PAUL SCHERRER INSTITUT

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PANDA Transient Tests

M2, M10A & M10B Integral System Test Procedure

PSI Internal Document

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Abstract:

This report details the procedure for conducting PANDA Transient Tests M2, M10A & M10B specified by GE document 25A5785 Rev.0.

All phases for PANDA operation during the preconditioning processes and the test phases are described.

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00 Introduction

This procedure for Transient Tests M2, M10A and M10B describes all test phases including preconditioning processes. Assuming that the starting point for the preconditioning is an empty facility at atmospheric conditions, this procedure gives sequences of processes, which do not need to be strickly followed during the preconditioning process, at the discretion of Test Engineer. Required phases are listed in the Checklist and must be recorded when conducted.
The current procedure gives guidance on how to proceed to bring PANDA to the required initial test conditions for a extreme case (from a cold and empty facility). The order of preconditioning sequences may be modified if needed, and single phases may be adapted to the actual conditions. Heating power indicated in preconditioning phases is theoretical and considered as basis for time estimation. Due to PSI electrical power limitation or modification in preconditioning process, the heating power may be reduced.
In any case, the foreseen preconditioning process is to start with the Suppression Chambers conditioning after the facility has been set ready for operation. It continues with the GDCS tank, all PCC/IC condenser pools and the Drywells. Just before test initiation, the RPV is set up to satisfy the required initial conditions. The test is then conducted under automatic power control and without any operator actions, during 20 hours for M2 and less than 10 hours for both M10A and M10B tests.
A time estimation for the preconditioning of an empty and cold facility is given for each component in the following table.
Test Plan Specifications are described in the GE document 25A5785 REV.0.

Note: - Since temperatures are given in Kelvin in the Test Plan Specification and in °C in the PANDA DAS, they are indicated in both units in the current procedure.
- Idem for pressures which appear in kPa in the Test Plan Specification and in bar in the PANDA DAS; they are also indicated in two units in the current procedure.
- Key parameters or key actions are indicated in dark frames to make reading easier during PANDA operation.

Time Estimation

Phase n°	Preconditioning Phases	time	
10	Initial Alignment	not estimated	
20	RPV Setup for Vessel Preconditioning	5,2	[hour]
30	Suppression Chambers Setup	12,8	[hour]
40	GDCS Heating	2,6	[hour]
50	PCC1 Pool Setup	2,0	[hour]
60	PCC2 Pool Setup	2,0	[hour]
70	PCC3 Pool Setup	2,0	[hour]
80	Drywells Setup	1,5	[hour]
90	RPV Initial Conditions Setup for Test	not estimated	
100	Test Conditions Setup	not estimated	
110	M2 Test	20,0	[hour]
121	M2 Test Extension	~ 1,0	[hour]
110	M10A or M10B Test	8,0	[hour]
121	M10A or M10B Test Extension	~ 2,0	[hour]
10 to 100	Duration for Preconditioning	28,0	[hour]
10 to 120	Duration for the whole M2 Test	49,0	[hour]
10 to 120	Duration for the whole M10A or M10B Test	38,0	[hour]

Note: Duration of phases n°10, 90 & 100 cannot be estimated; it should not exceed a couple of hours.

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01 Test Configuration and Initial Conditions

The configuration for these Asymetric Transient Tests includes the RPV, Suppression Chambers, Drywells, GDCS, all PCC condensers and their respective pools; the IC condenser and its pool are not included in the test configuration. The Equalization Lines connecting both Wetwells to the RPV are also not part of the system and kept closed. The Main Steam Lines are not both used during these tests; only one Steam Line is connected.
For tests M2 and M10A, the RPV is connected only to Drywell 2 through the Main Steam Line 2 and for M10B only to Drywell 1; the Main Steam Line 1 is valved out in the first case and the Main Steam Line 2 for M10B. A detailed description of the required configuration is given in the Test Plan.
An overview of the test configuration is summarized in the list of Test Initial Conditions given in the following. Defined for all components involved for Transient Tests, these initial conditions described in the above mentioned GE document are listed below with the respective tolerances.

Note: The current procedure is based on the values given in the following List.

Test Initial Conditions List

RPV (V.RP)

- Total Pressure	MP.RP.1 =	295 [kPa]	±	4 [kPa]
- Mean Fluid Temperature	$T_{F\_mean}(RP)$ =	Σ(MTF.RP.i)/max(i)		with i=1 to 5
	$T_{F\_mean}(RP)$ =	406 [K]	±	2 [K]
- Local Fluid Temperature	MTF.RP.1...5 =	$T_{F\_mean}(RP)$	±	2 [K]
- Water Level	ML.RP.1 =	12,70 [m]	±	0,20 [m]

Drywell 1 and 2 (V.D1 - V.D2)

- Air Partial Pressure	MPG.D1.1 =	13 [kPa]	±	2 [kPa]
	MPG.D2.1 =	13 [kPa]	±	2 [kPa]
- Mean Gas Temperature	$T_{G\_mean}(D1)$ =	Σ(MTG.D1.i)/max(i)		with i=1 to 6
	$T_{G\_mean}(D2)$ =	Σ(MTG.D2.i)/max(i)		with i=1 to 6
	$T_{G\_mean}(D1)$ =	404 [K]	±	2 [K]
	$T_{G\_mean}(D2)$ =	404 [K]	±	2 [K]
- Local Gas Temperature	MTG.D1.1...6 =	$T_{G\_mean}(D1)$	±	2 [K]
	MTG.D2.1...6 =	$T_{G\_mean}(D2)$	±	2 [K]
- Water Level	ML.D1 =	0,00 [m]	±	0,10 [m]
	ML.D2 =	0,00 [m]	±	0,10 [m]

Suppression Chamber 1 and 2 (V.S1 - V.S2)

-Total Pressure	MP.S1 =	285 [kPa]	±	4 [kPa]
	MP.S2 =	285 [kPa]	±	4 [kPa]
- Mean Gas Temperature	$T_{G\_mean}(S1)$ =	Σ(MTG.S1.i)/max(i)		with i=1 to 6
	$T_{G\_mean}(S2)$ =	Σ(MTG.S2.i)/max(i)		with i=1 to 6
	$T_{G\_mean}(S1)$ =	352 [K]	±	2 [K]
	$T_{G\_mean}(S2)$ =	352 [K]	±	2 [K]
- Local Gas Temperature	MTG.S1.1...6 =	$T_{G\_mean}(S1)$	±	2 [K]
	MTG.S2.1...6 =	$T_{G\_mean}(S2)$	±	2 [K]
- Mean Water Temperature	$T_{W\_mean}(S1)$ =	Σ(MTL.S1.i)/max(i)		with i=1 to 6
	$T_{W\_mean}(S2)$ =	Σ(MTL.S2.i)/max(i)		with i=1 to 6
	$T_{W\_mean}(S1)$ =	352 [K]	±	2 [K]
	$T_{W\_mean}(S2)$ =	352 [K]	±	2 [K]
- Local Water Temperature	MTL.S1.1...6 =	$T_{W\_mean}(S1)$	±	2 [K]
	MTL.S2.1...6 =	$T_{W\_mean}(S2)$	±	2 [K]
- Water Level	ML.S1 =	3,80 [m]	±	0,10 [m]
	ML.S2 =	3,80 [m]	±	0,10 [m]

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Test Initial Conditions List (cont'd)

GDCS (V.GD)

-Total Pressure	MP.GD =	294 [kPa]	±	4 [kPa]
- Mean Fluid Temperature	$T_{F\_mean}(GD)$ =	Σ(MTF.GD.i)/max(i)		with i=1 to 7
	$T_{F\_mean}(GD)$ =	333 [K]	±	4 [K]
- Local Fluid Temperature	MTF.GD.1...7 =	$T_{F\_mean}(GD)$	±	4 [K]
- Water Level	ML.GD =	0,00 [m]	±	0,10 [m]

PCC1, 2 and 3 Pools (V.U1 - V.U2 - V.U3)

-Total Pressure	* MP.ENV =	97 [kPa]		
- Mean Water Temperature	$T_{W\_mean}(U1)$ =	Σ(MTL.U1.i)/max(i)		with i=1 to 7
	$T_{W\_mean}(U2)$ =	Σ(MTL.U2.i)/max(i)		with i=1 to 7
	$T_{W\_mean}(U3)$ =	Σ(MTL.U3.i)/max(i)		with i=1 to 19
	* $T_{W\_mean}(U1)$ =	372 [K]	+0/ -4	[K]
	* $T_{W\_mean}(U2)$ =	372 [K]	+0/ -4	[K]
	* $T_{W\_mean}(U3)$ =	372 [K]	+0/ -4	[K]
- Local Water Temperature	MTL.U1.1...7 =	$T_{W\_mean}(U1)$	±	2 [K]
	MTL.U2.1...7 =	$T_{W\_mean}(U2)$	±	2 [K]
	MTL.U3.1..19 =	$T_{W\_mean}(U3)$	±	2 [K]
- Water Level	ML.U1 =	4,80 [m]	±	0,20 [m]
	ML.U2 =	4,80 [m]	±	0,20 [m]
	ML.U3 =	4,80 [m]	±	0,20 [m]

Note: * The pressure and temperature defined for the PCC Pools correspond to saturation values at usual atmospheric pressure at the test site.

10 Initial Alignment

Before starting any preconditioning process, the facility is set into the specific state which establishes operations from the control room. The configuration is set in order to avoid any unintentional hardware manipulation during testing or preconditioning. The Data Acquisition and Control System must be properly initiated and brought into operation. Valves are aligned in accordance to STARTUP Status, automatic heat power regulation files are loaded and the auxiliary water system is filled to allow pump operation.

Five different preparation phases are needed for the Transient Tests: phase n°11 starting Control and Data Acquisition Systems, phase n°12 for the initial valve setup, phase n°13 for the configuration checking, phase n°14 to prepare the automatic heat power regulation and phase n°15 for auxiliary water system filling.

11 Control System and DAS Setup

- Ethernet connection is isolated from PSI network (Unplug Ethernet connector)
- Run Factory Link software on HP-UNIX workstation (cf. Trending System User's Guide)
- Run DAS software (cf. DAS User's Guide)
- Run Factory Link software on PC (cf. Control Syst. User's Guide)
- Switch all local controllers to "external" and "automatic" state

Record on attached checklist

12 Valve Alignment

- Valve off pressure difference transmitters
- Set valve positions according to the STARTUP status

Record on attached checklist

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13 General Facility Configuraton Check

- Check that the facility configuration corresponds to the required test configuration

Record on attached checklist

14 Prepare Automatic Heat Power Regulation

- Copy PF_TABLE.dec and PF_TABLE.str in C:\FLINK\RECIPE
- Test these two files (RUN program called "TEST" on the PC)

Record on attached checklist

15 Auxiliary Water System Filling

- Fill the Auxiliary Water System

16 Instrument / Zero Check

16.0 - Turn On Oxygen Probes - Reference Gas and Probe Heaters

16.1 - Check Instruments

Transmitter zero check and DAS reading check according to the actual facility state, recording on DAS-Reading Hard-Copy and Trending Plots.

Record on attached checklist

20 RPV Setup for Vessel Preconditioning

As the heat source for the whole preconditioning process, the RPV must be capable of producing steam for vessel heating or providing hot water to the auxiliary system. In order to establish conditions to generate steam, the RPV is first heated to 373K, while most of the air is purged by venting to the atmosphere. Not all air is purged at this temperature, but that does not affect vessel preconditioning; pure steam conditions are only required for the tests. Then the RPV is heated to about 415K to supply the auxiliary water system heat exchanger.

The RPV water level is set before preconditioning to anticipate evaporation occuring during heating by steam injection; it should reach the required test water level at the end of the preconditioning process. However in any case it must be lower than the main steam line inlets to avoid water hammer.

21 Water Filling

21.0 Monitor RPV Parameters — Assumption:
- Water Level — ML.RP.1 = 0,0 [m]; M(RPV-water) = 0,00 [ton]

21.1 Supply water until level reaches 12,7 [m]

Vent Air to the Atmosphere
- Open valve CC.RPV

Auxiliary water system operation
Pump MP.B0D On — MV.B0D = 2 [l/s]
ML.RP.1 = 12,7 [m] — M(RPV-water) = 15,01 [ton]; => time = 7505 [sec]

Pump MP.B0D Off

Fill preheater heating side with water
- Open valve CB.HRH, CB.HFH

21.2 Monitor RPV Parameters
- Water Level — ML.RP.1 = 12,70 [m]

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22 Heating / Purging

22.0 Monitor RPV Parameters

-Total Pressure	Assumptions:	MP.RP.1 =	97 [kPa]	=	0,97 [bar]
- Local Fluid Temperature		MTF.RP.1...5 =	283 [K]	=	10 [°C]
- Structure temperature		MTI.RP.1...3 =	283 [K]	=	10 [°C]
- Water Level		ML.RP.1 =	12,70 [m]		

22.1 Heat until temperature equals 373 [K]

Heaters On

MW.RP.7 = 800 [kW]

MTF.RP.1...5 =	373 [K]	=> ΔT = 90 [K]
=	100 [°C]	
M(RPV-water) =	15,01 [ton]	=> ΔQ = 5,67378 [GJ]
M(RPV-struct) =	8,00 [ton]	=> ΔQ = 0,36 [GJ]
		=> ΔQtot = 6,04 [GJ]
		=> time = 7544 [sec]

- Close valve CC.RPV

22.2 Heat until temperature equals 415 [K]

* MTF.RP.1...5 =	415 [K]	=> ΔT = 42 [K]
=	142 [°C]	

Note: * Temperature corresponding to the heat exchanger operation: SC's water filling

M(RPV-water) =	15,01 [ton]	=> ΔQ = 2,65 [GJ]
M(RPV-struct) =	8,00 [ton]	=> ΔQ = 0,17 [GJ]
		=> ΔQtot = 2,82 [GJ]
		=> time = 3521 [sec]

Heaters Off

22.3 Monitor RPV Parameters

-Total Pressure		MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature		MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Structure temperature		MTI.RP.1...3 =	415 [K]	=	142 [°C]
- Water Level		ML.RP.1 =	13,7 [m]		
		M(RPV-water) =	15,01 [ton]		

30 Suppression Chambers Setup

The Test Initial Conditions require a collapsed water level in both Suppression Chambers of 3,8m above the PANDA heater bundle, that corresponds to a water column of 3,8m from the bottom of the Suppression Chamber. The required temperature is a homogeneous temperature of 352K for the pool water as well as for the gas space. The total pressure, considering saturated conditions, is at 285kPa, which includes an air partial pressure of 240kPa.

The Suppression Chambers Setup starts with water filling and pool conditioning (phase n° 31), continues with gas space heating by steam injection keeping 1 bar air partial pressure inside the vessels (phase n° 32). The total pressure is then set up by injecting air with the auxiliary air system (phase n° 33). Phase n° 33 is performed during phases n° 31 and 32.

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31 Water Filling

31.0 Monitor SCs Parameters — Assumptions:

-Total Pressure	MP.S1 =	97	[kPa]	=	0,97 [bar]
	MP.S2 =	97	[kPa]	=	0,97 [bar]
- Local Water Temperature	MTL.S1.1...6 =	283	[K]	=	10 [°C]
	MTL.S2.1...6 =	283	[K]	=	10 [°C]
- Water Level	ML.S1 =	0,00	[m]		
	ML.S2 =	0,00	[m]		

31.1 RPV Setup for Heat Exchanger Operation
Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388	[kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415	[K]	=	142 [°C]
- Water Level	ML.RP.1 =	13,72	[m]		

Heaters On
MW.RP.7 = 800 [kW]

31.2 Supply water until level reaches 3,8 [m]
Auxiliary water system operation
Pump PC.HFH On
Setup control valve CC.BHA

	MTL.BHA =	354,5	[K]	=	81 [°C]

CC.BCA — MTL.BCA = max [K]
- Open valve CB.S1L, CB.S2L
Pump PC.B0D On
ML.S1 = 3,8 [m]
ML.S2 = 3,8 [m]

MV.B0D =	2	[l/s]	
M(S1-water) =	42,50	[ton]	
M(S2-water) =	42,50	[ton]	
M(TSL-water) =	7,10	[ton]	
=> time =	46050	[sec]	

- Close valve CB.S1L, CB.S2L
Pump PC.B0D Off — MV.B0D = 0 [l/s]
Pump PC.HFH Off
Heaters Off

31.3 SCs Parameters

- Mean Water Temperature	T_{w_mean}(S1) =	352	[K]	=	79 [°C]
	T_{w_mean}(S2) =	352	[K]	=	79 [°C]
- Water Level	ML.S1 =	3,80	[m]		
	ML.S2 =	3,80	[m]		

32 Gas Space Heating

32.0 Monitor SCs Parameters — Assumptions:

-Total Pressure	MP.S1 =	156	[kPa]	=	1,56 [bar]
	MP.S2 =	156	[kPa]	=	1,56 [bar]
- Local Gas Temperature	MTG.S1.1...6 =	283	[K]	=	10 [°C]
	MTG.S2.1...6 =	283	[K]	=	10 [°C]
- Structure temperature	MTI.S1.1...9 =	283	[K]	=	10 [°C]
	MTI.S2.1...9 =	283	[K]	=	10 [°C]

32.1 RPV Setup for Steam Injection
Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388	[kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415	[K]	=	142 [°C]
- Water Level	ML.RP.1 =	13,72	[m]		

Heaters On
MW.RP.7 = 800 [kW]

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32.2 Steam injection
- Open valve CB.B1S, CB.S1S, CB.S2S

MTI.S1.1...9 =	352 [K]	=> ΔT =	69 [K]
=	79 [°C]		
MTI.S2.1...9 =	352 [K]		
=	79 [°C]		
M(SCs-struct) =	72,7 [ton]	=> ΔQ =	2,52 [GJ]
ΔM(steam) =	1095 [kg]	=> time =	3148 [sec]

- Close valve CB.B1S, CB.S1S, CB.S2S

Heaters Off

Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

32.3 Monitor SCs Parameters

-Total Pressure	MP.S1 =	201 [kPa]	=	2,01 [bar]
	MP.S2 =	201 [kPa]	=	2,01 [bar]
- Mean Gas Temperature	T_{G_mean}(S1) =	352 [K]	=	79 [°C]
	T_{G_mean}(S2) =	352 [K]	=	79 [°C]
- Mean Water Temperature	T_{W_mean}(S1) =	352 [K]	=	79 [°C]
	T_{W_mean}(S2) =	352 [K]	=	79 [°C]
- Water Level	ML.S1 =	3,80 [m]		
	ML.S2 =	3,80 [m]		

33 Pressurization

33.0 Monitor SCs Parameters

-Total Pressure	MP.S1 =	201 [kPa]	=	2,01 [bar]
	MP.S2 =	201 [kPa]	=	2,01 [bar]

33.1 Air injection until total pressure reaches 285 [kPa]

Auxiliary air supply system operation
Setup control valve CC.B0G.2 MM.B0G = max
- Open valve CB.S1G, CB.S2G, CB.B0G

MP.S1 =	285 [kPa]	=	2,85 [bar]
ΔM(air) =	62 [kg]	=> time =	2073 [sec]

- Close valve CB.S1G, CB.S2G, CB.B0G

33.2 Monitor SCs Parameters

-Total Pressure	MP.S1 =	285 [kPa]	=	2,85 [bar]
	MP.S2 =	285 [kPa]	=	2,85 [bar]
- Mean Gas Temperature	T_{G_mean}(S1) =	352 [K]	=	79 [°C]
	T_{G_mean}(S2) =	352 [K]	=	79 [°C]
- Mean Water Temperature	T_{W_mean}(S1) =	352 [K]	=	79 [°C]
	T_{W_mean}(S2) =	352 [K]	=	79 [°C]
- Water Level	ML.S1 =	3,80 [m]		
	ML.S2 =	3,80 [m]		

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40 GDCS Heating

The Test Initial Conditions require a water level in the GDCS tank of 10,7m above the PANDA heater bundle, corresponding to a water level of 0,0m from the bottom of the tank, taking into account a full GDCS Return Line. The required temperature is a homogeneous temperature of 333K for the whole tank, which is achieved by filling with water up to approximately 5,5m at the required temperature and then draining the tank. The total pressure in GDCS, under saturated conditions and in equilibrium with the Drywell pressure is at 294kPa, which includes an air partial pressure of 274kPa.
The GDCS Setup consits of heating by water filling (phase n° 41) and pressurization by air injection (phase n° 42). Filling and draining processes are performed with the GDCS vent valve open. The total pressure is then adjusted by injecting air by mean of the auxiliary air system or by venting air to the atmosphere (phase n° 42). That last phase is performed after water has been drained and transferred to the PCC pools.

41 Water Filling

41.0 Monitor GDCS Parameters — Assumptions:

-Total Pressure	MP.GD =	97 [kPa]	=	0,97 [bar]
- Local Fluid Temperature	MTF.GD.1...7 =	283 [K]	=	10 [°C]
- Structure temperature	MTI.GD.1...6 =	283 [K]	=	10 [°C]
- Water Level	ML.GD =	0,00 [m]		

41.1 RPV Setup for Heat Exchanger Operation
Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

Heaters On
MW.RP.7 = 800 [kW]

Heaters On
MW.RP.7 = 800 [kW]

41.2 Supply water until level reaches 5,5 [m]

Setup control valve CC.BUV
- Open valve CB.GDV

Auxiliary water system operation
Pump PC.HFH On
Setup control valve CC.BHA — MTL.BHA = 335 [K] = 62 [°C]
CC.BCA — MTL.BCA = max [K]
Pump PC.B0D On — MV.B0D = 2 [i/s]
- Open valve CB.GDL
ML.GD = 5,5 [m] — M(GD-water) = 16,4 [ton]
=> time = 8195 [sec]
- Close valve CB.GDL
Pump PC.B0D Off
Pump PC.HFH Off
Heaters Off

41.3 Monitor GDCS Parameters

-Total Pressure	MP.GD =	97 [kPa]	=	0,97 [bar]
- Mean Fluid Temperature	T_{F_mean}(GD) =	333 [K]	=	60 [°C]
- Structure temperature	MTI.GD.1...6 =	333 [K]	=	60 [°C]
- Water Level	ML.GD =	5,50 [m]		

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42 Pressurization

42.0 See phase n°72
Since the GDCS is full with water, it cannot be pressurized during the phase n°42.
The GDCS pressurization is performed at phase n°72.

50 PCC1 Pool Setup

The Test Initial Conditions for all PCC Pools are the same; water level from the top of the PANDA heater bundle is defined at the maximum possible level (23,6m), which corresponds to a water level of 4,8m in the pools. The end point temperature is near the saturation temperature for actual atmospheric pressure.
The Pools Setup is performed as follows: water is filled at the highest possible temperature (phase n°51, 61 & 71) and the temperature conditions are adjusted then by water circulation through the auxiliary heat exchanger (phase n°101, 102 & 103).

Note: Pools can be connected together and filled simultaneously; water circulation might also be performed simultaneously with interconnected pools.

51 Water Filling

51.0 Monitor PCC1 Pool Pararneters

- Local Water Temperature	MTL.U1.1...7 =	283 [K]	=	10 [°C]
- Water Level	ML.U1 =	0,00 [m]		

51.1 RPV Setup for Heat Exchanger Operation
Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

Heaters On
MW.RP.7 = 800 [kW]

Note: The RPV temperature indicated here is a basis for the water filling operation; it might be lower than indicated.

51.2 Supply water until level reaches 4,9 [m]
Auxiliary water system operation
Pump PC.HFH On
Setup control valve CC.BHA MTL.BHA = 375 [K] = 102 [°C]
CC.BCA MTL.BCA = max [K]
Pump PC.B0D On MV.B0D = 2 [l/s]
- Open valve CB.U1L

ML.U1 = 4,9 [m] M(U1-water) = 14,22 [ton]
=> time = 7111 [sec]

- Close valve CB.U1L

Pump PC.B0D Off
Pump PC.HFH Off
Heaters Off

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51.3 Monitor PCC1 Pool Parameters

- Mean Water Temperature	$T_{W\_mean}(U1)$ =	372 [K]	=	99 [°C]
- Water Level	ML.U1 =	4,90 [m]		

60 PCC2 Pool Setup

For PCC2 Pool Setup refer to description of pools conditioning in phase n°50.

61 Water Filling

61.0 Monitor PCC2 Pool Parameters

- Local Water Temperature	MTL.U2.1...7 =	283 [K]	=	10 [°C]
- Water Level	ML.U2 =	0,00 [m]		

61.1 RPV Setup for Heat Exchanger Operation
Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

Heaters On
MW.RP.7 = 800 [kW]

61.2 Supply water until level reaches 4,9 [m]
Auxiliary water system operation
Pump PC.HFH On
Setup control valve CC.BHA — MTL.BHA = 375 [K] = 102 [°C]
CC.BCA — MTL.BCA = max [K]
Pump PC.B0D On — MV.B0D = 2 [l/s]
- Open valve CB.U2L
ML.U2 = 4,9 [m] — M(U2-water) = 14,22 [ton]
=> time = 7111 [sec]
- Close valve CB.U2L

Pump PC.B0D Off
Pump PC.HFH
Heaters Off

61.3 Monitor PCC2 Pool Parameters

- Mean Water Temperature	$T_{W\_mean}(U2)$ =	372 [K]	=	99 [°C]
- Water Level	ML.U2 =	4,90 [m]		

70 PCC3 Pool Setup

For PCC3 Pool Setup refer to description of pools conditioning in phase n°50. In that case, the water comes from the GDCS; this phase defines the transfer (of the water used to heat the GDCS tank) from GDCS to PCC3 pool.
After water has been drained, the GDCS is pressurized by air injection (phase n°82).

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71 Water Transfer from GDCS Tank

71.0 Monitor PCC3 Pool Parameters

- Local Water Temperature	MTL.U3.1..19 =	283 [K]	=	10 [°C]
- Water Level	ML.U3 =	0,00 [m]		

Monitor GDCS Parameters

-Total Pressure	MP.GD =	97 [kPa]	=	0,97 [bar]
- Mean Fluid Temperature	T_{F_mean}(GD) =	333 [K]	=	60 [°C]
- Structure temperature	MTI.GD.1...6 =	333 [K]	=	60 [°C]
- Water Level	ML.GD =	5,50 [m]		

71.1 RPV Setup for Heat Exchanger Operation

Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

Heaters On
MW.RP.7 = 800 [kW]

Note: The RPV temperature indicated here is a basis for the water filling operation; it might be lower than indicated.

71.2 Supply water until level reaches 4,9 [m]
Auxiliary water system operation
Pump PC.HFH On
Setup control valve MTL.BHA = 375,3 [K] = 102 [°C]
MTL.BCA = max [K]
Pump PC.B0A On MV.B0A = 2 [l/s]
- Open valve CB.B0L, CB.LXA, CB.AXU
CB.U3U, CB.GDL
ML_U3 = 4,90 [m] M(U3-water) = 14,22 [ton]
=> time = 7111 [sec]
- Close valve CB.U3U, CB.GDL
CB.B0L, CB.LXA, CB.AXU

Pump PC.B0A Off
Pump PC.HFH Off

Isolate GDCS from atmosphere
- Close valve CC.BUV, CB.GDV

71.3 Monitor PCC3 Pool Parameters

- Mean Water Temperature	T_{W_mean}(U3) =	372 [K]	=	99 [°C]
- Water Level	ML.U3 =	4,90 [m]		

Monitor GDCS Parameters

-Total Pressure	MP.GD =	97 [kPa]	=	0,97 [bar]
- Mean Fluid Temperature	T_{F_mean}(GD) =	333 [K]	=	60 [°C]
- Structure temperature	MTI.GD.1...6 =	333 [K]	=	60 [°C]
- Water Level	ML.GD =	0,00 [m]		

Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	388 [kPa]	=	3,88 [bar]
- Local Fluid Temperature	MTF.RP.1...5 =	415 [K]	=	142 [°C]
- Water Level	ML.RP.1 =	12,75 [m]		

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72 GDCS Pressurization

72.0 Monitor GDCS Parameters
-Total Pressure MP.GD = 97 [kPa] = 0,97 [bar]

72.1 Air injection until total pressure reaches 294 [kPa]
Auxiliary air supply system operation
Setup control valve CC.B0G.2 MM.B0G = max
- Open valve CB.GDG, CB.B0G
MP.GD = 294 [kPa] = 2,94 [bar]
ΔM(air) = 38 [kg] => time = 1255 [sec]
- Close valve CB.GDG, CB.B0G

72.2 Monitor GDCS Parameters
-Total Pressure MP.GD = 294 [kPa] = 2,94 [bar]
- Mean Fluid Temperature T_{F_mean}(GD) = 333 [K]
- Water Level ML.GD = 0,00 [m]

80 Drywells Setup

The nominal Drywell condition is no water; the atmosphere is a mixture of steam with a small amount of air. The total pressure considered at saturated condition is defined at 294kPa, which includes an air partial pressure of 13kPa. The required temperature being homogeneous in the whole gas space, corresponds to 404K.
The Drywells Setup consists of steam injection to heat the gas space (phase n° 81) and of a depressurization by venting to atmosphere (phase n° 82). In order to get homogeneous temperature in the vessels, air is purged during phase n°81 and 20kg of air is reinjected to the Drywells in order to satisfy the required air partial pessure of 13kPa.
During the heating process, the RPV, used as steam source, is cooled down in order to approach the required test initial conditions - heater power is controlled in order to decrease the RPV temperature.

81 Gas Space Heating

81.0 Monitor Drywell Parameters Assumptions:
-Total Pressure MP.D1 = 97 [kPa] = 0,97 [bar]
MP.D2 = 97 [kPa] = 0,97 [bar]
- Local Gas Temperature MTG.D1.1...6 = 283 [K] = 10 [°C]
MTG.D2.1...6 = 283 [K] = 10 [°C]
- Structure temperature MTI.D1.1...9 = 283 [K] = 10 [°C]
MTI.D2.1...9 = 283 [K] = 10 [°C]
- Water Level ML.D1 = 0,00 [m]
ML.D2 = 0,00 [m]

81.1 Connect Drywells to all PCC Condensers
- Open valve CB.P1F, CB.P2F, CB.P3F

81.2 RPV Setup for Heat Exchanger Operation
Monitor RPV Parameters
-Total Pressure MP.RP.1 = 388 [kPa] = 3,88 [bar]
- Local Fluid Temperature MTF.RP.1...5 = 415 [K] = 142 [°C]
- Water Level ML.RP.1 = 12,75 [m]
Heaters On
MW.RP.7 = 800 [kW]

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81.3 Steam injection (with air purging)

Vent valve opening for air purging

- Open valve CC.BUV, CB.D1V, CB.D2V
- Open valve CB.B1S, CB.D1S, CB.D2S

MTI.D1.1...9 =	373 [K]	=> ΔT =	90 [K]
=	100 [°C]		
MTI.D2.1...9 =	373 [K]	=> ΔT =	90 [K]
=	100 [°C]		
M(DWs-struct) =	48,9 [ton]	=> ΔQ =	2,21 [GJ]
M(DWs-steam) =	98 [kg]	=> ΔQ =	0,26 [GJ]
		=> ΔQtot =	2,47 [GJ]
ΔM(steam) =	1073 [kg]	=> time =	3084 [sec]

Vent valves are closed when temperature has reached 373K and is steady

- Close valve CC.BUV, CB.D1V, CB.D2V

81.4 Continue Steam Injection (without air purging)

MTI.D1.1...9 =	404 [K]	=> ΔT =	31 [K]
=	131 [°C]		
MTI.D2.1...9 =	404 [K]	=> ΔT =	31 [K]
=	131 [°C]		
M(DWs-struct) =	48,9 [ton]	=> ΔQ =	0,76 [GJ]
M(DWs-steam) =	182 [kg]	=> ΔQ =	0,43 [GJ]
		=> ΔQtot =	1,20 [GJ]
ΔM(steam) =	520 [kg]	=> time =	1494 [sec]

- Close valve CB.B1S, CB.D1S, CB.D2S

Heaters Off

Note: * During that phase, the RPV, used as heat source for steam injection to the Drywell, is cooled down in order to approach the required test initial conditions - heat power is controlled (eventually not used) in order to decrease the RPV temperature.

81.5 Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	295 [kPa]	=	2,95 [bar]
- Mean Fluid Temperature	T_{F_mean}(RP) =	406 [K]	=	133 [°C]
- Water Level	ML.RP.1 =	11,35 [m]		

Monitor Drywell Parameters

-Total Pressure	MP.D1 =	281 [kPa]	=	2,81 [bar]
	MP.D2 =	281 [kPa]	=	2,81 [bar]
- Local Gas Temperature	MTG.D1.1...6 =	404 [K]	=	131 [°C]
	MTG.D2.1...6 =	404 [K]	=	131 [°C]
- Structure temperature	MTI.D1.1...9 =	404 [K]	=	131 [°C]
	MTI.D2.1...9 =	404 [K]	=	131 [°C]

Monitor PCCs Parameters

-Total Pressure	MP.P1F =	281 [kPa]	=	2,81 [bar]
	MP.P2F =	281 [kPa]	=	2,81 [bar]
	MP.P3F =	281 [kPa]	=	2,81 [bar]
- Local Gas Temperature	MTG.P1.1...9 =	372 [K]	=	99 [°C]
	MTG.P2.1...9 =	372 [K]	=	99 [°C]
	MTG.P3.1...9 =	372 [K]	=	99 [°C]

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82 Pressurization

Both Drywells have now been purged and heated up to 404K; since the three PCCs were connected to the Drywells and due to the PCC pool temperature (~370K), a certain amount of air has been vented to the PCCs satisfying pressure equilibrium between Drywells and PCCs.
The Drywell, which atmosphere is considered as being under almost pure steam condition, is pressurized by air injection. In order to avoid condensation in the PCCs and let stabilize the Drywell pressure, the PCCs are isolated for the pressurization process.

82.0 Isolate Drywells from PCCs
- Close valve CB.P1F, CB.P2F, CB.P3F

82.1 Monitor Drywell Parameters

-Total Pressure	MP.D1 =	281 [kPa]	=	2,81 [bar]
	MP.D2 =	281 [kPa]	=	2,81 [bar]
- Local Gas Temperature	MTG.D1.1...6 =	404 [K]	=	131 [°C]
	MTG.D2.1...6 =	404 [K]	=	131 [°C]
- Structure temperature	MTI.D1.1...9 =	404 [K]	=	131 [°C]
	MTI.D2.1...9 =	404 [K]	=	131 [°C]

82.3 Air injection until Drywell total pressure increases by 13 [kPa]
Auxiliary air supply system operation
Setup control valve CC.B0G.2 MM.B0G = max
- Open valve CB.D1G, CB.D2G, CB.B0G

MPG.D1.1 = 13 [kPa]
MPG.D2.1 = 13 [kPa]

ΔM(air) = 21 [kg] => time = 778 [sec]

- Close valve CB.D1G, CB.D2G, CB.B0G

82.4 Monitor Drywell Parameters

- Air Partial Pressure	MPG.D1.1 =	13 [kPa]		
	MPG.D2.1 =	13 [kPa]		
- Local Gas Temperature	MTG.D1.1...6 =	404 [K]	=	131 [°C]
	MTG.D2.1...6 =	404 [K]	=	131 [°C]
- Structure temperature	MTI.D1.1...9 =	404 [K]	=	131 [°C]
	MTI.D2.1...9 =	404 [K]	=	131 [°C]

90 RPV Initial Conditions Setup for Test

After having used the RPV as heat source for vessel preconditioning, it might be under conditions differing from these required for test initiation; water level, pressure and temperature may need to be adjusted in order to satisfy the test initial conditions.
Phase n° 91 starts with a parameter monitoring, which will give the basis for RPV condition adjustement.

91 Adjusting RPV Conditions

91.0 Monitor RPV Parameters	Assumtions:			
-Total Pressure	MP.RP.1 =	295 [kPa]	=	2,95 [bar]
- Mean Fluid Temperature	T_{F_mean}(RP) =	406 [K]	=	133 [°C]
- Water Level	ML.RP.1 =	11,35 [m]		

91.1 Adjust Test Initial Conditions in RPV

Assuming saturated conditions and a negligible air partial pressure, the pressure is set by adjusting the temperature. Cooling is achieved by venting steam to the atmosphere. Heating is performed by using RPV heaters. Any required action is allowed to set up the RPV test initial conditions with the required tolerances (see phase 01).

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100 Test Conditions Setup

PANDA preconditioning has now been performed and the state of the facility is close to that required for test initiation; conditions out of tolerance must be adjusted to the defined values.
The test condition setup starts with the adjustment of both Suppression Chamber (SC) Pools (phase n° 101) and continues with the SCs gas space setup (phase n°102). The GDCS tank is then adjusted to its defined test initial conditions (phase n°103), before adjusting conditions of both Drywells (phase n° 104). The test condition setup continues then with the PCC Pools condition adjustment (phase n° 105, 106 & 107), which can be performed simultaneously. All these phases are not defined in detail, allowing any required action to get the test initial conditions established.

101 Adjusting SC Pools Conditions

101.0 Adjust Test Initial Conditions in Suppression Chamber Pools

After the check of the water temperature and water level, required action to adjust the corresponding parameters are supplying or draining water to satisfy the defined water level, and water circulation through one or the other of the two auxiliary heat exchangers as required to adjust the desired temperature. Any action is allowed to setup the SCs pools test initial conditions according to the defined tolerances (see phase 01).

101.1 Monitor SCs Parameters

- Mean Water Temperature
- Local Water Temperature
- Water Level

$T_{W\_mean}(S1)$ =	352 [K]	±	2 [K]
=	79 [°C]		
$T_{W\_mean}(S2)$ =	352 [K]	±	2 [K]
=	79 [°C]		
MTL.S1.1...6 =	$T_{W\_mean}(S1)$	±	2 [K]
MTL.S2.1...6 =	$T_{W\_mean}(S2)$	±	2 [K]
ML.S1 =	3,80 [m]	±	0,10 [m]
ML.S2 =	3,80 [m]	±	0,10 [m]

Record on attached checklist

102 Adjusting SC Gas Space Conditions

102.0 Adjust Test Initial Conditions in Suppression Chamber Gas Space

Assuming saturated steam/air mixture, the temperature and the pressure are separately adjusted by steam and air injection. Any required action is allowed to setup the SCs gas space test initial conditions according to the defined tolerances (see phase 01).

102.1 Monitor SCs Parameters

- -Total Pressure
- Mean Gas Temperature
- Local Gas Temperature

MP.S1 =	2,85 [bar]	±	0,04 [bar]
MP.S2 =	2,85 [bar]	±	0,04 [bar]
$T_{G\_mean}(S1)$ =	352 [K]	±	2 [K]
=	79 [°C]		
$T_{G\_mean}(S2)$ =	352 [K]	±	2 [K]
=	79 [°C]		
MTG.S1.1...6 =	$T_{G\_mean}(S1)$	±	2 [K]
MTG.S2.1...6 =	$T_{G\_mean}(S2)$	±	2 [K]

Record on attached checklist

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103 Adjusting GDCS Conditions

103.0 Adjust Test Initial Conditions in GDCS

Assuming saturated steam/air mixture, the temperature and the pressure are separately adjusted by steam and air injection. Any required action is allowed to setup the GDCS test initial conditions according to the defined tolerances (see phase 01).

103.1 Monitor GDCS Parameters

- -Total Pressure
- - Mean Fluid Temperature
- - Local Fluid Temperature
- - Water Level

MP.GD =	2,94 [bar]	±	0,04 [bar]
T_{F_mean}(GD) =	333 [K]	±	4 [K]
=	60 [°C]		
MTF.GD.1...7 =	T_{F_mean}(GD)	±	4 [K]
ML.GD =	0,00 [m]	±	0,10 [m]

Record on attached checklist

104 Adjusting DWs Conditions

104.0 Adjust Test Initial Conditions in Drywells

Assuming saturated conditions and an air partial pressure satisfying the required value, the temperature is adjusted by steam injection. Any required action is allowed to setup the Drywells test initial conditions according to the defined tolerances (see phase 01).

104.1 Monitor Drywell Parameters

- - Air Partial Pressure
- - Mean Gas Temperature
- - Local Gas Temperature
- - Structure temperature
- - Water Level

MPG.D1.1 =	13 [kPa]	±	2 [kPa]
MPG.D2.1 =	13 [kPa]	±	2 [kPa]
T_{G_mean}(D1) =	404 [K]	±	2 [K]
=	131 [°C]		
T_{G_mean}(D2) =	404 [K]	±	2 [K]
=	131 [°C]		
MTG.D1.1...6 =	T_{G_mean}(D1)	±	2 [K]
MTG.D2.1...6 =	T_{G_mean}(D2)	±	2 [K]
MTI.D1.1...9 =	T_{G_mean}(D1)	±	2 [K]
MTI.D2.1...9 =	T_{G_mean}(D2)	±	2 [K]
ML.D1 =	0,00 [m]	±	0,10 [m]
ML.D2 =	0,00 [m]	±	0,10 [m]

Record on attached checklist

105 Adjusting PCC1 Pool Conditions

105.0 Adjust Test Initial Conditions in PCC1 Pool

For all pools, water temperature adjustment is performed by water circulation through the auxiliary heat exchanger and level adjustment by supplying water from the demineralized water tank. Any required action is allowed to setup the PCC pools test initial conditions according to the defined tolerances (see phase 01).
Since all PCC pools initial conditions are the same, they may be adjusted simultaneously by connecting the three pools together.

105.1 Set PCC1 Pool Parameters

- - Mean Water Temperature
- - Local Water Temperature
- - Water Level

T_{W_mean}(U1) =	372 [K]	+0/-4	[K]
=	99 [°C]	+0/-4	[°C]
MTL.U1.1...7 =	T_{W_mean}(U1)	±	2 [K]
ML.U1 =	4,80 [m]	±	0,20 [m]

Record on attached checklist

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106 Adjusting PCC2 Pool Conditions

106.0 Adjust Test Initial Conditions in PCC2 Pool

For PCC2 Pool conditions adjustment refer to description of phase n°105.

106.1 Monitor PCC2 Pool Parameters

- Mean Water Temperature
- Local Water Temperature
- Water Level

$T_{w\_mean}(U2)$ =	372 [K]	+0/ -4	[K]
=	99 [°C]	+0/ -4	[°C]
MTL.U2.1..7 =	$T_{w\_mean}(U2)$	± 2	[K]
ML.U2 =	4,80 [m]	±	0,20 [m]

Record on attached checklist

107 Adjusting PCC3 Pool Conditions

107.0 Adjust Test Initial Conditions in PCC3 Pool

For PCC3 Pool conditions adjustment refer to description of phase n°105.

107.1 Monitor PCC3 Pool Parameters

- Mean Water Temperature
- Local Water Temperature
- Water Level

$T_{w\_mean}(U3)$ =	372 [K]	+0/ -4	[K]
=	99 [°C]	+0/ -4	[°C]
MTL.U3.1..19 =	$T_{w\_mean}(U3)$	± 2	[K]
ML.U3 =	4,80 [m]	±	0,20 [m]

Record on attached checklist

110 Test

The facility satisfies now the required test initial conditions and must be configured according to the test configuration described in GE Test Plan. Due to the relatively quick test initiation, data recording is started (phase n°111) before setting the desired RPV conditions (phase n°112) and before setting the test configuration (phase n°113). That last phase should not affect the PANDA conditions, but in order to assure test initial conditions satisfying the defined tolerances, the duration of all these phases between the test configuration setup (phase n°113.1 to n° 113.9) and the test initiation (phase n°113.10) should not exceed a few minutes (~5min). Before test initiation, just before phase n° 113.9, the test initial conditions must be within the tolerances given in phases n°100 and 112, in order to satisfy the acceptance criteria defined in phase 01. If test initial conditions do not satisfy the above mentioned acceptance criteria, the test is interrupted, the heat power is shut down (phase n° 123.0), the vessels are isolated (phase n° 123.3) and the procedure starts again with the Test Conditions Setup (phase n° 100).

Due to the excessive pressure differences between vessels during the preconditioning, the pressure difference transmitters valve-in must be performed after the test initial conditions have been established; it is performed during test configuration setup (phase n°113.8).

111 Data Recording

111.0 Start Data Recording

- Set "Daten-Speich." on HP-1000
- Set "Data recording rate" on HP-1000 / High Scan Rate: 1/2 Hz

Record on attached checklist

111.1 Record the PANDA-Building temperatures at elevation 0m and 22m

Record on attached checklist

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112 Adjusting RPV Conditions

112.0 Adjust Test Initial Conditions in RPV

Assuming saturated conditions and a negligible air partial pressure, the required pressure is set by adjusting the temperature. Any required action is allowed to setup the RPV test initial conditions according to the defined tolerances (see phase 01).

112.1 Monitor RPV Parameters

-Total Pressure	MP.RP.1 =	2,95 [bar]	±	0,04 [bar]
- Mean Fluid Temperature	T_{F_mean}(RP) =	406 [K]	±	2 [K]
	=	133 [°C]		
- Local Fluid Temperature	MTF.RP.1...5 =	T_{F_mean}(RP)	±	2 [K]
- Water Level	ML.RP.1 =	12,70 [m]	±	0,20 [m]

Record on attached checklist

113 Configuration Setup and Test Initiation

Since Test M2, M10A and M10B require different configuration, a few specific phases must be performed differently in each case. A phase number with a test number besides - n°...**M2/M10A** or n°...**M10B** - concerns only the corresponding test **M2, M10A** or **M10B**. Mark M2/M10A or M10B, as applicable.

113.0 Setup Automatic Heat Power Regulation

- Set "SCALED OPERATING POWER"
- Set "TRANSIENT START TIME AFT. SCRAM"

Record on attached checklist

113.1 Isolate Pools

Pools might be already isolated, in that case verify that the following valves are closed

- Close valve CB.U1L, CB.U2L, CB.U3L
  CB.U1U, CB.U2U, CB.U3U

Record on attached checklist

113.2 Open GDCS Pressurization lines

- Open valve C[illegible], CB.GP2

Record on attached checklist

113.3 Open Main Vent Lines

- Open valve CB.MV1, CB.MV2

Record on attached checklist

113.4 Open GDCS Return Line

- Open valve CB.GRT.2, CB.GRT.1

Record on attached checklist

113.5 Open PCC Vent Lines

- Open valve CB.P1V, CB.P2V, CB.P3V

Record on attached checklist

113.6 Open PCC Condensate Lines

- Open valve CB.P1C, CB.P2C, CB.P3C

Record on attached checklist

113.7 M2 **Test M2** - Open all PCC Feed Lines

- Open valve CB.P1F, CB.P2F, CB.P3F

Record on attached checklist

113.7 M10A / M10B **Test M10A & M10B** - Open PCC2 & PCC3 Feed Lines

- Open valve CB.P2F, CB.P3F

Record on attached checklist

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113.8 Instrument / Zero Check and Pressure Difference Transmitters Piping Valve In
- Check Instruments as described in phase n°16
- Pressure Difference Transmitters Piping Valve In

Record on attached checklist

113.9 M2/M10A **Test M2 & M10A** - Open Main Steam Line 2
- Open valve CB.MS2, CC.MS2 Record on attached checklist

113.9 M10B **Test M10B** - Open Main Steam Line 1
- Open valve CB.MS1, CC.MS1 Record on attached checklist

113.10 Test Initiation
- Connect Electrical Lines on Schema (click on the lower arrow)
- Select "ACTUAL CALCULATED POWER" - " POWER ON"
- Select "ACTUAL TRANSIENT TIME" - "TRANS. START"

Record on attached checklist

113.11 Print Valve Status Report every two hours during the Test duration
- Compare to Valve Status for Test M2/M10A or Valve Status Report for Test M10B
- Attach Valve Status Reports to the Checklist

Record on attached checklist

113.12 Check O_2 Probes
- Check every two hours, the oxygen flow which must be at ~10-20%
- Check every two hours, the probe temperature which must be at ~695 °C

Record on attached checklist

113.13 Check Test Initial Conditions - Acceptance Criteria
- Check parameters as indicated in phases n°100 & n°112.

Record on attached checklist

113.14 Test Interruption
If the Acceptance Criteria are not satisfied go to phase n° : 122.0 & 122.3
=> phase n° 122.0
=> phase n° 122.3
- Restart procedure with phase n° 100 (Test Conditions Setup)

113.15 VB-Opening Setup
- Set up automatic VB-Opening Control (Process Control System)
- Set up automatic Burst-measurement for VB-Opening (DAS-System)

Record on attached checklist

120 End of Test

Since M2 and both M10 tests must be extended after a predefined duration, the end of test procedure contains test specific phases. These phases are described below; they will be marked as applicable during the test.
For M2, the test is terminated after the test extension has been conducted (description of test extension is summarized below).
Concerning both M10 tests, data recording is terminated after 8 hours if the indication of air partial pressure in both Drywells is no longer changing (see details of test completion in the Test Plan), otherwise data recording continues for two more hours.
Phase n°121 describes the specific test extensions, while phase n°122 describes the end of data recording. Facility shut down is given at phase n°123.

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121 Test Extension

121.0 - M2 **Test M2** - After 20 Hours of Data Recording Increase RPV Heat Power Heaters On

MW.RP.7 = 800 [kW] Record on attached checklist

121.1 - M2 **Test M2** - Close **one** PCC Feed Line

After the system has reached a quasi-steady state condition, close the feedflow line to one of the PCCs. This PCC should be the one which is removing the most heat as evidenced by the actual PCC pool level response.

- Close one PCC Feed Line Valve: CB.P1F or CB.P2F or CB.P3F

Record on attached checklist

121.2 - M2 **Test M2** - End of Test Extension / Stop Data Recording

After the system has reached a quasi-steady state condition, the test extension is terminated and data recording stopped.

- Conduct phase n°122 if the system has reached a quasi-steady state.

Record on attached checklist

121.0 - M10A / M10B **Test M10A & M10B** - End of Test / Criteria Evaluation

After at least 8 hours of test operations and when the indications for both Drywells show that non-condensible gas partial pressure is no longer changing, the test is terminated and data recording stopped.

Monitor Drywell Air Concentrations MPG.D1.1, MPG.D1.2, MPG.D1.3
MPG.D1.1, MPG.D1.2, MPG.D1.3

- Conduct phase n°122 if the air concentration in both Drywells is constant.

Record on attached checklist

122 End of Data Recording

122.0 Stop Data Recording (cf DAS User's Guide) Record on attached checklist
After specific criteria have been reached, the test is terminated and data recording stopped.

122.1 Save Data (cf DAS User's Guide) Record on attached checklist

122.2 Record the PANDA-Building temperatures at elevation 0m and 22m
Record on attached checklist

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123 Facility Shut Down

123.0 Stop Heat Power
Heaters Off

123.1 Oxygen Probes Shut Off

123.2 Pressure Transmitters Piping Valve Off

123.3 Isolating Vessels

Check that the following valves are closed :

CB.MS1, CC.MS1
CB.MS2, CC.MS2
CB.P1C, CB.P2C, CB.P3C
CB.P1V, CB.P2V, CB.P3V
CB.P1F, CB.P2F, CB.P3F
CB.GRT.2, CB.GRT.1
CB.MV1, CB.MV2
CB.GP1, CB.GP2

123.4 Valve Alignment

- Set valve positions according to the valve STARTUP status
- Print out valve status report
- Compare the printed out valve status report to valve STARTUP status

123.5 - Set "Data recording rate" on HP-1000 / Low Scan Rate: $2*10^{-3}$ Hz

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200 Checklist

Checklist Transient Test Number: ..... Date:		
Completion of Procedure Phase n°	Date / Time	Signatures Performer / Reviewer
11		
12		
13		
14		
16		
101		
102		
103		
104		
105		
106		
107		
111.0		
111.1	Building Temperatures at 0m: and 22m:	
112		
113.0		
113.1		
113.2		
113.3		
113.4		
113.5		
113.6		
113.7 M2 / M10A / M10B		
113.8		
113.9 M2 / M10A / M10B		
113.10	Time of Test Start	
113.11		

* Mark M2, M10A or M10B, as applicable

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Checklist (cont'd)

Transient Test Number: ..... Date: .....

Completion of Procedure Phase n°	Date / Time	Signatures Performer / Reviewer
113.12		
113.13		
113.15		
121.0 - M2		
121.1 - M2		
121.2 - M2		
121.0 - M10A / M10B		
122.0		
122.1		
122.2	Building Temperatures at 0m: and 22m:	

* Mark M2, M10A or M10B, as applicable