

## **18D Emergency Procedures Guidelines—Input Data and Calculation Results**

### **18D.1 Introduction**

The Emergency Procedure Guidelines (EPGs) given in Appendix 18A contain various limits for emergency plant operation. These operation limits are calculated based upon specific plant design parameters. This appendix contains the plant parameter values used for calculation of operation limits and results of these calculations. The calculation methods used are in accordance with those in Appendix C of the BWROG EPG, Revision 4.

The parameter values used for calculation of operation limits are given in Section 18D.2, and the results of calculations are given in Section 18D.3. Certain input values used for calculation are estimated values for the purpose of completing the calculations. The COL applicant is required to update the input parameters based upon specific installation details and, if necessary, recalculate affected operation limits. In addition, the EPGs in Appendix 18A shall incorporate these updated calculations, if required.

### **18D.2 Input Parameters**

Table 18D-1 lists all plant parameters used for calculation of operation limits. The parameter definitions are in accordance with Appendix C of the BWROG EPG, Revision 4. Parameters indicated by a “\*” in the “Parameter” column are estimated values which cannot be established until detailed plant design is completed or until specific plant installation details are known.

### **18D.3 Calculation Results**

Table 18D-2 contains the results of calculations of operation limits. Calculations are performed in accordance with the methods given in Appendix C of the BWROG EPG, Revision 4. For each figure used in Appendix 18A, the data points used to construct the graphs are given in Table 18D-2 to provide flexibility in the use of these graphs, if desired. The graphs and other operation limits have been incorporated in the EPGs in Appendix 18A.

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR**

| <b>Parameter</b> | <b>Value</b>           | <b>Parameter Definition</b>   |
|------------------|------------------------|---|
| IDSuct_1         | RHR (LPCF)             | Suction identification  |
| Dsuct_1          | 42.86 cm               | Internal diameter of suction inlet to suppression pool  |
| Hsuct_1          | 1.115 m                | Elevation (inside bottom of suppression pool = El.0) of center of suction inlet to suppression pool   |
| Wsuct_max_1      | 1130 m <sup>3</sup> /h | Flow (maximum) through suction  |
| IDSuct_2         | HPCF                   | Suction identification  |
| Dsuct_2          | 38.74 cm               | Internal diameter of suction inlet to suppression pool  |
| Hsuct_2          | 1.115 m                | Elevation (inside bottom of suppression pool = El.0) of center of suction inlet to suppression pool   |
| Wsuct_max_2      | 890 m <sup>3</sup> /h  | Flow (maximum) through suction  |
| BWR type         | 6                      | BWR type (Enter: 1, 2, 3, 4, 5 or 6) (ABWR = 6)   |
| Tcst             | 66°C                   | Temperature (maximum normal operating) of condensate storage tank water   |
| Hvent_pc         | 24.5 m                 | Elevation of containment vent (center) line located above TAF (Main steamline penetration is specified since drywell has no vent provisions due to COPS). |
| Hsp_lco          | 7 m                    | Elevation of minimum suppression pool water level LCO   |
| Hsc_tap*         | 14.2 m                 | Elevation of suppression chamber pressure instrument tap  |
| Psp_des          | 310 kPa                | Pressure rise (design load), suppression pool boundary  |
| Psp_srv          | 152 kPa                | Pressure rise (maximum load) on suppression pool boundary resulting from SRV actuation  |
| Mf_sp_lco        | 3558426 kg             | Mass of water in suppression pool with water level at minimum LCO and water temperature at maximum LCO for unrestricted operation at power                |
| Ppc_vent         | 651.6 kPaG             | Pressure (maximum) in airspace at which containment vent will open  |
| Pdw_maxop*       | 5.198 kPaG             | Pressure (maximum normal operating), drywell  |
| Psc_maxop*       | 5.198 kPaG             | Pressure (maximum normal operating), suppression chamber  |
| Pdw_minop        | 0 kPaG                 | Pressure (minimum normal operating), drywell  |
| Psc_minop        | 0 kPaG                 | Pressure (minimum normal operating), suppression chamber  |
| Pdw_scam         | 11.77 kPaG             | Pressure setpoint for high drywell pressure scram   |
| Tsp_scam         | 43.3°C                 | Temperature of suppression pool at which reactor scram is required  |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>        | <b>Parameter Definition</b>   |
|------------------|---------------------|---|
| Tdw_maxop*       | 57.2°C              | Temperature (maximum normal operating), drywell   |
| Tsc_maxop        | 35.0°C              | Temperature (maximum normal operating), suppression chamber airspace  |
| Tdw_minop*       | 49.4°C              | Temperature (minimum normal operating), drywell   |
| Tsc_minop        | 10°C                | Temperature (minimum normal operating), suppression chamber airspace  |
| Tsp_minop        | 10°C                | Temperature (minimum normal operating) suppression pool   |
| Tsc_des          | 103.9°C             | Temperature (design), suppression chamber   |
| Vdw              | 7350 m <sup>3</sup> | Volume (free) of drywell and vent system<br>I/II: Vol. drywell & vent system<br>III/ABWR: Vol. drywell (vent sys=0)   |
| Vsc_lco          | 6005 m <sup>3</sup> | Volume (free) of suppression chamber above minimum suppression pool water level LCO   |
| WLsp_srv         | 7.1 m               | Water level (inside bottom of pool = 0) of suppression pool used to determine maximum suppression pool boundary load resulting from SRV actuation   |
| WLsp_lco         | 7 m                 | Water level (inside bottom of pool = 0) LCO (minimum) of suppression pool   |
| dPdw_ww          | 20.7 kPaD           | Differential pressure capability (maximum), drywell below wetwell (if value is greater than 68.95 kPaD, enter 68.95)  |
| Hdco             | N/A                 | Elevation of Mark I/II downcomer openings   |
| Vsc_dco          | 7619 m <sup>3</sup> | Volume (free) of suppression chamber above Mark I/II downcomer openings or volume (free) of suppression chamber above top of ABWR horizontal vents  |
| Hhorvent         | 3.85 m              | Elevation of top of Mark III/ABWR horizontal vents  |
| Tcn_des          | N/A                 | Temperature (design), Mark III containment  |
| n_1              | DRYWELL HEAD        | Identification  |
| H_1              | 36.14 m             | Elevation (inside bottom of suppression pool = El.0)  |
| Loc_1            | DW                  | Location (Enter: DW or WW)  |
| Mat_1            | 6                   | Material types (Enter: 1, 2, 3, 4, 5, or 6, 7)<br>1=SS304, SA240, SA320 and A312<br>2=S21800, A193 and A194<br>3=A36<br>4=A160 Gr. B and A105<br>5=A201 Gr. B, A212 and SA516<br>6=(User Definable Material No. 1)<br>7=(User Definable Material No. 2) |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>           | <b>Parameter Definition</b>   |
|------------------|------------------------|---|
| Pcalc_1*         | 668.8 kPaG             | Pressure capability (maximum)   |
| MatS_1           | YS                     | Strength used to determine pressure capability (Enter: YS or TS)  |
| Tcalc_1          | 371.11°C               | Temperature used to determine pressure capability   |
| n_2              | RUPTURE DISC           | Identification  |
| H_2              | 17.2 m                 | Elevation (inside bottom of suppression pool = EI.0)  |
| Loc_2            | WW                     | Location (Enter: DW or WW)  |
| Mat_2*           | 7                      | Material types (Enter: 1, 2, 3, 4, 5, or 6, 7)<br>1=SS304, SA240, SA320 and A312<br>2=S21800, A193 and A194<br>3=A36<br>4=A160 Gr. B and A105<br>5=A201 Gr. B, A212 and SA516<br>6=(User Definable Material No. 1)<br>7=(User Definable Material No. 2) |
| Pcalc_2*         | 668.8 kPaG             | Pressure capability (maximum)   |
| MatS_2           | TS                     | Strength used to determine pressure capability (Enter: YS or TS)  |
| Tcalc_2          | 176.67°C               | Temperature used to determine pressure capability   |
| LHGRmax          | 47.24 kW/m             | Linear heat generation rate (design maximum) (the maximum allowable value is 47.24 kW/m)  |
| Kmarg_cs         | N/A                    | Margin (demonstrated) to cold shutdown at most reactive point in life with worst rod out (only applicable for active fuel length less than or equal to 3.71 m)  |
| Mclad            | 91128 kg               | Mass of clad and channels   |
| Mfuel*           | 171597 kg              | Mass of fuel (UO <sub>2</sub> )   |
| Nbuns            | 872                    | Number of fuel bundles  |
| Qrx_rated        | 3926 MWt               | Power (rated)   |
| vhand            | 354.68 cm <sup>3</sup> | Volume of control rod blade handle and structure  |
| f_1*             | 3.59-8GZ               | Identification  |
| Efuel_1*         | 0.71 Weight % U-235    | Enrichment in blanket zone at top of fuel rods  |
| Lctrl_1          | 12.7 cm                | Control rod blade length of B <sub>4</sub> C above enriched zone  |
| Kinf_1*          | 1.21                   | K-infinity (max) cold and uncontrolled  |
| Lfuel_1          | 381 cm                 | Length of active fuel   |
| Wfuel_1*         | 173.888 kg             | Weight of U (kg/bundle)   |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>           | <b>Parameter Definition</b>  |
|------------------|------------------------|--|
| f_2*             | 3.59-10GZ              | Identification   |
| Efuel_2*         | 0.71 Weight<br>% U-235 | Enrichment in blanket zone at top of fuel rods   |
| Lctrl_2          | 12.7 cm                | Control rod blade length of B <sub>4</sub> C above enriched zone   |
| Kinf_2*          | 1.21                   | K-infinity (max) cold and uncontrolled   |
| Lfuel_2          | 381 cm                 | Length of active fuel  |
| Wfuel_2*         | 173.199 kg             | Weight of U (kg/bundle)  |
| f_3*             | 2.59-4GZ               | Identification   |
| Efuel_3*         | 0.71 Weight<br>% U-235 | Enrichment in blanket zone at top of fuel rods   |
| Lctrl_3          | 12.7 cm                | Control rod blade length of B <sub>4</sub> C above enriched zone   |
| Kinf_3*          | 1.18                   | K-infinity (max) cold and uncontrolled   |
| Lfuel_3          | 381 cm                 | Length of active fuel  |
| Wfuel_3*         | 175.338 kg             | Weight of U (kg/bundle)  |
| f_4*             | 123-NOG                | Identification   |
| Efuel_4*         | 0.71 Weight<br>% U-235 | Enrichment in blanket zone at top of fuel rods   |
| Lctrl_4          | 12.7 cm                | Control rod blade length of B <sub>4</sub> C above enriched zone   |
| Kinf_4*          | 1                      | K-infinity (max) cold and uncontrolled   |
| Lfuel_4          | 381 cm                 | Length of active fuel  |
| Wfuel_4*         | 176.748 kg             | Weight of U (kg/bundle)  |
| dPvent_rpv       | N/A                    | Pneumatic supply-to-containment differential pressure (minimum) required to operate RPV vent valve(s) inside drywell   |
| Hvent_rpv        | N/A                    | Elevation (inside bottom of suppression pool=EI.0) of lowest RPV vent valve solenoid inside drywell  |
| Mrpv             | 1351682 kg             | Mass of RPV, internals, recirculation loops (ABWR=internal pumps), and main steamlines inboard of outboard MSIVs (less fuel, clad and channels)  |
| Mrpv_taf         | 689199 kg              | Mass of recirculation loops (ABWR=internal pumps) and of RPV internals below TAF (less fuel, clad and channels)  |
| Mg_rpv_hot       | 7150 kg                | Mass of saturated steam in RPV and main steamlines inboard of outboard MSIVs with water level at high level trip setpoint and pressure at minimum at which an SRV is set to lift (spring pressure) |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>           | <b>Parameter Definition</b>   |
|------------------|------------------------|---|
| Mf_rpv_cld*      | 820925 kg              | Mass of water in recirculation (ABWR=internal pumps), shutdown cooling, and RWCU loops and in RPV with water level at high level trip setpoint and water temperature at 20°C (68°F)   |
| Mf_rpv_hot*      | 341991 kg              | Mass of water in recirculation (ABWR=internal pumps) and RWCU loops and in RPV with water level at high level trip setpoint and water temperature at saturation temperature for minimum pressure at which an SRV is set to lift (spring pressure) |
| Psup_rpv         | N/A                    | Pressure (minimum normal operating), pneumatic supply system for RPV vent valve(s) inside drywell   |
| Vrpv_taf*        | 429.912 m <sup>3</sup> | Volume (free) of recirculation (ABWR=internal pumps) and RWCU loops and of shutdown cooling loops and RPV below TAF   |
| WLrpv_taf        | 9.0495 m               | Water level at top of active fuel (from RPV invert)   |
| WLinst_1         | SHUTDOWN               | Instrument identification   |
| Href_surf_1      | 22.045 m               | Elevation of condensing chamber water surface   |
| Hrange_lo_1      | 12.604 m               | Elevation of instrument range low end   |
| Href_dw_1*       | 16.336 m               | Elevation (centerline) of reference leg drywell penetration   |
| Hvar_dw_1*       | 9.95 m                 | Elevation (centerline) of variable leg drywell penetration  |
| Hvar_tap_1       | 12.22 m                | Elevation (centerline) of variable leg RPV tap  |
| Fhtc_1           | N/A                    | Heat transfer coefficient (dimensionless—heated reference leg instruments only)   |
| WLrpv_hi_1       | 12.825 m               | Instrument range high end   |
| WLrpv_lo_1       | 3.555 m                | Instrument range low end  |
| Prpv_cal_1       | 0 MPaG                 | Pressure in RPV at calibration  |
| Tdw_cal_1        | 26.7°C                 | Temperature in drywell at calibration   |
| Trb_cal_1        | 26.7°C                 | Temperature (normal shutdown) in Reactor Building (MK I/II/ABWR) or containment (MK III) at calibration   |
| WLinst_2         | NARROW                 | Instrument identification   |
| Href_surf_2*     | 16.336 m               | Elevation of condensing chamber water surface   |
| Hrange_lo_2      | 12.604 m               | Elevation of instrument range low end   |
| Href_dw_2*       | 15.45 m                | Elevation (centerline) of reference leg drywell penetration   |
| Hvar_dw_2*       | 9.95 m                 | Elevation (centerline) of variable leg drywell penetration  |
| Hvar_tap_2       | 12.22 m                | Elevation (centerline) of variable leg RPV tap  |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b> | <b>Parameter Definition</b>   |
|------------------|--------------|---|
| Fhtc_2           | N/A          | Heat transfer coefficient (dimensionless—heated reference leg instruments only)                         |
| WLrpv_hi_2       | 5.080 m      | Instrument range high end   |
| WLrpv_lo_2       | 3.555 m      | Instrument range low end  |
| Prpv_cal_2       | 7.07 MPaG    | Pressure in RPV at calibration  |
| Tdw_cal_2        | 57.2°C       | Temperature in drywell at calibration   |
| Trb_cal_2        | 26.7°C       | Temperature (normal shutdown) in Reactor Building (MK I/II/ABWR) or containment (MK III) at calibration |
| WLinst_3         | WIDE         | Instrument identification   |
| Href_surf_3*     | 16.336 m     | Elevation of condensing chamber water surface   |
| Hrange_lo_3      | 9.0495 m     | Elevation of instrument range low end   |
| Href_dw_3*       | 15.45 m      | Elevation (centerline) of reference leg drywell penetration   |
| Hvar_dw_3*       | 7.7 m        | Elevation (centerline) of variable leg drywell penetration  |
| Hvar_tap_3       | 8.978 m      | Elevation (centerline) of variable leg RPV tap  |
| Fhtc_3           | N/A          | Heat transfer coefficient (dimensionless—heated reference leg instruments only)                         |
| WLrpv_hi_3       | 6.605 m      | Instrument range high end   |
| WLrpv_lo_3       | 0.0 m        | Instrument range low end  |
| Prpv_cal_3       | 7.07 MPaG    | Pressure in RPV at calibration  |
| Tdw_cal_3        | 57.2°C       | Temperature in drywell at calibration   |
| Trb_cal_3        | 26.7°C       | Temperature (normal shutdown) in Reactor Building (MK I/II/ABWR) or containment (MK III) at calibration |
| WLinst_4         | FUEL ZONE    | Instrument identification   |
| Href_surf_4*     | 16.336 m     | Elevation of condensing chamber water surface   |
| Hrange_lo_4      | 5.2395 m     | Elevation of instrument range low end   |
| Href_dw_4*       | 15.45 m      | Elevation (centerline) of reference leg drywell penetration   |
| Hvar_dw_4*       | −3.25 m      | Elevation (centerline) of variable leg drywell penetration  |
| Hvar_tap_4       | 1.905 m      | Elevation (centerline) of variable leg RPV tap  |
| Fhtc_4           | N/A          | Heat transfer coefficient (dimensionless—heated reference leg instruments only)                         |
| WLrpv_hi_4       | 1.270 m      | Instrument range high end   |
| WLrpv_lo_4       | −3.810 m     | Instrument range low end  |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| <b>Parameter</b>        | <b>Value</b>              | <b>Parameter Definition</b>  |
|-------------------------|---------------------------|--|
| Prpv_cal_4              | 0 kPaG                    | Pressure in RPV at calibration   |
| Tdw_cal_4               | 100°C                     | Temperature in drywell at calibration  |
| Trb_cal_4               | 26.7°C                    | Temperature (normal shutdown) in Reactor Building (MK I/II/ABWR) or containment (MK III) at calibration    |
| XB_slc                  | 24530 ppm                 | Concentration (minimum normal operating) of boron in SLC tank  |
| Wslc                    | 11.3575 m <sup>3</sup> /h | Flow rate of SLCs (minimum)  |
| Tslc                    | 68°C                      | Temperature (maximum normal operating) of solution in SLC tank   |
| dPsr <sup>v</sup> *     | 620.6 kPaD                | Pneumatic supply-to-drywell differential pressure (minimum) required to open SRVs (see Note 1)             |
| Hsr <sup>v</sup> *      | 25.6448 m                 | Elevation (inside bottom of suppression pool=El.0) of lowest SRV solenoid                                  |
| Wsr <sup>v</sup> _name* | 405607 kg/h               | Flowrate of SRV per nameplate  |
| Nsr <sup>v</sup> _ads   | 8                         | Number of SRVs dedicated to ADS  |
| Prpv_tp                 | 9343 kPaG                 | Pressure in RPV used for SRV tail pipe design calculations   |
| Psup_sr <sup>v</sup>    | 1.38 MPaG                 | Pressure (minimum normal operating), pneumatic supply system for SRVs (see Note 1)                         |
| Psr <sup>v</sup> _lift  | 7930 kPaG                 | Pressure (minimum) in RPV at which an SRV is set to lift (spring pressure)                                 |
| Psr <sup>v</sup> _name* | 7930 kPaG                 | Pressure corresponding to nameplate flow rate  |
| Pq_code*                | 149.3 N/mm <sup>2</sup>   | Stress (code allowable) for quencher   |
| Pqs_code*               | 149.3 N/mm <sup>2</sup>   | Stress (code allowable) for quencher support   |
| Ptp_code*               | 149.3 N/mm <sup>2</sup>   | Stress (code allowable) for SRV tail pipe  |
| Ptps_code*              | N/A                       | Stress (code allowable) for SRV tail pipe support  |
| Pq_des*                 | 149.3 N/mm <sup>2</sup>   | Calculated stress (design basis) for quencher  |
| Pqs_des*                | 60 N/mm <sup>2</sup>      | Calculated stress (design basis) for quencher support  |
| Ptp_des*                | 149.3 N/mm <sup>2</sup>   | Calculated stress (design basis) for SRV tail pipe   |
| Ptps_des*               | N/A                       | Calculated stress (design basis) for SRV tail pipe support   |
| SRVtype*                | 5                         | Type of SRV (Enter: 1, 2, 3, 4 or 5)<br>1=Dresser<br>2=Crosby<br>3=2-stage TR<br>4=3-stage TR<br>5=Dijkers |



**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| Parameter    | Value                          |                          |                              | Parameter Definition  |
|--------------|--------------------------------|--------------------------|------------------------------|---|
| WLsp_tp      | 7.1 m                          |                          |                              | Water level (inside bottom of pool=0) of suppression pool used for SRV tail pipe design calculations  |
| IDpump_1     | RHR (LPCF)                     |                          |                              | Pump (system) identification  |
| Hpsuct_1*    | −7.2 m                         |                          |                              | Elevation (centerline) of pump suction inlet  |
| Hssuct_1     | −7.085 m                       |                          |                              | Elevation (centerline) of system suction location in the suppression pool   |
| IDpump_2     | HPCF                           |                          |                              | Pump (system) identification  |
| Hpsuct_2*    | −7.2 m                         |                          |                              | Elevation (centerline) of pump suction inlet  |
| Hssuct_2     | −7.085 m                       |                          |                              | Elevation (centerline) of system suction location in the suppression pool   |
| Wlpci        | RPV Pressure (MPaG)            |                          | Flowrate (m <sup>3</sup> /h) | Flowrate outside core shroud from one RHR (LPCF) pump as a function of RPV pressure—maximum ten data points, runout to shutoff  |
|              | 0.00                           |                          | 1130                         |   |
|              | 0.554                          |                          | 1105                         |   |
|              | 0.821                          |                          | 933                          |   |
|              | 1.193                          |                          | 684                          |   |
|              | 1.440                          |                          | 489                          |   |
|              | 1.639                          |                          | 293                          |   |
|              | 1.828                          |                          | 0                            |   |
| Wlpcs        | ABWR does not have LPCS System |                          |                              | Flowrate from one LPCS pump as a function of RPV pressure—maximum ten data points, runout to shutoff  |
| Vsp, Vsc_air | Pool                           | Water                    | Airspace                     | Volume (free) of water and air in suppression chamber as a function of suppression pool water level (inside bottom of pool=0)—maximum ten data points, bottom to top of suppression chamber   |
|              | Water Level (m)                | Volume (m <sup>3</sup> ) | Volume (m <sup>3</sup> )     |   |
|              | 0.00                           | 0                        | 9585                         |   |
|              | 3.85                           | 1966                     | 7619                         |   |
|              | 5.00                           | 2553                     | 7032                         |   |
|              | 7.00                           | 3580                     | 6005                         |   |
|              | 7.10                           | 3625                     | 5960                         |   |
|              | 10.00                          | 5042                     | 4543                         |   |
|              | 12.00                          | 6019                     | 3566                         |   |
|              | 14.00                          | 6996                     | 2589                         |   |
|              | 16.00                          | 7973                     | 1612                         |   |
|              | 19.30                          | 9585                     | 0                            |   |
| WLL_(n)      | SRVDL Type 1 SPWL (m)          |                          | WLL (m)                      | Water leg length (WLL) in SRV tail pipe (SRVDL) as a function of SP water level (SPWL) (inside bottom of pool=0). Reference WLL=0 at SPWL used for SRV tail pipe design calculations—maximum 8 data points per SRVDL type, up to 6 SRVDL types. (Note: SRVDL Type=different SRVDL routing from quencher to approx. 6.7m WLL above normal water level, longest WLL per SPWL is most limiting.) |
|              | 7.10                           |                          | 0.00                         |   |
|              | 9.07                           |                          | 2.27                         |   |
|              | 12.55                          |                          | 5.74                         |   |
|              | 12.82                          |                          | 12.54                        |   |

**Table 18D-1 BWROG EPG Rev. 4 Appendix C Input Data for ABWR (Continued)**

| Parameter                      | Value               |               |          | Parameter Definition  |
|--------------------------------|---------------------|---------------|----------|---|
| sysFlow_1*                     | NPSH                | Friction      |          | RHR (LPCF) System Flow dependent parameters—maximum ten data points |
|                                | Flow rate           | Required      | Head     |   |
|                                | Wsuct               | NPSHR         | Loss     |   |
|                                | (m <sup>3</sup> /h) | (m)           | Hfl (m)  |   |
|                                | 0                   | 3.2           | 0.00     |   |
|                                | 820                 | 3.6           | 1.01     |   |
| sysFlow_2*                     | 954                 | 3.8           | 1.37     | HPCF System Flow dependent parameters—maximum ten data points:      |
|                                | 1130                | 4.2           | 1.82     |   |
|                                | NPSH                | Friction      |          |   |
|                                | Flow rate           | Required      | Head     |   |
|                                | Wsuct               | NPSHR         | Loss     |   |
|                                | (m <sup>3</sup> /h) | (m)           | Hfl (m)  |   |
| User Definable Material No. 1  | 0                   | 1.7           | 0.00     | Enter data for using optional user definable material type          |
|                                | 500                 | 1.4           | 0.55     |   |
|                                | 640                 | 1.5           | 0.90     |   |
|                                | 890                 | 2.2           | 1.82     |   |
|                                | Normalized          | Normalized    |          |   |
|                                | Temp                | Yield         | Tensile  |   |
| User Definable Material No. 2* | (°C)                | Strength      | Strength | Enter data for using optional user definable material type          |
|                                | 21                  | 1.027         | N/A      |   |
|                                | 93                  | 0.910         | N/A      |   |
|                                | 204                 | 0.860         | N/A      |   |
|                                | 316                 | 0.740         | N/A      |   |
|                                | Strength/           | Most Limiting |          |   |
|                                | Location            | temp (°C)     |          |   |
|                                | TS/DW               | N/A           |          |   |
|                                | TS/WW               | N/A           |          |   |
|                                | YS/DW               | 285           |          |   |
|                                | YS/WW               | N/A           |          |   |
|                                | Normalized          | Normalized    |          |   |
| User Definable Material No. 2* | Temp                | Yield         | Tensile  | Enter data for using optional user definable material type          |
|                                | (°C)                | Strength      | Strength |   |
|                                | 21                  | N/A           | 1        |   |
|                                | 93                  | N/A           | 1        |   |
|                                | 204                 | N/A           | 1        |   |
|                                | 316                 | N/A           | 1        |   |
| User Definable Material No. 2* | Strength/           | Most Limiting |          | Enter data for using optional user definable material type          |
|                                | Location            | temp (°C)     |          |   |
|                                | TS/DW               | N/A           |          |   |
|                                | TS/WW               | 176.67        |          |   |
|                                | YS/DW               | N/A           |          |   |
|                                | YS/WW               | N/A           |          |   |

- \* These values are preliminary or approximate values used to complete the ABWR calculations. The applicant referencing the ABWR design will be required to re-evaluate these values as an “interface requirement” when plant specific installation details are completed.

Note 1: This value is dependent upon specific SRV selection. SRV pneumatic supply pressure will be established such that SRVs will be operable at the maximum COPS pressure. A consistent set of values for dPSRV and PSUP-SRV was selected for completing calculations.

**Table 18D-2 BWROG EPG Rev. 4 Appendix C Results for ABWR**

| Parameter  |           | Value                  | Parameter Definition  |
|------------|-----------|------------------------|---|
| CSBW       |           | 541.8 kg               | Cold Shutdown Boron Weight  |
| MSBWP      |           | 4.2%*                  | Maximum Subcritical Banked Withdrawal Position  |
| Tsp_hctl_2 |           | 145.6°C                | Heat Capacity Temperature Limit Low-Pressure Endpoint Temperature   |
| Tsp_hctl_1 |           | 111.8°C                | Heat Capacity Temperature Limit High-Pressure Endpoint Temperature  |
| Ppc_pcpl_1 |           | 646 kPaG               | Primary Containment Pressure Limit at Elevation of Minimum Suppression Pool Water Level LCO                           |
| MNSRED     |           | 6                      | Minimum Number of SRVs Required for Emergency Depressurization  |
| MRFP       |           | 354 kPaG               | Minimum RPV Flooding Pressure   |
| MSCRWL     |           | −79.45 cm <sup>†</sup> | Minimum Steam Cooling RPV Water Level   |
| MZIRWL     |           | −111.2 cm <sup>†</sup> | Minimum Zero-Injection RPV Water Level  |
| MSRP       |           | 0 kPaG                 | Minimum SRV Re-opening Pressure   |
| WLsp_tpl_1 |           | 12.65 m                | SRV Tail Pipe Level Limit Low-Pressure Endpoint Water Level   |
| SCSIP      |           | 71.39 kPaG             | Suppression Chamber Spray Initiation Pressure   |
| [None]     |           | 2                      | Minimum Number of SRVs for which the Minimum Alternate RPV Flooding Pressure is below the lowest SRV lifting pressure |
| MARFP      | SRVs (#)  | MARFP (MPaG)           | Minimum Alternate RPV Flood Pressure  |
|            | 8 or more | 0.93                   |   |
|            | 7         | 1.08                   |   |
|            | 6         | 1.27                   |   |
|            | 5         | 1.55                   |   |
|            | 4         | 1.96                   |   |
|            | 3         | 2.65                   |   |
|            | 2         | 4.02                   |   |
| MCFI       | SRVs (#)  | MCFI (min)             | Minimum Core Flooding Interval  |
|            | 8 or more | 43.5                   |   |
|            | 7         | 59.4                   |   |
|            | 6         | 84.3                   |   |

**Table 18D-2 BWROG EPG Rev. 4 Appendix C Results for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>             |   | <b>Parameter Definition</b>  |
|------------------|--------------------------|---|--|
| WLI_1            | Highest DW Run Temp (°C) | Min. Indicated Level (cm)                     | Water Level Instrument Number 1: Shutdown (355.5 to 1282.5 cm)                                   |
|                  | Low                      | High  |  |
|                  | —                        | 65.6  |  |
|                  | 65.6                     | 121.1   |  |
|                  | 121.1                    | 176.7   |  |
|                  | 176.7                    | 232.2   |  |
| WLI_2            | Highest DW Run Temp (°C) | Min. Indicated Level (cm)                     | Water Level Instrument Number 2: Narrow Range (355.5 to 508.0 cm)                                |
|                  | Low                      | High  |  |
|                  | —                        | 65.6  |  |
|                  | 65.6                     | 287.8   |  |
| DWSIL            | Drywell Pressure (kPaG)  | Drywell Temperature (°C)                      | Drywell Spray Initiation Limit (See Figure in Section 18A.5)                                     |
|                  | 20.7                     | 46.3  |  |
|                  | 32.4                     | 105.4   |  |
|                  | 46.2                     | 173.1   |  |
|                  | 60.0                     | 243.8   |  |
|                  | 73.8                     | 319.5   |  |
| HCTL             | RPV Pressure (MPaG)      | Suppression Pool Temp (°C)                    | Heat Capacity Temperature Limit (See Figure in Sections 18A.4, 18A.5)                            |
|                  | 0.35                     | 145.6   |  |
|                  | 0.41                     | 144.2   |  |
|                  | 0.55                     | 141.9   |  |
|                  | 0.69                     | 140.1   |  |
|                  | 1.03                     | 136.9   |  |
|                  | 1.38                     | 134.6   |  |
|                  | 2.07                     | 130.8   |  |
|                  | 2.76                     | 127.9   |  |
|                  | 4.14                     | 122.9   |  |
|                  | 5.52                     | 118.6   |  |
| HCLL             | HCTL Margin (°C)         | Suppression Pool Water Level <sup>‡</sup> (m) | Heat Capacity Level Limit<br>See Figure in Section 18A.5<br><br>0 m = Bottom of Suppression Pool |
|                  | 0.0                      | 7.00  |  |
|                  | 2.8                      | 6.48  |  |
|                  | 5.6                      | 6.02  |  |
|                  | 8.3                      | 5.62  |  |
|                  | 11.1                     | 5.28  |  |
|                  | 13.9                     | 4.97  |  |
|                  | 16.7                     | 4.70  |  |
|                  | 19.4                     | 4.46  |  |
|                  | 44.4                     | 4.46  |  |

**Table 18D-2 BWROG EPG Rev. 4 Appendix C Results for ABWR (Continued)**

| <b>Parameter</b> | <b>Value</b>  | <b>Parameter Definition</b>  |
|------------------|---|--|
| PSP              | Suppression<br>Pool<br>Water Level <sup>‡</sup><br>(m)<br>0.0<br>4.5<br>4.5<br>4.8<br>12.6<br>12.6      | Suppression<br>Chamber<br>Pressure<br>(kPaG)<br>0.00<br>0.00<br>162.0<br>180.6<br>103.4<br>0.00<br>Pressure Suppression Pressure<br>(See Figure in Section 18A.5)<br><br>*0 m = Bottom of Suppression Pool   |
| PCPL             | Primary<br>Containment<br>Water Level <sup>‡</sup><br>(m)<br>0.0<br>24.5<br>24.5                        | Suppression<br>Chamber<br>Pressure<br>( MPaG)<br>0.65<br>0.65<br>0.00<br>Primary Containment Pressure Limit (See<br>Figure in Section 18A.5)<br><br>0 m = Bottom of Suppression Pool   |
| MPCWLL           | Suppression<br>Chamber<br>Pressure<br>( MPaG)<br>0.0<br>0.65<br>0.65                                    | Primary<br>Containment<br>Water Level <sup>‡</sup><br>(m)<br>24.5<br>24.5<br>0.0<br>Maximum Primary Containment Water<br>Level Limit<br>See Figure in Sections 18A.4, 18A.5,<br>18A.8, 18A.11, 18A.12, and 18A.13)<br><br>0 m = Bottom of Suppression Pool |
| MCUTL            | Time After<br>Shutdown<br>(min)<br>43.5<br>60.0<br>90.0<br>120.0<br>500.0<br>1000.0<br>3000.0<br>6000.0 | MCUTL<br>(min)<br>4.19<br>4.62<br>5.24<br>5.55<br>8.46<br>10.21<br>14.09<br>18.29<br>Maximum Core Uncovery Time Limit (See<br>Figure in Section 18A.11)  |
| STPLL            | RPV<br>Pressure<br>( MPaG)<br>0.0<br>2.76<br>9.34   | Suppression<br>Pool<br>Water Level <sup>‡</sup><br>(m)<br>12.7<br>12.6<br>7.1<br>SRV Tail Pipe Level Limit<br>(See Figure in Sections 18A.4, 18A.5)<br><br>0 m = Bottom of Suppression Pool  |

**Table 18D-2 BWROG EPG Rev. 4 Appendix C Results for ABWR (Continued)**

| Parameter |                     | Value                    | Parameter Definition  |
|-----------|---------------------|--------------------------|---|
| RHR VL    | Pump                | Suppression              | RHR (LPCF) Vortex Limit<br>(See Figure in Sections 18A.4, 18A.12)                           |
|           | Flow                | Pool                     |   |
|           | (m <sup>3</sup> /h) | Water Level <sup>†</sup> |   |
|           | 0                   | (m)                      |   |
|           | 852                 | 1.54                     |   |
|           | 909                 | 1.54                     |   |
|           | 1022                | 1.60                     |   |
| HPCF VL   | 1130                | 1.73                     | HPCF Vortex Limit<br>(See Figure in Section 18A.4)  |
|           |                     | 1.87                     |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
| RPVS      | RVP Pressure        | Suppression              | RPV Saturation<br>(See Figure in Section 18A.3)   |
|           | (MPaG)              | Pool                     |   |
|           |                     | Water Level <sup>‡</sup> |   |
|           |                     | (m)                      |   |
|           |                     | 0                        |   |
|           |                     | 1.50                     |   |
|           |                     | 662                      |   |
|           |                     | 1.50                     |   |
|           |                     | 795                      |   |
|           |                     | 1.67                     |   |
|           |                     | 890                      |   |
|           |                     | 1.82                     |   |
| RPVS      | RVP Pressure        | Temperature              | RPV Saturation<br>(See Figure in Section 18A.3)   |
|           | (MPaG)              | (°C)                     |   |
|           | 7.93                | 295.2                    |   |
|           | 6.89                | 285.8                    |   |
|           | 5.52                | 271.3                    |   |
|           | 4.14                | 253.8                    |   |
|           | 2.76                | 231.2                    |   |
|           | 1.38                | 197.7                    |   |
|           | 0.69                | 169.9                    |   |
|           | 0.41                | 152.9                    |   |
|           | 0.14                | 126.0                    |   |
| BIIT      | 0.07                | 115.2                    | Boron Injection Initiation Temperature<br>(See Figure in Sections 18A.4, 18A.5, and 18A.12) |
|           | 0.00                | 100.0                    |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
|           |                     |                          |   |
| BIIT      | Reactor             | SuppressionPool          | Boron Injection Initiation Temperature<br>(See Figure in Sections 18A.4, 18A.5, and 18A.12) |
|           | Power               | Average Temperature      |   |
|           | (%)                 | (°C)                     |   |
|           | 0                   | 93.4                     |   |
|           | 2.21                | 93.4                     |   |
|           | 8.26                | 43.3                     |   |
|           | 10.00               | 43.3                     |   |

\* 0% Fully Inserted

† 0=Top of Active Fuel (TAF)

‡ 0m = Bottom of Suppression Pool

Table 18D-2 BWROG EPG Rev. 4 Appendix C Results for ABWR (Continued)

| Parameter |        | Value                      |       |       |       |       |       |       | Parameter Definition   |
|-----------|--------|----------------------------|-------|-------|-------|-------|-------|-------|--|
| RHR NPSH  | Pump   | Suppression Pool Temp (°C) |       |       |       |       |       |       | RHR (LPCF NPSH Limits<br>(See Figure in Section 18A.4, 18A.12) |
|           | Flow   | for Overpressure of ( MPa) |       |       |       |       |       |       |  |
|           | (m³/h) | 0.00                       | 0.034 | 0.069 | 0.103 | 0.173 | 0.241 | 0.276 |  |
|           | 0      | 90.6                       | 101.7 | 109.4 | 116.1 | 126.7 | 135.6 | 138.9 |  |
|           | 820    | 85.6                       | 97.8  | 106.7 | 113.9 | 125.0 | 133.9 | 137.2 |  |
|           | 954    | 82.8                       | 96.1  | 105.6 | 112.8 | 124.4 | 133.3 | 136.7 |  |
|           | 1130   | 78.9                       | 93.3  | 103.3 | 111.1 | 123.3 | 132.2 | 136.1 |  |
| HPCF NPSH | Pump   | Suppression Pool Temp (°C) |       |       |       |       |       |       | HPCF NPSH Limits<br>See Figure in Section 18A.3)               |
|           | Flow   | for Overpressure of ( MPa) |       |       |       |       |       |       |  |
|           | (m³/h) | 0.00                       | 0.034 | 0.069 | 0.103 | 0.173 | 0.241 |       |  |
|           | 0      | 95.6                       | 105.0 | 112.2 | 118.9 | 128.9 | 136.7 |       |  |
|           | 500    | 95.0                       | 104.4 | 112.2 | 118.3 | 128.3 | 136.7 |       |  |
|           | 641    | 93.3                       | 103.3 | 111.1 | 117.8 | 127.7 | 136.1 |       |  |
|           | 890    | 87.8                       | 99.4  | 107.8 | 115.0 | 125.6 | 134.1 |       |  |