANDA facility will be configured to simulate the SBWR post-LOCA configuration as follows:

1) Table 4.1 identifies the key PANDA facility geometry and effective flow area ($A/\sqrt{k}$) characteristics. In Table 4.1, the required tolerance for the PANDA as-built value relative to the corresponding SBWR scaled value is tabulated for each of these key characteristics. In addition, the required accuracy for the as-built value for each of the key characteristics is tabulated in Table 4.1. The actual as-built accuracy should be approximately equal to or less than the required accuracy tabulated in Table 4.1. The actual as-built accuracies depend on the source of the as-built value. These sources can be measurements by PSI or Electorwatt (i.e. line losses, line lengths, elevations), manufacturer's specifications or design standards (i.e., PCC/IC tubes), or calculations from as-built dimensions (i.e., vessel volumes, losses for lines without flow tests).

2) The RPV will supply steam to the each drywell with two steam lines (one to each drywell). These two steam lines will have the same pressure loss characteristics.

3) RPV heater power will be controlled as a function of time to simulate the scaled decay heat and stored energy.

4) The IC unit will be lined up to operate in parallel with the PCC condensers. The IC feed & drain will be open with the IC vent line closed initially. The IC vent may be opened in a later portion of the test if the IC accumulates enough non-condensable gas to force the IC to shutdown on its own. If the IC vent is opened for the later portion of the test it will remain open. The IC vent line is not scaled consistently with the 1:25 scaling of PANDA to SBWR.

5) All three PCC units will be lined-up to take feedflow from the drywells, to vent noncondensables and steam into the water volume of the suppression pool, and drain condensate to the GDCS volume.

6) The PCC pools and IC pool will be filled and isolated from each other. During the test, no water will be added or drained.

7) The only direct lines of communication between the drywell and wetwell will be as follows:

a) through the vacuum breakers (when the wetwell pressure exceeds drywell pressure sufficiently to open the vacuum breaker) and b) through main vent lines (which will be submerged within the wetwells), and c) through the bypass leakage path between the wetwell and drywell placed in service at 4 hours after initiation of the test and configured to provide an effective flow area($A/\sqrt{k}$) of approximately 0.40 cm^2 .

8) The GDCS pressure equalization lines to both drywells will be open.

9) The GDCS drain line with check valve will be up to return PCC condensate to the RPV.

10) The Equalizing lines between the RPV and wetwells will be valved out of service.

Table 4.1: PANDA Transient Integral System Tests

Key Facility Characteristics

PARAMETER	TOLERANCE FOR PANDA AS-BUILT VALUE RELATIVE TO SBWR SCALED VALUE FOR PANDA	PANDA AS-BUILT ACCURACY
PCC/IC Heat Exchanger Tubing		
-Length	± 5 %	± 5 mm
-Outside Diameter	± 5 %	± 0.3 mm
-Thickness	± 15 %	± 0.2 mm
PCC/IC Heat Exchanger Headers		
-Outside diameter	± 5 %	± 5 mm
-Length	± 5 %	± 5 mm
-Steel thickness cylindrical section	± 5 %	± 0.3 mm
-Steel thickness end plates	± 5 %	± 0.3 mm
-Distance between headers (drums)	± 5 %	± 5 mm

Table 4.1: PANDA Transient Integral System Tests

Key Facility Characteristics (continued)

PARAMETER	TOLERANCE FOR PANDA AS-BUILT VALUE RELATIVE TO SBWR SCALED VALUE FOR PANDA	PANDA AS-BUILT ACCURACY
Vessel Volumes		
-RPV	± 10 %	± 2 %
-Drywell 1	± 10 %	± 2 %
-Drywell 2	± 10 %	± 2 %
-Wetwell 1	± 10 %	± 2 %
-Wetwell 2	± 10 %	± 2 %
-GDCS	(1)	± 2 %
-IC/PCC pools	(2)	± 2 %

(1) GDCS pool volume is not scaled to SBWR

(2) IC/PCC pool volumes are not scaled to SBWR

Table 4.1: PANDA Transient Integral System Tests

Key Facility Characteristics (continued)

PARAMETER	TOLERANCE FOR PANDA AS-BUILT VALUE RELATIVE TO SBWR SCALED VALUE FOR PANDA	PANDA AS-BUILT ACCURACY
Elevation Differences		
I1V-P1V-P2V-P3V discharges	± 2 cm	± 1 cm
P1C inlet to outlet	± 10 cm	± 1 cm
P2C inlet to outlet	± 10 cm	± 1 cm
P3C inlet to outlet	± 10 cm	± 1 cm
I1F inlet to outlet	± 10 cm	± 1 cm
I1C inlet to outlet	± 10 cm	± 1 cm
P1V, P2V, P3V discharges relative to normal suppression pool level	± 5 cm	± 1 cm
MV1 and MV2 discharges relative to normal suppression pool level	± 5 cm	± 1 cm
I1V, P1V, P2V, P3V discharges relative to MV1 and MV2 discharges	± 5 cm	± 1 cm
P1F, P2F, P3F inlet relative to MS1 and MS2 discharge	+ 200 cm / − 0	± 1 cm

Table 4.1: PANDA Transient Integral System Tests

Key Facility Characteristics (continued)

PARAMETER	TOLERANCE FOR PANDA AS-BUILT VALUE RELATIVE TO SBWR SCALED VALUE FOR PANDA	PANDA AS-BUILT ACCURACY
Elevations (relative to TAF/Heaters)		
P1F, P2F, P3F inlet	+ 200 cm / − 0	± 5 mm
P1C,P2C,P3C inlet	± 5 cm	± 5 mm
P1V,P2V,P3V discharge	± 5 cm	± 5 mm
I1F inlet	± 5 cm	± 5 mm
I1C outlet	± 5 cm	± 5 mm
GRT inlet	± 5 cm	± 5 mm
GRT outlet	± 5 cm	± 5 mm
MV1 outlet	± 5 cm	± 5 mm
MV2 outlet	± 5 cm	± 5 mm
MSL 1 outlet	± 5 cm	± 5 mm
MSL 2 outlet	± 5 cm	± 5 mm
Top of RPV chimney	± 25 cm	± 50 mm

Table 4.1: PANDA Transient Integral System Tests

Key Facility Characteristics (continued)

PARAMETER	TOLERANCE FOR PANDA AS-BUILT VALUE RELATIVE TO SBWR SCALED VALUE FOR PANDA	PANDA AS-BUILT ACCURACY
Connecting Line Flow Resistances		
RPV to DW1	± 20%	± 10%
RPV to DW 2	± 20%	± 10%
DW 1 to PCC1	± 20%	± 10%
DW 2 to PCC2	± 20%	± 10%
DW 2 to PCC3	± 20%	± 10%
DW 1 to WW 1 (LOCA vent)	(3)	± 10%
DW 2 to WW 2 (LOCA vent)	(3)	± 10%
RPV to IC	± 20%	± 10%
IC to WW1	(3)	± 10%
IC to RPV	± 20%	± 10%
PCC1 to GDCS	± 20%	± 10%
PCC2 to GDCS	± 20%	± 10%
PCC3 to GDCS	± 20%	± 10%
PCC1 to WW 1	± 20%	± 10%
PCC2 to WW 2	± 20%	± 10%
PCC3 to WW 2	± 20%	± 10%
GDCS to RPV	± 20%	± 10%
WW 1 to DW 1 (bypass/vac. brkr)	± 20%	± 10%

(3) IC vent and LOCA vents are not scaled to SBWR

5. CONTROL SYSTEM DESCRIPTION

In order to perform the transient integral system tests, several control systems are to be used to establish initial and boundary conditions for each test. These control systems will be used to manage and regulate the key test parameters prior to the test. Following test initiation, only the RPV heater power and the vacuum breaker controllers will be used. A main control system, which includes the electronic controllers, will be used to perform the operations.

5.1 RPV Heater Power Control

The electrical power to the heaters in the RPV will be controlled automatically following test initiation, to match the decay power and RPV structural heat release specified in Section 9.

5.2 Drywell/Wetwell Vacuum Breaker Control

The operation of the vacuum breaker valve will be controlled based on the measured pressure difference between the drywell and wetwell. Drywell pressure is initially established at a value equal to or greater than the wetwell pressure to conform to the post-LOCA condition specified for the beginning of each individual test. During the course of a test if the drywell to wetwell pressure drops below a minimum value the vacuum breaker valve control will automatically open the valve. The wetwell-to-drywell differential pressure at which the vacuum breaker for Drywell 1 opens will be set at 0.47 psi (3.24 kPa), and the differential pressure at which the vacuum breaker for Drywell 1 closes will be set at 0.3 psi (2.06 kPa). The opening and closing differential pressure for the vacuum breaker in Drywell 2 will be set 0.1 psi higher than the corresponding setpoints for the Drywell 1 vacuum breaker, i.e., at 0.57 psi (3.9 kPa) and 0.4 psi (2.8 kPa), respectively.

6. REQUIRED MEASUREMENTS

Table 6.1 gives the measurements required to meet the objectives for Tests M6/8. With the exception of the temperature indication, no PANDA instrumentation other than that in Table 6.1 is necessary for the performance of Tests M6/8. The sensors identified in Table 6.1 must be operable prior to initiation of these tests. It is acceptable if a sensor is not operable, if the backup identified in the second column is operable.

Temperature measurements in the PCCs and the various connected vessels are desirable, but not all of these temperature measurements are required for the performance of these tests as discussed below. The temperature measurements required for these tests with an accuracy of 1.5°C are as follows:

RPV steam dome (at least one).

PCC/IC tubes; (It is required that 50% of the tube wall and fluid sensors be available. The available sensors must include at least 40% of the probes above and at least 40% of the probes below the horizontal mid-plane of the tube bundle. Within these constraints, the test engineer has responsibility and authority to judge whether or not sufficient PCC temperature sensors are operable to initiate a test).

PCC/IC pools: 30% of the liquid probes including one of the lowest three elevations.

DW: 50% of the fluid probes including either the lowest elevation or one thermocouple from the water-surface probe.

WW: 50% of the gas probes, 50% of the liquid probes and two out of three of the floating probes.

GDCS pool: 50% of the fluid probes and one thermocouple from the floating probe.

Vessel walls: 20% of GDCS, DW, and WW.

System lines: 50% of the gas and liquid temperature probes in each system line used for the test (if number of sensors is odd, round to lower whole number, i.e. 3 sensors total in one line means one is required).

In Table 6.1 a subset of the required instruments are identified as "top priority measurements". Time history plots of these top priority measurements are to be included in the Test File (see Section 7.3) and the Apparent Test Results (ATR) Report (see Section 10). In addition to the top priority measurements identified in Table 6.1, there are other top priority measurements. These are: 1) the total electrical power to the heaters in the RPV which is determined during post-test data processing, and 2) some temperature measurements. The top priority temperature measurements are: RPV steam dome temperature measurement, highest and lowest temperature measurement location in each drywell, highest and lowest temperature measurement location in the gas space of each wetwell, highest liquid temperature measurement location in each wetwell, and one temperature measurement in the GDCS drain line and in each of the three PCC vent lines.

As noted in Section 7.4, the operator will perform checks as possible to confirm instrumentation performance. These checks will include comparison of redundant measurements.

Table 6.1: INSTRUMENTATION REQUIRED* FOR TEST M6/8			
Processid **	Backup	Accuracy	Location
CB.VB1 ♦		N/A (On/Off)	Valve position :Vacuum Breaker Line 1
CB.VB2 ♦		N/A (On/Off)	Valve position :Vacuum Breaker Line 2
MD.MV1	MI.MV1	0.5 kPa	pressure diff. meas. Main Vent line DW1->SC1
MD.MV2	MI.MV2	0.5 kPa	pressure diff. meas. Main Vent line DW2->SC2
MD.P1F	MV.P1F	0.5 kPa	pressure diff. meas. PCC1 Feed DW1->PCC1
MD.P1V.2	MI.P1V.1	0.5 kPa	pressure diff. meas. PCC1 Vent PCC1->SC1
MD.P2F	MV.P2F	0.5 kPa	pressure diff. meas. PCC2 Feed DW2->PCC2
MD.P2V.2	MI.P2V.1	0.5 kPa	pressure diff. meas. PCC2 Vent PCC2->SC2
MD.P3F	MV.P3F	0.5 kPa	pressure diff. meas. PCC3 Feed DW2->PCC3
MD.P3V.2	MI.P3V.1	0.5 kPa	pressure diff. meas. PCC3 Vent PCC3->SC2
MD.I1F(4)	MV.I1F	0.58 kPa	pressure diff. meas. IC Feed RPV->IC
MD.VB1	MD.VB2	0.5 kPa	pressure diff. meas. Vacuum Breaker SC1-DW1
MD.VB2	MD.VB1	0.5 kPa	pressure diff. meas. Vacuum Breaker SC2-DW2

Table 6.1: INSTRUMENTATION REQUIRED* FOR TEST M6/8

Processid **	Backup	Accuracy	Location
MI.MV1	MD.MV1	N/A(on/off)	phase indicator Main Vent line DW1->SC1
MI.MV2	MD.MV2	N/A(on/off)	phase indicator Main Vent line DW2->SC2
MI.P1V.1	MD.P1V.2	N/A(on/off)	phase indicator PCC1 Vent PCC1->SC1
MI.P2V.1	MD.P2V.2	N/A(on/off)	phase indicator PCC2 Vent PCC2->SC2
MI.P3V.1	MD.P3V.2	N/A(on/off)	phase indicator PCC3 Vent PCC3->SC2
MP.D1 ♦		2.5 kPa	absol. pressure meas. Drywell 1 / DW1
MP.RP.1 ♦		2.5 kPa	absol. pressure meas. Reactor Pressure Vessel / RPV
MP.S1 ♦		2.5 kPa	absol. pressure meas. Suppression Chamber 1 / SC1
ML.U1		0.2 m ↕	PCC 1 pool level
ML.U2		0.2 m ↕	PCC 2 pool level
ML.U3		0.2 m ↕	PCC 3 pool level
ML.U0		0.2 m ↕	IC pool level
ML.RP.1		0.2 m	RPV level
ML.S1	ML.S2	0.05 m	Suppression pool level

Table 6.1: INSTRUMENTATION REQUIRED* FOR TEST M6/8			
Processid **	Backup	Accuracy	Location
ML.D1	ML.D2	0.05 m	Drywell water level
MPG.D1(2)_1 ♠	†	5.00%	air partial pres. meas. Drywell 1(2) / DW1(2) (highest probe in DW)
MPG.S1	†	5.00%	air partial pres. meas. Wetwell /WW1
MV.VL1(5)		3.00%	volume flow meas. VB1 Leakage
MV.MS1 (1)	MV.MS2	N/A	volume flow meas. Main Steam line RPV->DW1
MV.MS2 (1)	MV.MS1	N/A	volume flow meas. Main Steam line RPV->DW2
MV.P1F (1)(2)		3.00%	volume flow meas. PCC1 Feed DW1->PCC1
MV.P2F (1)(2)		3.00%	volume flow meas. PCC2 Feed DW2->PCC2
MV.P3F (1)(2)		3.00%	volume flow meas. PCC3 Feed DW2->PCC3
MV.I1F(4)		3.00%	volume flow meas. IC Feed RPV->IC
MW.RP.1		3.00%	electrical power meas Reactor Pressure Vessel / RPV

Table 6.1: INSTRUMENTATION REQUIRED* FOR TEST M6/8			
Processid **	Backup	Accuracy	Location
MW.RP.2		3.00%	electrical power meas Reactor Pressure Vessel / RPV
MW.RP.3		3.00%	electrical power meas Reactor Pressure Vessel / RPV
MW.RP.4		3.00%	electrical power meas Reactor Pressure Vessel / RPV
MW.RP.5		3.00%	electrical power meas Reactor Pressure Vessel / RPV
MW.RP.6		3.00%	electrical power meas Reactor Pressure Vessel / RPV

(♦) Top Priority Measurements, additional high priority temperature measurements are defined in the text of this section.

(*) It is required that temperature monitoring capability with an accuracy of 1.5°C be available for these tests as described in the text of this section.

(**) PANDA instrumentation identification system is described in Section 5.2 of ALPHA 410

(‡) Differential accuracy over short time intervals is ±0.02m

(†) Any of the other instruments for determining or inferring air partial pressure in the drywells/wetwells may backup these instruments.

(1) For volumetric flow rate measurements, all additional measurements (pressure and temperature) required to convert the volumetric flow rate to a mass flow rate are required.

(2) 2 of the 3 volumetric flowmeters for PCC feed lines are required.

(3) All instrumentation listed in this table is required to be operable only while the monitored process value is within the instruments operating range as defined in Table 5.3 of ALPHA-410.

(4) Only required when IC in operation during test M6/8

(5) Only required when Vacuum Breaker Bypass Leakage Line in operation during test M6/8

7. DATA RECORDING, PROCESSING AND ANALYSIS

7.1 Data Recording

During (approximately) the first two hours of the test (until the first drywell pressure peak is reached) the data for all channels will be recorded at 6 samples per minute. During the rest of the test (after the peak drywell pressure is reached) the data will be recorded at 1 sample per minute. It is necessary that the data sampling rate be sufficient to record opening and closing of the vacuum breakers between the drywells and wetwells.

7.2 Data Records

The digitally acquired data will be recorded in real time for the entire duration of the test. Immediately after the test, a copy of the data file will be created in order to have a backup record of the data file. Also to be recorded with this data file are all information required to perform subsequent processing of the data.

7.3 Data Sheets

The following data sheets will be prepared for each test for inclusion in the PANDA Test File (PTF). The unique test number will be printed on each sheet.

1) print table containing the list of the measurements with their main characteristics (identification, span, calibration constants, associated error, location on the facility, measurement channel number and sampling frequency)

2) graphs of top priority measurements identified in Section 6 as a function of time (time histories). Graphs may show groups of up to 8 test measurements.

3) print table showing the position (status) of all on-off valves, just after the beginning and just before the end of the test and periodically throughout the duration of the test.

7.4 Data Processing and Analysis

During the preconditioning of the test facility and during the running of the transient tests,the operators will monitor the required instrumentation identified for these tests in Table 6.1. The operators will check whether or not redundant measurements are consistent and perform other congruency checks including zero checks as possible to verify that the instrumentation and data acquisition system are working correctly.

Following completion of the tests described in Section 9, data reduction will be performed to support preparation of the Apparent Test Results Reports (ATR). This data reduction will include a representative set of time history plots of system flows, differential pressure, vessel pressures, air partial pressure (O_2 sensor readout), and temperatures covering the full test duration for top priority measurements. These results will be reviewed and reported in the ATR (see Section 10).

The Data Transmittal Report (DTR) will transmit all the data for the transient integral system tests (see Section 10).

8. SHAKEDOWN TESTS

8.1 No shakedown tests are planned.

9. TEST DESCRIPTION

9.1 TEST DESCRIPTION

A series of transient integral tests will be conducted using the PANDA facility configured as described in Section 4. The tests will be performed using detailed procedure(s). The following summarizes the approach to be followed by the test procedure for Test M6/8.

The drywells, wetwells, GDCS tank and PCC/IC pools will be pre-conditioned and brought separately to their required initial conditions (or slightly higher temperatures and/or pressures if heat loss or stabilization is expected to bring conditions within their required range).

The IC will be pre-conditioned to allow operation with non-condensable gas inventory as low as practical at the initiation of the test. The pre-test line-up should be with the feed, drain and vent line valves closed.

Once the initial conditions of the various vessels are confirmed to match the values specified in Table 9.1, the test is initiated as follows:

Start to open all valves which must be open in lines between vessels per the test configuration in Section 4, except the valves in the RPV to drywell steamlines and the IC feed and drain line, within a period of approximately 5 minutes.

Then, the following sequence should be performed as quickly as possible:

1) Open the valves in both RPV to drywell steamlines

2) Place RPV heater controls in automatic operation to follow the time dependent heater power determined from the specification in Table 9.2.

3) Open the IC feed, and after IC pressure has stabilized open the drain line valve.

4) In order to minimize the non-condensable gas concentration in the IC near the start of the test, open the IC lower vent within the first 5 minutes after the IC operation has been initiated. Close the IC lower after venting for approximately 5 minutes.

5) At 4 hours after test start, establish the bypass leakage path between the Wetwell 1 and Drywell 1 volumes.

6) At 6 hours after test start:

a) if the IC is still in operation* , terminate IC operation by closing the feed and drain valves and continue test for 4 hours(until 10 hours after test start) or until pressure reaches 4 bars, or

b) if the IC has shutdown because of non-condensable gas accumulation*, continue the test until at least a total of 4 hours of bypass leakage operation with the IC shutdown has elapsed, or until pressure reaches 4 bars. After at least 4 hours of bypass leakage operation with the IC shutdown, or when pressure reaches 4 bars, open the IC vent line valve and continue the test for an additional 2 hours or until pressure reaches 4.3 bars.

At the completion of step 6.a or step 6.b, as applicable, data recording may be terminated, and the test performance declared complete.

* As determined by the Test Engineer from IC tube centerline and upper and lower header thermocouple responses and IC pool level and temperature responses.

Table 9.1: INITIAL CONDITIONS					
INITIAL CONDITIONS FOR PANDA TEST M6/8					
	RPV	Drywell	Wetwell	GDCS	PCC/IC Pools
Total Pressure (kPa)	295	294	285	294	≈100
Air Pressure (kPa)	0	13	240	274	N/A
Vapor Temperature (K)	406	404	352	333	N/A
Liquid Temperature (K)	406	404	352	333	≈373
Collapsed Water Level (m) (1)	11.2	(2)	3.8	10.7 (3)	23.6

Notes:

(1) Water levels are specified relative to the top of the PANDA heater bundle.

(2) The nominal DW condition is no water. However, a small amount of spill from the RPV to the DW at the start of the test is acceptable.

(3) The GDCS level should be positioned in hydrostatic equilibrium with the RPV level (including an appropriate adjustment for temperature difference).

Table 9.2a: POWER FOR PANDA TESTS M6/8; Shutdown Power vs. Time		
TIME FROM SCRAM (sec)	DECAY HEAT (%)	PANDA DECAY HEAT (MW)
3600 (Test start)	0.0132	1.056
3650	0.0131	1.048
4000	0.0127	1.016
5000	0.0119	0.952
6000	0.0112	0.896
7000	0.0107	0.856
7200	0.0106	0.848
8000	0.0103	0.824
9000	0.0100	0.800
10000	0.00972	0.778
14400	0.00928	0.742
18000	0.00881	0.705
20000	0.00859	0.687
28800	0.00788	0.630
30000	0.00781	0.625
36000	0.00748	0.598
40000	0.00729	0.583
50000	0.00689	0.551
60000	0.00658	0.526
70000	0.00631	0.505
80000	0.00609	0.487

Table 9.2b: POWER FOR PANDA TESTS M6/8; (Total Power*)/(Decay Power) vs. Time

TIME FROM SCRAM (sec)	TOTAL POWER*/DECAY POWER
3600 (Test Start)	1.070
5000	1.058
7500	1.038
10,000	1.025
12,500	1.019
15,000	1.016
20,000	1.010
25,000	1.008
30,000	1.007
72,000	1.000

* Total power includes contribution from reactor structure stored energy

Note: Tolerance on PANDA power throughout transient is ± 25 kW or 0.025 MW.

9.2 Test Acceptance Criteria

In order to assure the objectives of these tests are met, it is necessary that:

1) the values over the 1 minute period prior to the test for the following initial conditions must be within the specified ranges:

– Total Pressure (kPa)	=	reference matrix value ± 4 kPa (all vessels except drywell)
– Drywell Air Partial Pressure (kPa)	=	reference matrix value ± 2 kPa
– Mean Vapor Temperature (K)	=	reference matrix value ± 2 °K(all vessels except GDCS/all tests)
– Mean Vapor Temperature (K)	=	reference matrix value ± 4 °K(GDCS vessel)
– Local Vapor Temperature (K)	=	mean value ± 2 °K(all vessels except GDCS/all tests)
– Local Vapor Temperature (K)	=	mean value ± 4 °K(GDCS vessel)
– Mean Liquid Temperature (K)	=	reference matrix value ± 2 °K (except for PCC/IC pools)
– Mean Liquid Temperature(K)	=	Saturation temperature at actual environmental pressure +0/-4 °K (for PCC/IC pools)
– Local Liquid Temperature (K)	=	mean value ± 2 °K
– Wetwell and GDCS Water Levels	=	reference matrix value ± 0.100 m
– RPV Water Level	=	reference matrix value ± 0.200 m
– PCC Pool Level	=	reference matrix value ± 0.200 m

2) the required instrumentation defined in Section 6 and Table 6.1 be operational

3) at test initiation and throughout the transient, (to be confirmed during post-test data analysis):

– RPV Power = reference matrix value ± 25 kW or 0.025 MW

10. REPORTS

One brief Apparent Test Results (ATR) report will be prepared covering the results for each of the transient integral tests based on the data reduction described in Section 7. The ATR will summarize the apparent results. The format for this report will include: test number, test objective, test date, data recording period, names of data files, list of failed or unavailable instruments considered to be required for the test, list of pressure and differential pressure instruments with zero not in tolerance or over-range during test, deviations from test procedure, problems, table of actual initial conditions based on average and standard deviation over a one minute time period just before the start of the test of all parameters with a specified acceptance criteria in section 9.1 and time history plots of top priority measurements over the test duration. The ATR report is a verified report, approved by the PSI PANDA Project Manager, and will be transmitted to the GE within approximately two weeks of the completion of each transient integral system test.

The Data Transmittal Report (DTR) containing all data for transient integral system tests M6/8, will be issued approximately two months after the last test is performed. It will provide detailed information on the test facility configuration, test instrumentation, test conditions and the format for the data. In addition, samples of data will be presented in tables and plots. The DTR will be verified before it is issued, approved by the PSI PANDA Project Manager, and then be transmitted to GE.

11. TEST HOLD/DECISION POINTS

The Test Procedure(s) must have been reviewed and approved by GE's Project Manager, GE Site QA Representative and PSI's PANDA Project Manager before the transient testing described in Section 9 can be performed.