ENCLOSURE 2

Minimum Containment Pressure Available
Analysis

Exhibit NE-C-420-1, Rev. 2
Effective Date:

PECO Nuclear
Doctype 061

CALCULATION COVER SHEET

1. Calculation No. PM-1013

2. LGS ☐ PBAPS ☒

3. Unit(s) 2&3

4. (MOD)/ECR/Other No. P-00350-2

5. Last Page No. 50

6. Safety Related ☒ Non-Safety Related ☐

7. Description: MIN. CONTAINMENT PRESS. AVAILABLE

8. System/Topic No.: 10, 13, 14, 22, 32, 902, 910, 912
Structure: NA
2(3)A(B,C,D)P035; 2(3)CP036; 2(3)A(B,C,D)P037
Component: 2(3)CP033

Record of Revisions

9. Rev. No.	10. Description of Revision	11. Vendor Calc. Number	11. Vendor Calc. Rev.	12. Assumptions YES	12. Assumptions NO	13. Signatures Preparer	13. Signatures Reviewer	13. Signatures Approver(s) / Date
1	CHANGED RHR HEAT EXCHANGER TUBE PLUGGING ASSUMPTION (5%) TO BE CONSISTENT WITH GE SUPPRESSION POOL TEMPERATURE ANALYSIS.					6/10/98		6/22/98 E.W.H.

14. Related Calculation No(s). Provides Info. To:	PM-1010	PM-1011, R2				15. Manual ☑ Computer ☐ Computer Program & Version No.:
Receives Info. From:	11187-M-24, R4					
16. Provides Info. To: UFSAR/Tech.Spec./etc.:						17. Total Pages: (DS Info. Only) 50

PORC	NO
SQR	NO
NQA	NO
50.59	NO
RESP MGR	YES

CALC. # PM-1013 REV. 1

DCD # _____ DATE: _____

CALCULATION REVIEW CHECKLIST

MANUAL CALC.	COMPUTER CALC.		YES or N/A
X	X	CALCULATION IS THE APPROPRIATE BASIS FOR THE ACTIVITY	YES
X	X	CALCULATION ASSUMPTIONS, CONSIDERATIONS, AND METHODOLOGY CONFORM TO APPLICABLE DESIGN REQUIREMENTS	YES
X	X	SOURCES OF DATA AND FORMULAS WERE REVIEWED AND VERIFIED TO BE CORRECT AND COMPLETE	YES
X	X	INPUT DATE IS CORRECT AND USED PROPERLY	YES
X		THE ANALYTICAL METHOD USED IN THE CALCULATION HAS BEEN CONSIDERED AND IS PROPER FOR THE INTENDED USE	YES
X		MATHEMATICAL ACCURACY HAS BEEN CHECKED AND IS CORRECT (INDICATE METHOD USED)	YES
		A) COMPLETE CHECK OF EACH COMPUTATION	YES
		B) SPOT CHECK OF SELECTED COMPUTATIONS	N/A
		C) PERFORMANCE OF ALTERNATE OR APPROXIMATION CALCULATION (ATTECHED)	N/A
X	X	CALCULATION RESULTS WERE CHECKED AGAINST APPLICABLE DESIGN CRITERIA AND WERE FOUND TO BE IN COMPLIANCE	YES
X	X	EXISTING CALCULATIONS REQUIRING REVISION AS A RESULT OF THIS CALCULATION HAVE BEEN IDENTIFIED & DOCUMENTED	YES
	X	THE ANALYTICAL METHODS DESCRIBED IN THE COMPUTER CALCULATION SUMMARY IS PROPER FOR THE INTENDED USE	N/A
X	X	ALL SYSTEM AND TOPIC NUMBERS ASSOCIATED WITH THE CALCULATION ARE LISTED	~~N/A~~ YES
	X	COMPUTATIONAL ACCURACY HAS BEEN CHECKED AND IS CORRECT (INDICATE METHOD USED)	N/A
		A) CHECK SAMPLE CALCULATION USING DATA OTHER THAN THAT USED IN THE SAMPLE	N/A
		B) PERFORMANCE OF ALTERNATE OR APPROXIMATION CALCULATION (ATTACHED)	N/A
		C) DESCRIBE OTHER METHOD USED: _____	N/A
	X	PROGRAM USED IS APPROPRIATE, INPUT IS VALID, AND OUTPUT IS REASONABLE CONSIDERING THE INPUT	N/A
X	X	BASE CALCULATION HAS BEEN REVIEWED AGAINST CURRENT DRAWING REVISIONS AND POSTED DCDS TO IDENTIFY SIGNIFICANT DIFFERENCES	YES

The criteria listed above are the minimum criteria to be considered and are not intended to limit the initiative of the reviewer to consider other criteria.

Attributes applicable to manual and computer calculations are noted by an "X" in the appropriate column.

List the documents used to support this review. PM-1013 & ASSOCIATED DOC'N INCLUDED IN 6. REFERENCES

REVIEWED BY: _____ DATE: 6/10/98

PECO ENERGY NUCLEAR GROUP	CALCULATION SHEET	CALC. NO.: PM-1013 PAGE: 2 REVISION: 1

1. Purpose / Objective

The purpose of this calculation is to determine the minimum containment pressure available (MCPA) following a design basis large break loss of coolant accident (DBA LG-LOCA). This MCPA is intended to be used by other calculations to demonstrate that there is sufficient ECCS pump net positive suction head (NPSH) margin.

PBAPS Units 2 & 3 are not committed to NRC Safety Guide 1.1, and have always taken credit for containment overpressure. During NRC review and approval of the PBAPS FSAR, the NRC questioned the use of containment overpressure for the DBA LOCA event (Reference Question 6.3 of the PBAPS FSAR). In response to the NRC question, PBAPS provided a curve of the MCPA which showed a margin between the MCPA and the containment overpressure required for the ECCS pumps to maintain adequate NPSH. Assumptions used in the analysis and described in the text of the question response were chosen to minimize the margin.

This calculation will document the re-analysis of the MCPA expected following a DBA LG-LOCA using the results of the PBAPS Power Rerate containment analysis. In addition, a calculation of the MCPA following a DBA LG-LOCA during containment purge operation is also performed.

Data provided by General Electric for the Post DBA LG-LOCA for the suppression pool temperature ended at approximately 12 hours following initiation of the event. Temperatures are sufficiently elevated that credit for containment overpressure will be required for some time beyond this interval. This calculation will extrapolate the suppression pool temperature data provided by General Electric, to assist in determining the point where credit for containment overpressure is no longer required.

At the end of the calculation, an assessment of the MCPA is performed for other events which require credit for containment overpressure.

ACCEPTANCE CRITERIA

This calculation will determine the MCPA following a DBA LG-LOCA for use in other calculations to determine that adequate NPSH margin exists for the ECCS pumps. As such, there are no specific acceptance criteria for this calculation. The results should be presented in a format which facilitates the use in other calculations.

IMPACT STATEMENT

This calculation and its results makes no impact on the following:

	TRUE	FALSE
Station administrative and implementing procedures, including Surveillance Test procedures	☒	☐
Station operating procedures	☒[1]	☐
Issued Design Basis Documents (DBDs)	☐	☒[2]
Licensing documents (i.e., SAR) **CM-1**	☒	☐
Existing calculations	☐	☒[2]

Explanation of checkmarks are as follows:

1. This calculation does not depend on any specific operating procedure and supports the use of the plant Transient Response Implementation Program (TRIP) procedures, including use of containment sprays.

2. Changes required to DBDs and existing calculations are addressed in AR A1110856.

2. Summary of Results

The MCPA available for any ECCS pump NPSH following the DBA LG-LOCA is shown in the following figures. The peak MCPA value of 22.10 psia (7.41 psig) coincides, as expected, with the time of peak suppression pool temperature of 205.7 DegF and peak licensing basis drywell pressure (post blowdown) of 29.60 psia.

With the DBA LG-LOCA occurring concurrent with containment purge, sufficient nitrogen is lost from the containment (1091 lbm) to reduce the peak MCPA value to 21.21 psia (6.52 psig) and coincides, as expected, with the time of peak suppression pool temperature of 205.7 DegF and peak licensing basis drywell pressure (post blowdown) of 29.60 psia. This reduction is expected since it lowers the partial pressure contribution of the nitrogen due to the reduced mass, while the partial pressure of the water vapor remains unaffected (a function of containment temperature only).

During the "Other Events", it was determined that Station Blackout and Inadvertent SRV Opening did not require containment overpressure credit. The MCPA during the ATWS event was calculated to be 4.86 psig, and the MCPA during the FSSD event was calculated to be 5.73 psig.

The extrapolation of the suppression pool temperature shows that the temperature is expected to be below 170°F at approximately 50.4 hours following the beginning of the event.

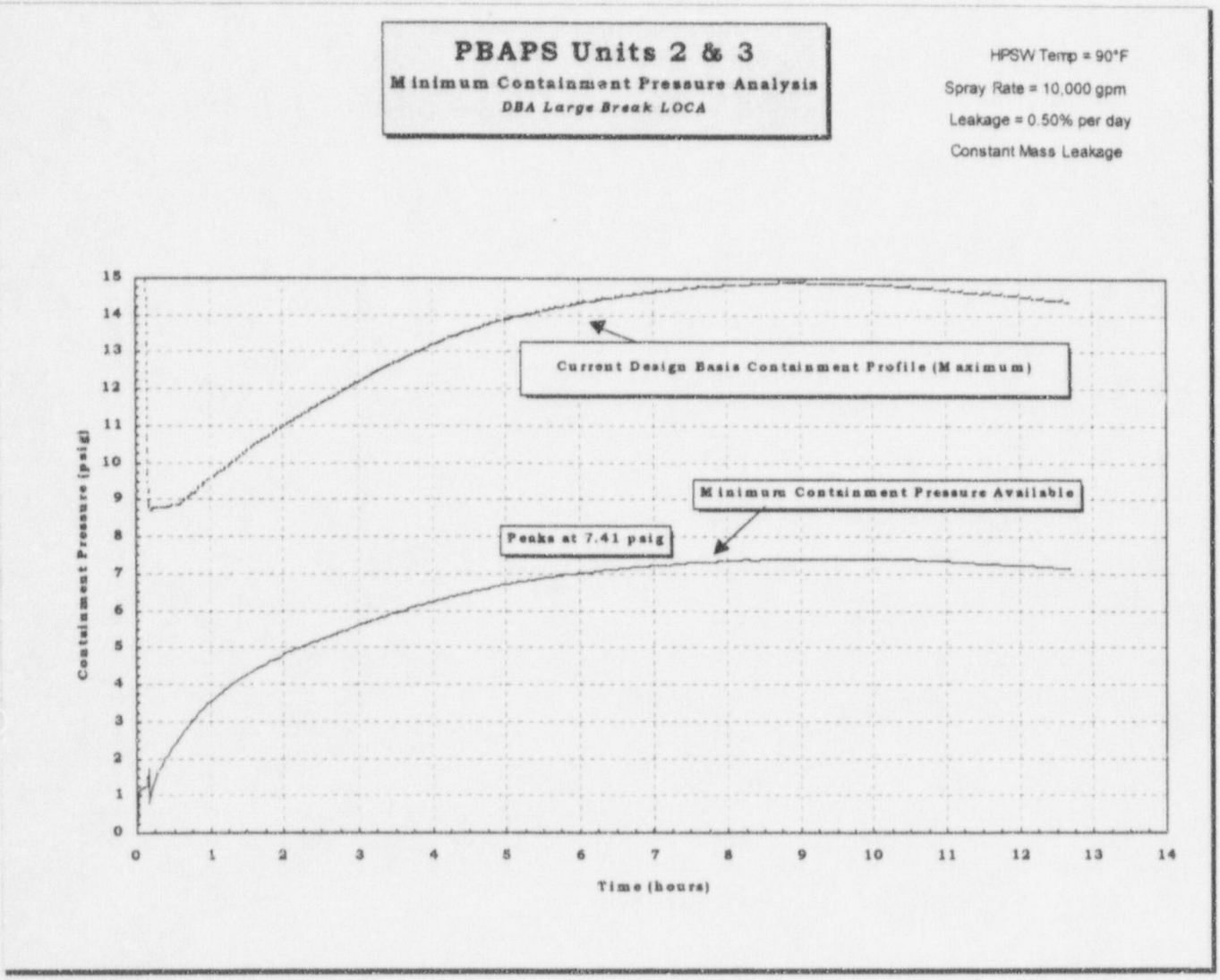


Figure 1 – Minimum Containment Pressure Available Following a DBA LOCA– No Containment Purge

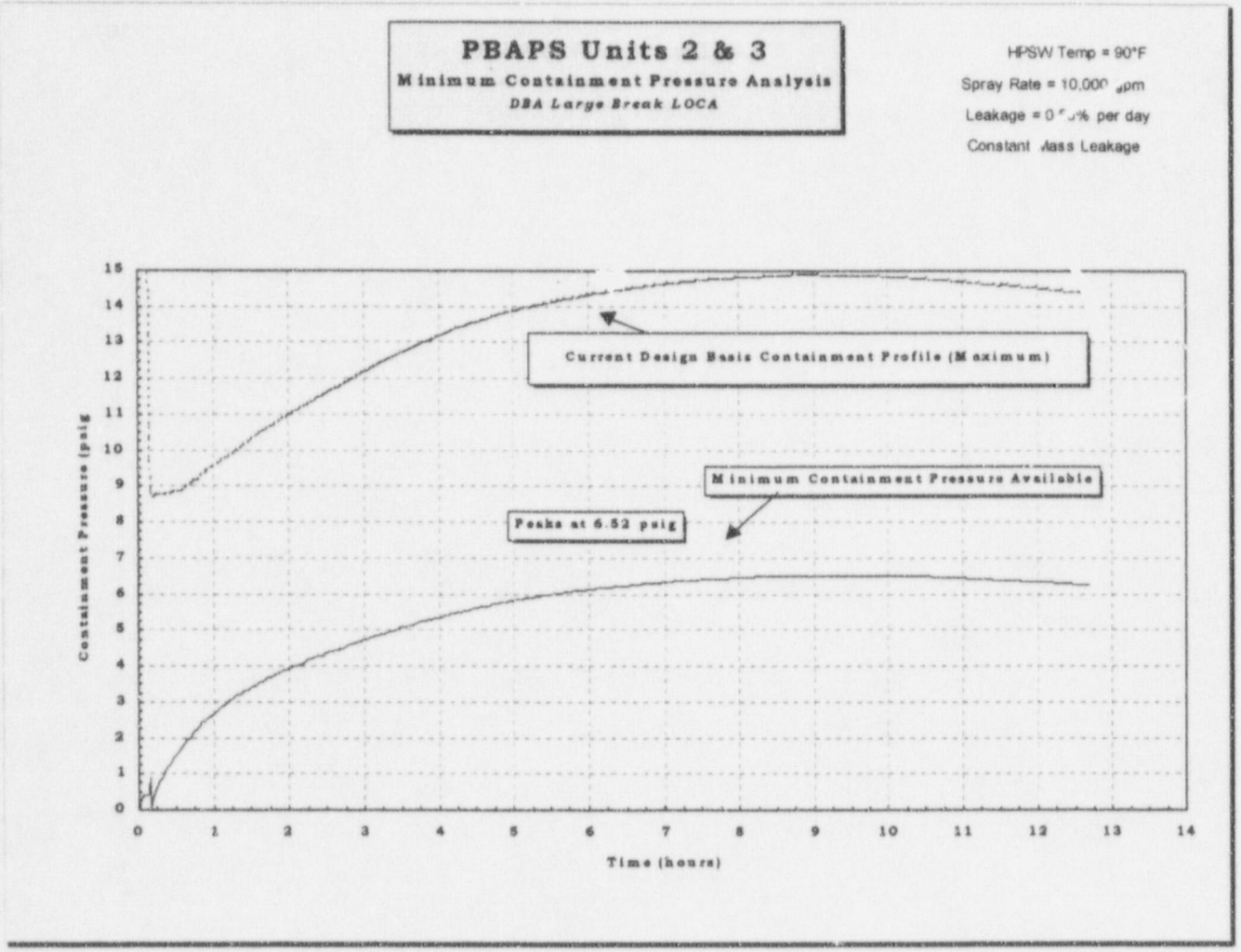


Figure 2 – Minimum Containment Pressure Available Following a DBA LOCA– Containment Purge in Progress

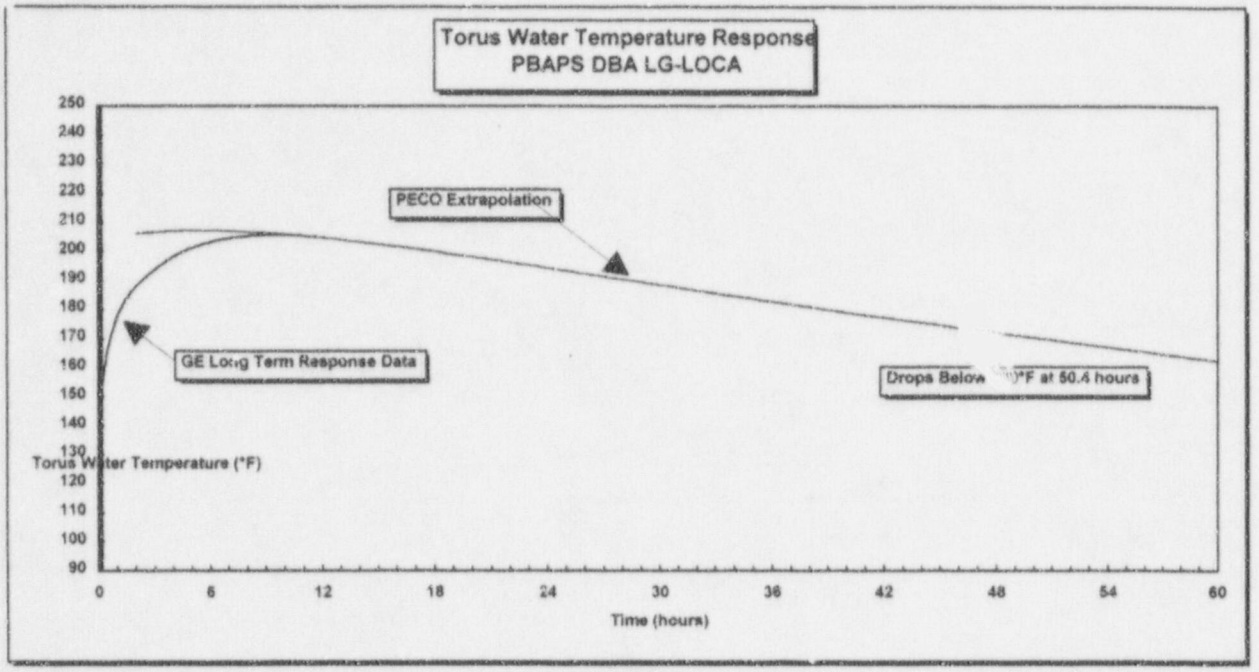


Figure 1 - Suppression Pool Temperature Extrapolation

3. Design Input / Criteria

Constants			Reference
Patm	14.69598677	psia	6.L
	7.480519481	gal/cuft	6.L
R (Nitrogen)	55.2	ft-lbf/lbm-°R	6.M
To	459.67	°R	6.L

Inputs				
RHR SPC/Spray Flow rate		*10,000*	gpm	6.B, 5.J.xiv
RHR Hx Ueff		**216.52**	BTU/hr-sqft-°F	6.B, 5.J.ix
RHR Hx Area		***5851***	sqft	6.B, 5.J.ix
RHR Hx MTD Correction Factor		**0.977**	(unitless)	6.B, 5.J.ix
HPSW Flow rate		**4500**	gpm	6.T
HPSW Temperature		**90**	°F	6.B, 5.J.viii
	Dryw ell	Wetw ell		
Airspace Volume	**175,800**	**127,700**	cuft	6.A, 5.J.i
Initial Temperature	**145**	**95**	°F	6.B, 5.J.iii
Initial Pressure	**0.00**	**0.00**	psig	5.J.ii
Initial Relative Humidity	**100%**	**100%**		5.J.iv
Initial Containment Purge		**0**	lbm N2	6.V
Containment Leakage (v/o)		***0.5%***	per day	5.J.x

In addition, the containment temperature (T_L) and pressure (P_L) used to calculate the constant mass leakage rate is 95°F and 15 psig, respectively.

4. Computer Calculation

NA. Although this calculation uses the results of a GE computer run, and process all input values using a spreadsheet developed by the Originator, this calculation is treated as a manual calculation.

5. Assumptions and Identified Facts

The following assumptions are made in performing this calculation, all of which are conservative and none of which require any verification. In addition, various facts are identified for clarification.

5.A. The event analyzed is the DBA LG-LOCA, which assumes a complete guillotine break of a recirculation pump suction line. The event is modeled because it results in the hottest torus water temperature, compared to an intermediate or small line break.

5.B. Reactor blowdown mass and energy release is not re-evaluated. Instead, the temperature profile of the torus water is used as the driving force for the evaluation. This is acceptable because the Rerate analysis that generated the profile included various conservative assumptions that tend to predict maximum pool temperatures, which is also conservative in our consideration of ECCS pump NPSH.

5.C. Deleted.

5.D. Containment spray is assumed initiated immediately after initiation of the event (time = 0 seconds). Cooling water flow to the heat exchanger is not initiated until 10 minutes after initiation of the event (time = 594.45 seconds). This is consistent with the GE analysis that generated the pool temperature profile.

5.E. Deleted

5.F. The "system" is considered quasi-steady state. This is conservative because the time of peak torus water temperature occurs hours after initiation of the event. The dynamics of the blowdown and mass/energy/momentum conservation are of significance only early in the event when things are happening rapidly. At the time of concern (peak pool temperature), things are happening relatively slowly.

5.G. Heat removal from the containment is independent of the point of return of torus cooling water, i.e., whether returned directly to the torus or via containment sprays. This is consistent with statements made in the UFSAR for PBAPS. Thus use of sprays does not alter the torus water temperature profile as developed by GE.

5.H. Time assumed for initiation of sprays is early in the event such that the containment atmosphere is at the same temperature as the spray water. This also assumes that the sprays are 100% efficient and sufficient for the containment size. This assumption is conservative in that, if undersized or less efficient, the containment atmosphere would be at a higher temperature than the sprays and thus the containment pressure would also be higher.

5.I. As a quasi-steady state system, with the temperature profile already computed using the GE SHEX code, evaluation of containment environment parameters can be performed for any point in time irrespective of any prior (or later) point in time. No differential or integral equations are necessary.

5.J. Values for input parameters are used which will tend to result in hot torus water temperatures and minimum containment pressures, in that order of preference. Following this guidance, the following inputs are used:

5.J.i. The containment air volume, taken from PBAPS UFSAR Table 5.2.1, is assumed at the maximum values. This assumption, although resulting in a greater initial mass of non-condensibles (NCs), results in a smaller increase in pressure as a result of increasing containment pressure. This was confirmed by changing the input to the smaller containment values and confirming that the margin increased.

5.J.ii. Initial containment pressure is assumed at 0.0 psig instead of 0.75 used in the maximum containment pressure analyses. This assumptions is consistent with the original MCPA analysis and results in less mass of NCs and thus smaller containment pressures.

5.J.iii. Initial containment temperature is assumed at the Tech. Spec. maximum allowables of 145°F in

the drywell and 95°F in the torus. This assumption again results in less mass of NCs. This assumption is consistent with the licensing analyses, which assumed these values because they result in higher peak (short-term) containment temperatures and thus higher peak (short-term) containment pressures.

5.J.iv. Initial containment airspace relative humidity of 100% for both the drywell and the torus. This assumption again results in less mass of NCs. The licensing analyses used a relative humidity in the drywell of 20%, giving more mass of NCs and thus (slightly) higher peak pressures.

5.J.v. Deleted.

5.J.vi. No credit is taken for generation and release of non-condensibles from the reactor vessel.

5.J.vii. Deleted.

5.J.viii. Service water temperature is assumed at 90°F, consistent with the current licensing analyses. Although a lower temperature would result in lower containment pressure, it would also yield lower torus water temperatures. The following sensitivity study confirms use of higher service water temperatures is conservative:

The existing analysis uses a service water temperature of 90°F and yielded a maximum pool temperature of 206°F for the 102% of 110% of original power and 10,000 gpm RHR flowrate (non-PERFORM).

GE has provided PECO with a letter stating that a change in service water temperature of 5°F (increase to 95°F) conservatively would increase the peak pool temperature by NO GREATER THAN 5°F. The negative of this is thus also true, that a decrease in service water temperature of 5°F (to 85°F) will drop the peak pool temperature NO GREATER THAN 5°F.

At a hot inlet temperature of 206°F and a service water temperature of 90°F, the hot exit will be NO LESS THAN 183.4°F. With a decrease in service water temperature of 85°F, GE states that the peak pool temperature will be NO LESS THAN 201°F, and the hot exit will be NO LESS THAN 179.7°F. This decrease in spray temperature (and thus containment temperature) from 183.4°0F to 179.7°F results in a decrease in available overpressure from 21.90 psia to 21.19 psia, or 0.71 psi. However, the decrease in peak pool temperature also results in a decrease in required overpressure due to the drop of saturation pressure from 13.03 psia to 11.77 psia, or 1.26 psi. This confirms that hot service water is conservative, with respect for minimum containment pressure analysis, for the DBA LOCA event.

5.J.ix. The RHR heat exchanger effective surface area used in determining the spray temperature is the same as the value used in the GE analysis for pool temperature heatup. This value is conservatively low and assumes 5% tubes plugged. Low values for this parameter result in higher pool temperatures, which is conservative, but also results in higher containment pressures, which is non-conservative. However, for the same change in this parameter, the net impact is that low values of this parameter are conservative for safety system NPSH concerns, and thus conservative for this analysis.

5.J.x. Containment leakage is assumed at the rate of 0.5% per day by volume. Results of the analysis have indicated that this has a minor impact on available overpressure. It is also conservatively assumed that only the nitrogen leaks.

5.J.xi. It is assumed that the drywell and wetwell airspace are connected by a large opening such that they are one volume. This is conservative since the wetwell pressure cannot become greater than the drywell pressure by any appreciable amount due to the vacuum breakers. This assumption results allows as much return of NCs to the drywell as is required to balance pressures.

5.J.xii. Deleted.

5.J.xiii. Deleted

5.J.xiv. PECO Calculation 11187-M-08 indicates a maximum spray flow rate of 9,350 gpm, instead of the 10,000 assumed in this calculation. The design basis flow required for torus cooling remains 10,000 gpm. Use of 9,350 gpm has little impact on the margin calculated herein (approximately 0.02 psid).

5.J.xv. Deleted

6. References

6.A PBAPS UFSAR Table 5.2.1
6.B NE-163-3 "Peach Bottom Power Rerate Project Engineering Report"
6.C PECO Calculation 18247-M-30 "RHR Pumps NPSH Post LOCA"
6.D PECO Calculation 18247-M-29 "Core Spray [Pump] NPSH Post LOCA"
6.E PECO Calculation 18247-M-31 "HPCI System NPSH Following a LOCA"
6.F PECO Calculation 18247-M-32 "RCIC System NPSH Following a LOCA "
6.G PECO Calculation PM-1010 "RHR Pump NPSH"
6.H PECO Calculation PM-1011 "Core Spray Pump NPSH"
6.I Pump Curves M-1-U-283 through 286, 293 through 296, 419 through 426, 430 through 437, and M-1-JJ-49
6.J Drawing S-51 "Containment Vessels - Requirements"
6.K EAS 10-0289 "Peach Bottom Suppression Pool Drawdown"
6.L ASME Steam Tables (fifth edition)
6.M Crane Technical Paper No. 410 (25th printing)
6.N Hydraulic Institute Standards (13th edition)
6.O Standards of the Tubular Exchanger Manufacturers Association (TEMA) (7th edition)
6.P Attachment 1 to PECO NCR 95-05708 "PBAPS Safe S/D Analysis"
6.Q PECO Calculation 18247-M-001 "Maximum Torus Temp. For The ECCS Syst."
6.R PECO Calculation PM-760 "Power Rerate Evaluation - SBO Analysis"
6.S NEDC-24380-P "PBAPS 2 & 3 Suppression Pool Temperature Response"
6.T M-1-DD-9 "Process Diagram RHR System"
6.U PECO Calculation 11187-EC-017-0101 "Pressure Drops Across the RHR and Core Spray Strainers"
6.V PECO Calculation 18247-M-24 Rev.4 (Containment Purge N2 loss)

7. Calculation

A simplified model of the PBAPS containment is used. Initial conditions are assumed that tend to decrease the margin between the MCPA and the required OP for the DBA LG-LOCA analysis.

CONVERSION FACTORS AND CONSTANTS USED

P_{atm}	Conversion factor - psig to psia	14.6959
G	Conversion factor - U.S. gallons per cubic foot	1728 / 231
R_a	Ideal gas constant for nitrogen (ft-lbf/lbm-°R)	55.2
T_0	Conversion factor - °F to °R	459.67

INPUT PARAMETERS AND VARIABLES USED

Note: A subscript "i" denotes the initial condition value for the variable.

t	Time from initiation of the event (seconds)	
$T_T(t)$	Torus water temperature at time t (°F)	
V_d	Volume (airspace) of the drywell (cuft)	175,800
V_w	Volume (airspace) of the wetwell (cuft)	127,700
V	Total containment volume (cuft)	
P_d	Atmospheric Pressure in the drywell (psig)	
P_w	Atmospheric Pressure in the wetwell (psig)	
T_d	Atmospheric Temperature in the drywell (°F)	
T_w	Atmospheric Temperature in the wetwell (°F)	
RH_d	Relative Humidity of the drywell atmosphere (%)	
RH_w	Relative Humidity of the wetwell atmosphere (%)	
$P_{sat}(T)$	Saturation pressure of water for a given temperature (psia)	
Pv_d	Partial pressure of water vapor in the drywell airspace (psia)	
Pv_w	Partial pressure of water vapor in the wetwell airspace (psia)	
Pa_d	Partial pressure of nitrogen in the drywell airspace (psia)	
Pa_w	Partial pressure of nitrogen in the drywell airspace (psia)	
Ma_d	Mass of nitrogen in the drywell airspace (lbm)	
Ma_w	Mass of nitrogen in the wetwell airspace (lbm)	
Ma	Total mass of nitrogen in containment (lbm)	
Mp	Total mass of nitrogen purged from containment during blowdown (lbm)	
Lv	Volumetric leakage rate of nitrogen (% per day by volume)	0.5%
Lm	Mass leakage rate of nitrogen (lbm/sec)	
P_L	Conservatively high pressure for computing Lm (psig)	15
T_L	Conservatively low temperature for computing Lm (°F)	95

U	RHR heat exchanger overall coefficient of heat transfer (BTU/hr-sqft-°F)	216.52
A	RHR heat exchanger effective tube surface area (sqft)	5851
LMTD	RHR heat exchanger log-mean temperature difference (°F)	
F	RHR heat exchanger mean temperature difference correction factor (unitless)	0.977
Q_R	RHR containment cooling flow rate through the heat exchanger (gpm)	10,000
Q_S	HPSW flow rate through the RHR heat exchanger (gpm)	4500
T_S	HPSW cooling water temperature (°F)	90
M_S	HPSW mass flow rate through the RHR heat exchanger (lbm/sec)	
$Cp_S(T_S)$	Specific heat at constant pressure for the HPSW (BTU/lbm °F)	
$M_R(T_R)$	RHR mass flow rate through the RHR heat exchanger (lbm/sec)	
$Cp_R(T_R)$	Specific heat at constant pressure for the RHR (BTU/lbm °F)	
P_0	Total containment pressure (psig)	
$v_f(T)$	Specific volume of water at the given temperature (cuft/lbm)	

EQUATIONS USED - MCPA

Constants

$$V = V_d + V_w \qquad \textbf{Equation 1}$$

$$m = \frac{144 * (P_L + P_{atm}) * Lv * V}{24 * 3600 * R_a * (T_L + T_0)} \qquad \textbf{Equation 2}$$

$$M_S = \frac{Q_S}{60 * G * v_f(T_s)} \qquad \textbf{Equation 3}$$

Initial Conditions

$$Ma_{d_i} = \frac{144 * \left(P_{d_i} + P_{atm} - RH_{d_i} * P_{sat}(T_{d_i})\right) * V_d}{R_a * \left(T_{d_i} + T_0\right)} \qquad \textbf{Equation 4}$$

$$Ma_{w_i} = \frac{144 * \left(P_{w_i} + P_{atm} - RH_{w_i} * P_{sat}(T_{w_i})\right) * V_w}{R_a * \left(T_{w_i} + T_0\right)} \qquad \textbf{Equation 5}$$

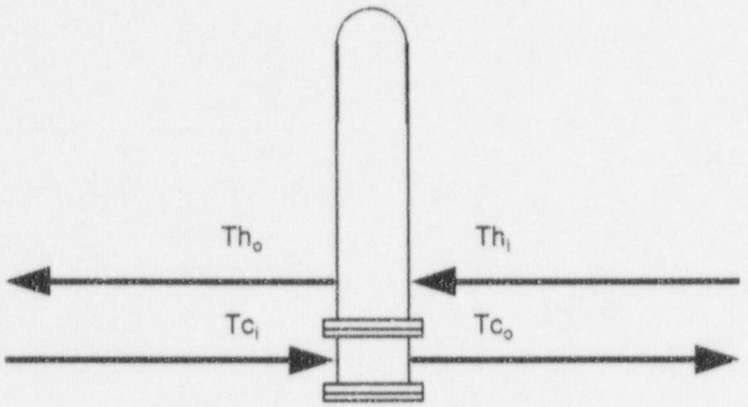
$$Ma_i = Ma_{d_i} + Ma_{w_i} \qquad \textbf{Equation 6}$$

Once initial conditions are determined, conditions at any subsequent time can be determined, independent of conditions since the initiation of the event. This is founded in the conservative assumption that the containment sprays are sized such that they can completely control the containment environment and the containment environment will be at the temperature of the sprays.

Given a time = t, and a torus water temperature for that time of $T_T(t)$ as provided in Reference 6.B:

$$M_R = \frac{Q_R}{60 * G * \nu_f(T_T)}$$ **Equation 7**

We know the temperature of the hot and cold water entering the RHR heat exchanger, Thi, and Tci, respectively. We need to determine the temperature of the hot water exiting the heat exchanger. We can either guess at a LMTD or use the LMTD determined for the previous time step, and use this as an initial value for LMTD, then iterate until exit temperatures and LMTD are consistent.



$$\begin{aligned} HX &= M_R * Cp_R * (Th_i - Th_o) \\ &= M_S * Cp_S * (Tc_o - Tc_i) \\ &= U * A * LMTD_0 * F \end{aligned}$$ **Equation 8**

Although F is dependent on the results, it does not change significantly and a conservative value can be chosen as a constant. Thus the iteration is simple, guess a value for $LMTD_0$, calculate the heat transferred, HX, then calculate the exit temperature for the hot side, Th_o. A value for the exit temperature of the cold side can also be calculated, but is not important in our analysis.

$$Th_o = Th_i - \frac{U * A * F * LMTD_0}{M_R * Cp_R}$$

$$Tc_o = Tc_i + \frac{U * A * F * LMTD_0}{M_S * CP_S}$$ **Equation 9**

where,

$$LMTD_0 = \frac{GTD - LTD}{\ln\left(\frac{GTD}{LTD}\right)}$$

$$GTD = Th_o - Tc_i \qquad \textbf{Equation 10}$$

$$LTD = Th_i - Tc_o$$

Assuming the containment spray capacity is oversized for the containment, the containment temperature will be that of the spray water, Th_o. The sprays also ensure the atmosphere in the containment is saturated. Since we know the initial mass of nitrogen and the (constant) mass leakage of nitrogen, we can determine the atmospheric conditions in the containment.

$$Ma = Ma_i - Lm * t - Mp \qquad \textbf{Equation 11}$$

$$Pv = P_{sat}(Th_o) \qquad \textbf{Equation 12}$$

$$Pa = \frac{Ma * R_a * \left(Th_o + T_0\right)}{144 * V} \qquad \textbf{Equation 13}$$

$$MCPA = Pv + Pa - P_{atm} \qquad \textbf{Equation 14}$$

The above equations provide us with a conservative profile for the minimum containment pressure available following an evaluated event, such as the DBA LG-LOCA. The "forcing function" for this evaluation is the temperature profile for the torus water. Other events can be evaluated in similar fashion provided a temperature profile for the torus water is available.

Computation of all parameters is simple and straightforward, given input values and using the above equations. A spreadsheet is used for the computations. Inputs to the spreadsheet are provided in Section 3 above. Sample calculations are provided below and confirm the spreadsheet results. Printout from the spreadsheet is provided as Attachment 1.

EQUATIONS USED - SUPPRESSION POOL TEMPERATURE EXTRAPOLATION

$$Mc_p\,(dT/dt) = Q_A\,(t) - C(T - 90)$$

where,

C = Heat Removal Rate of RHRHx (GE Number)

90 = HPSW Temperature

Q_A (t) = Decay Heat + Pump Work

$Q_A(t) = Q_o e^{-\lambda t} + P$

Assume $Q_o e^{-\lambda t} >> P$ for t small

i.e. P is considered negligible

$$Mc_p\,(dT/dt) = Q_o e^{-\lambda t} - C(T - 90)$$

$$(dT/dt) + (C/Mc_p)\,T = (Q_0/Mc_p)e^{-\lambda t} + (90C/Mc_p)$$

$$(dT/dt) + \gamma T = \beta e^{-\lambda t} + 90\gamma$$

where;

$$\gamma = (C/Mc_p)$$

$$\beta = (Q_0/Mc_p)$$

Homogeneous Solution: $T_h = Ae^{-\gamma t}$

Particular Solution: $T_P = Be^{-\lambda t} + D$

Total Solution: $T(t) = Ae^{-\gamma t} + Be^{-\lambda t} + D$

$$(dT/dt) = -\gamma Ae^{-\gamma t} + \lambda Be^{-\lambda t}$$

From this diffential equation:

$$(dT/dt) + \gamma T = \beta e^{-\lambda t} + 90\gamma$$

$$(-\gamma Ae^{-\gamma t} - \lambda Be^{-\lambda t}) + \gamma\,(Ae^{-\gamma t} + Be^{-\lambda t} + D) = \beta e^{-\lambda t} + 90\gamma$$

$$-\lambda Be^{-\lambda t} + \gamma Be^{-\lambda t} + \gamma D = \beta e^{-\lambda t} + 90\gamma$$

$e^{-\lambda t}$ terms: $(\gamma - \lambda)B = \beta$ or $B = \beta/(\gamma - \lambda)$

Constants: $\gamma D = 90\gamma$ or $D = 90$

$$T(t) = Ae^{-\gamma t} + [\beta/(\gamma - \lambda)]e^{-\lambda t} + 90$$

Sample Calculations

CONSTANTS

Vd	=			175,800 cuft
Vw	=			127,700 cuft
V	=	175,800 + 127,700	=	303,500.00 cuft
Lv	=			0.5% per day

P_L = 15 psig
T_L = 95 °F

$$Lm = \frac{144*(15+14.69598677)*\ 0.5\%*303,500.00}{24*3600*55.2*(95+459.67)} = 0.00245 \text{ lbm/sec}$$

Qs = 4500 gpm
T_s = 90 °F
v_{fs} = 0.016098759 cuft/lbm

$$Ms = \frac{4500}{60*7.480519481*0.016098759} = 622.7835 \text{ lbm/sec}$$

Cp_s = 0.9980 BTU/lbm °F

INITIAL CONDITIONS

Pd = 0.00 psig
Td = 145 °F
RHd = 100%

$$Mad_i = \frac{144*(0.00+14.69598677-100\%*Psat(145))*\ 175,800}{55.2*(145+459.67)} = 8,657.19 \text{ lbm}$$

Pw = 0.00 psig
Tw = 95 °F
RHw = 100%

$$Maw_i = \frac{144*(0.00+14.69598677-100\%*Psat(95)*\ 127,700}{55.2*(95+459.67)} = 8,336.61 \text{ lbm}$$

Ma_i = 8,657.19 + 8,336.61 = 16,993.80 lbm

TIME STEP SAMPLE CALCULATION

t = 18,045.52 seconds
T_T = 201.2 °F
vf(TT) = 0.016645 cuft/lbm
Cp_s = 1.00530BTU/lbm °F

$$M_R = \frac{10,000}{60*7.480519481*0.016645} = 1,338.5 \text{ lbm/sec}$$

Thi = 201.20°F
Tci = 90.00 °F

Guess an LMTD,

$LMTD_{guess}$ = 78.77 °F

$$Tho = 201.20 - \frac{216.52\ *5851*\ 0.977*\ 78.77}{1,338.56 * 1.00530 * 3600} = 180.66 \text{ °F}$$

$$Tco = 90.00 + \frac{216.52 * 5851 * 0.977 * 78.77}{622.7835 * 0.9980 * 3600} = 134.46\ °F$$

GTD = 180.66 - 90.00 = 90.74 °F
LTD = 201.20 - 134.74 = 66.74 °F

$$LMTD = \frac{90.74 - 66.74}{\ln(90.74 / 66.74)} = 78.09°F$$

Comparison of LMTD with $LMTD_{guess}$ shows that our original guess was appropriate. Our containment environment temperature is then no less than the spray temperature of 181.07°F.

With the previously calculated nitrogen mass loss due to initial containment purge operations, with the assumed constant nitrogen mass loss due to leakage, we can calculate our nitrogen mass in the containment as,

Mp = 0 lbm

Ma = 16,993.80 - 0.00245 * 18,045.52 - 0= 16,949.53 lbm

$$Pa = \frac{16,949.53 * 55.2 * (181.07 + 459.67)}{144 * 303,500.00} = 13.7170\ psia$$

P_{sat}(Temp) = 7.6918psia

MCPA = 7.6918 + 13.7170 - 14.69598677 = 6.7128 psig

SUPPRESSION POOL TEMPERATURE EXTRAPOLATION

Coefficients for the earlier equations will be determined now.
From GE supplied suppression pool temperature profile:

t_1 = 39,047.27 seconds T_1 = 205.4°F

t_2 = 43,377.02 seconds T_2 = 204.7°F

t_3 = 45,533.77 seconds T_3 = 204.3°F

Note: These points were chosen arbitrarily, late in the event because that is the timeframe that we are interested in. Since temperature is changing slowly, a wider time span is used to get a little more ΔT and thus increased accuracy.

$$\left.\frac{dT}{dt}\right|_{t_1} = \frac{T_2 - T_1}{t_2 - t_1} = (dT/dt)_1$$

From the differential equation:

$$Mc_P \left.\frac{dT}{dt}\right|_{t_1} = Q_0 e^{-\lambda t1} - c(T_1 - 90)$$

$$\left.\frac{dT}{dt}\right|_{t_2} = \frac{T_3 - T_2}{t_3 - t_2} = (dT/dt)_2$$

$$Mc_P \left.\frac{dT}{dt}\right|_{t_2} = Q_0 e^{-\lambda t2} - c(T_2 - 90)$$

$$Q_0 = [Mc_P(dT/dt)_1 + c(T_1 - 90)]e^{+\lambda t1} = \omega_1 e^{+\lambda t1}$$

$$Q_0 = [Mc_P(dT/dt)_2 + c(T_2 - 90)]e^{+\lambda t2} = \omega_2 e^{+\lambda t2}$$

where;

ω_1 and ω_2 are known from the data points

$1 = (\omega_1 / \omega_2)e^{-\lambda(t2-t1)}$ or $(\omega_1 / \omega_2) = e^{+\lambda(t2-t1)}$

$\lambda(t_2 - t_1) = \ln(\omega_1 / \omega_2)$ or $\lambda = \ln(\omega_1 / \omega_2) / (t_2 - t_1)$

Finally;

$$Q_0 = \omega_1 e^{\lambda t1}$$

and;

$$A = [T_1 - 90 - Be^{-\lambda t1}]e^{+\gamma t1}$$

Other Analyzed Events

Other analyzed events that may require credit for containment overpressure are Station Blackout, ATWS, Fire Safe Shutdown (FSSD), and Inadvertent Open Relief Valve (IORV). Design Basis Document P-T-12, Table T2.1-12-1 provides a list of events which require containment cooling mode of RHR. The IORV event is chosen to bound all anticipated operational occurrences and abnormal operational transients.

This section will assess the MCPA, how much overpressure credit is required (CPR), and ensure adequate margin exists. For each of these events, a time-dependent temperature profile for the torus water is not available. Instead, the peak torus water temperature is provided. Comparison of the minimum margin calculated for the DBA LG-LOCA and the margin at the peak torus water temperature indicates that the minimum margin is less than the margin at the peak temperature by less than 1 percent. Therefore, to estimate minimum margin for these events, the margin at peak temperature will be calculated and conservatively reduced by 2%. If the time of the peak pool temperature is unknown (for evaluating total nitrogen leakage), a conservative time of 28800 seconds will be used.

STATION BLACKOUT

Peak torus water temperature for the PBAPS SBO event is calculated in PM-760 (Reference 6.R) as 161°F at 15300 seconds. Calculation 18247-M-001 (Reference 6.Q) provides torus water temperatures for each ECCS/RCIC pump above which containment overpressure credit is required. The peak torus water temperature calculated for the SBO event (161°F) is well below temperatures where containment overpressure credit is required.

Therefore, an evaluation of available containment pressure is not required for the SBO event.

ATWS

Peak torus water temperature for the PBAPS ATWS event is calculated in Reference 6.B as 188°F at 3300 seconds. Calculation 18247-M-001 provides torus water temperatures for each ECCS/RCIC pump above which containment overpressure credit is required. Since the peak torus water temperature for the ATWS event (188°F)is greater than the temperatures of 18247-M-001 (Reference 6.Q), containment overpressure credit is required.

Therefore, an evaluation of available containment pressure is required for the ATWS event.

The analytical method used for the ATWS event analysis is identical to that used for the DBA LG-LOCA analysis, with the exception that time-based pool temperatures are not provided for the ATWS event, only peak pool temperatures. As explained above, a conservative margin reduction of 2% is used to account for any difference between margin at peak pool temperature and minimum margin.

The analysis is detailed on the following spreadsheet printout. The MCPA determined was 4.86 psig.

FSSD

Peak torus water temperature for the PBAPS FSSD event is calculated in Reference 6.P as 206°F at 28800 seconds. Calculation 18247-M-001 (Reference 6.Q) provides torus water temperatures for each ECCS/RCIC pump above which containment overpressure credit is required. Since the peak torus water temperature for the FSSD event (206°F)is greater than the temperatures of 18247-M-001 (Reference 6.Q), containment overpressure credit is required.

Therefore, an evaluation of available containment pressure is required for the FSSD event.

Initial containment parameters are identical to those used in the DBA LG-LOCA analysis. Service water temperature for pool and spray cooling is assumed at 40°F. Because torus water cooling is not initiated for the FSSD event until long after initiation of the event, use of colder water has only minor impact on the peak pool temperature, but has a significant impact on the spray temperature and hence, the MCPA. Use of 40°F service water temperature is conservative.

The analytical method used for the FSSD event analysis is identical to that used for the DBA LG-LOCA and ATWS analyses, with the exception that time-based pool temperatures are not provided for the FSSD event, only peak pool temperatures.

The analysis is detailed on the following spreadsheet printout. The MCPA determined was 5.73 psig..

IORV

Peak torus water temperature for the PBAPS IORV event is calculated in NEDC-24380-P (Reference 6.S) as 172°F at 3790 seconds. Calculation 18247-M-001 (Reference 6.Q) provides torus water temperatures for each ECCS/RCIC pump above which containment overpressure credit is required. The peak torus water temperature calculated for the IORV event (172°F) is well below temperatures where containment overpressure credit is required.

Therefore, an evaluation of available containment pressure is not required for the IORV event.

The results of these evaluations are as follows:

Inputs

Event	Peak Pool Temp. (°F)	Time (seconds)	HPSW Temp. (°F)	RHR Flow (gpm)
SBO	161	15300		10,000
ATWS	188	3300	90	10,000
FSSD	206	28800	40	10,000
SORV	172	3790	90	10,000

ATWS

Mao	16,993.80	lbm				TSP	188 °F
dMa/dt	0.002453	lbm/sec				TSW	90 °F
t	3300	secs				LMTDo	69.43963 °F
Ma(t)	16985.701	lbm				Tho	170.3198 °F
						Tco	128.4106 °F
Qr	10,000	gpm	Qs	4,500	gpm	GTD	80.31983 °F
TSP	188	°F	TSW	90	°F	LTD	59.58938 °F
Psat(TSP)	8.9468678	psia	Psat(TSP)	0.698127	psia	LMTD	69.43963 °F
Density	60.389019	lbm/cuft	Density	62.11659	lbm/cuft	T	170.3198 °F
Cpf	1.0036129	BTU/lbm°F	Cpf	0.99802	BTU/lbm°F	Pv	6.036849 psia
Mr	1345.4729	lbm/sec	Ms	622.7835	lbm/sec	Pa	13.51559 psia
						MCPA	4.856 psig

FSSD

Mao	16,993.80	lbm				TSP	206 °F
dMa/dt	0.002453	lbm/sec				TSW	40 °F
t	28800	secs				LMTDo	117.8559 °F
Ma(t)	16923.149	lbm				Tho	175.8499 °F
						Tco	104.4744 °F
Qr	10,000	gpm	Qs	4,500	gpm	GTD	135.8499 °F
TSP	206	°F	TSW	40	°F	LTD	101.5256 °F
Psat(TSP)	13.031183	psia	Psat(TSP)	0.121634	psia	LMTD	117.8559 °F
Density	59.962187	lbm/cuft	Density	62.4261	lbm/cuft	T	175.8499 °F
Cpf	1.0059786	BTU/lbm°F	Cpf	1.004126	BTU/lbm°F	Pv	6.845799 psia
Mr	1335.9631	lbm/sec	Ms	625.8867	lbm/sec	Pa	13.58402 psia
						MCPA	5.734 psig

8. Attachments

8.A Spreadsheet Printout for the MCPA following a DBA-LOCA, without containment purge, 14 pages, beginning on the next page.

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psi	Vf ft³/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
0.00	0.0000	95.0	15.45	0.8	0.016114	1,382.67	0.99801	95.00	95.00	0.00	95.00	90.00	5.00	0.00	0.00
49.26	0.0137	136.3	47.51	2.625	0.016276	1,368.92	0.99933	136.30	136.30	0.00	136.30	90.00	46.30	0.00	0.00
70.39	0.0196	139.0	47.48	2.81569	0.016288	1,367.86	0.99948	139.00	139.00	0.00	139.00	90.00	49.00	0.00	0.00
86.08	0.0239	139.4	47.25	2.84489	0.016290	1,367.70	0.99950	139.40	139.40	0.00	139.40	90.00	49.40	0.00	0.00
106.89	0.0297	139.8	46.94	2.87435	0.016292	1,367.54	0.99952	139.80	139.80	0.00	139.80	90.00	49.80	0.00	0.00
131.33	0.0365	140.3	46.5	2.91154	0.016295	1,367.34	0.99955	140.30	140.30	0.00	140.30	90.00	50.30	0.00	0.00
156.20	0.0434	140.8	45.93	2.94914	0.016297	1,367.13	0.99958	140.80	140.80	0.00	140.80	90.00	50.80	0.00	0.00
181.33	0.0504	141.2	45.19	2.97951	0.016299	1,366.97	0.99960	141.20	141.20	0.00	141.20	90.00	51.20	0.00	0.00
205.70	0.0571	141.4	44.49	2.99480	0.016300	1,366.89	0.99961	141.40	141.40	0.00	141.40	90.00	51.40	0.00	0.00
230.20	0.0639	141.5	43.69	3.00246	0.016300	1,366.85	0.99962	141.50	141.50	0.00	141.50	90.00	51.50	0.00	0.00
255.45	0.0710	141.6	43.01	3.01015	0.016301	1,366.81	0.99963	141.60	141.60	0.00	141.60	90.00	51.60	0.00	0.00
280.70	0.0780	141.6	42.18	3.01015	0.016301	1,366.81	0.99963	141.60	141.60	0.00	141.60	90.00	51.60	0.00	0.00
305.95	0.0850	141.7	41.54	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
331.08	0.0920	141.7	40.77	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
356.58	0.0990	141.7	40.10	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
381.58	0.1060	141.8	39.41	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
406.83	0.1130	141.8	38.71	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
431.83	0.1200	141.8	38.14	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
451.33	0.1254	141.9	32.30	3.03330	0.016302	1,366.69	0.99964	141.90	141.90	0.00	141.90	90.00	51.90	0.00	0.00
472.89	0.1314	142.1	27.42	3.04883	0.016303	1,366.61	0.99966	142.10	142.10	0.00	142.10	90.00	52.10	0.00	0.00
495.83	0.1377	142.8	25.39	3.10388	0.016307	1,366.32	0.99970	142.80	142.80	0.00	142.80	90.00	52.80	0.00	0.00
520.83	0.1447	143.9	24.43	3.19158	0.016312	1,365.87	0.99976	143.90	143.90	0.00	143.90	90.00	53.90	0.00	0.00
545.08	0.1514	145.2	23.96	3.29818	0.016318	1,365.33	0.99985	145.20	145.20	0.00	145.20	90.00	55.20	0.00	0.00
569.76	0.1583	146.5	23.67	3.40780	0.016325	1,364.79	0.99993	146.50	146.50	0.00	146.50	90.00	56.50	0.00	0.00
594.45	0.1651	147.8	23.49	3.52049	0.016331	1,364.25	1.00001	147.80	90.00	40.99	137.47	112.67	35.13	47.47	40.99
666.26	0.1851	150.6	23.41	3.77100	0.016346	1,363.06	1.00020	150.60	90.00	42.97	139.76	113.77	36.83	49.76	42.97
805.26	0.2237	153.9	23.48	4.09250	0.016363	1,361.63	1.00043	153.90	90.00	45.31	142.46	115.06	38.84	52.46	45.31
976.39	0.2712	156.5	23.50	4.35921	0.016376	1,360.49	1.00062	156.50	90.00	47.15	144.59	116.08	40.42	54.59	47.15
1,155.14	0.3209	158.9	23.51	4.61832	0.016389	1,359.43	1.00081	158.90	90.00	48.85	146.56	117.02	41.88	56.56	48.85
1,336.01	0.3711	161.0	23.51	4.85560	0.016401	1,358.48	1.00097	161.00	90.00	50.34	148.27	117.84	43.16	58.27	50.34
1,520.39	0.4223	163.0	23.53	5.09108	0.016412	1,357.57	1.00114	163.00	90.00	51.75	149.91	118.63	44.37	59.91	51.75
1,701.51	0.4726	164.8	23.55	5.31119	0.016422	1,356.75	1.00129	164.80	90.00	53.03	151.38	119.33	45.47	61.38	53.03
1,888.14	0.5245	166.5	23.58	5.52638	0.016431	1,355.98	1.00143	166.50	90.00	54.23	152.77	120.00	46.50	62.77	54.23
2,074.89	0.5764	168.0	23.61	5.72232	0.016440	1,355.26	1.00156	168.00	90.00	55.29	154.00	120.58	47.42	64.00	55.29
2,256.89	0.6269	169.4	23.67	5.91044	0.016448	1,354.60	1.00169	169.40	90.00	56.28	155.14	121.13	48.27	65.14	56.28
2,440.89	0.6780	170.7	23.74	6.08976	0.016455	1,353.99	1.00181	170.70	90.00	57.20	156.20	121.64	49.06	66.20	57.20
2,622.26	0.7284	171.9	23.82	6.25932	0.016462	1,353.42	1.00192	171.90	90.00	58.05	157.18	122.11	49.79	67.18	58.05
2,808.76	0.7802	173.0	23.88	6.41823	0.016468	1,352.89	1.00202	173.00	90.00	58.83	158.08	122.54	50.46	68.08	58.83
2,995.14	0.8320	174.0	23.99	6.56563	0.016474	1,352.41	1.00212	174.00	90.00	59.54	158.90	122.93	51.07	68.90	59.54
3,177.35	0.8826	175.0	24.06	6.71586	0.016480	1,351.93	1.00222	175.00	90.00	60.24	159.71	123.32	51.68	69.71	60.24
3,365.26	0.9348	175.9	24.17	6.85352	0.016485	1,351.50	1.00231	175.90	90.00	60.88	160.45	123.68	52.22	70.45	60.88
3,551.76	0.9866	176.8	24.22	6.99355	0.016491	1,351.06	1.00240	176.80	90.00	61.52	161.18	124.03	52.77	71.18	61.52
3,736.64	1.0380	177.6	24.32	7.12002	0.016496	1,350.67	1.00248	177.60	90.00	62.08	161.84	124.34	53.26	71.84	62.08
3,921.76	1.0894	178.4	24.41	7.24841	0.016500	1,350.28	1.00256	178.40	90.00	62.65	162.49	124.66	53.74	72.49	62.65
4,106.51	1.1407	179.1	24.47	7.36234	0.016505	1,349.93	1.00263	179.10	90.00	63.15	163.06	124.93	54.17	73.06	63.15
4,290.89	1.1919	179.8	24.53	7.47777	0.016509	1,349.59	1.00270	179.80	90.00	63.64	163.63	125.20	54.60	73.63	63.64
4,473.89	1.2427	180.5	24.61	7.59471	0.016513	1,349.24	1.00278	180.50	90.00	64.14	164.20	125.48	55.02	74.20	64.14
4,656.26	1.2934	181.1	24.69	7.69617	0.016517	1,348.95	1.00284	181.10	90.00	64.56	164.69	125.71	55.39	74.69	64.56
4,836.14	1.3434	181.7	24.78	7.79875	0.016520	1,348.65	1.00291	181.70	90.00	64.98	165.18	125.95	55.75	75.18	64.98
5,022.89	1.3952	182.2	24.85	7.88511	0.016523	1,348.40	1.00296	182.20	90.00	65.34	165.59	126.14	56.06	75.59	65.34

PECO ENERGY
NUCLEAR GROUP

CALCULATION SHEET

CALC NO.: PM-1013
PAGE: 22
REVISION: 1

196-21453 8/96

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
0.00	0.0000	95.00	2.7906	16,993.80	11.9054	0.0000	0.7540
49.26	0.0137	136.30	2.6252	16,993.68	12.7917	0.7209	32.8140
70.39	0.0196	139.00	2.8157	16,993.62	12.8497	0.9694	32.7840
86.08	0.0239	139.40	2.8449	16,993.58	12.8582	1.0071	32.5540
106.89	0.0297	139.80	2.8744	16,993.53	12.8668	1.0451	32.2440
131.33	0.0365	140.30	2.9115	16,993.47	12.8774	1.0930	31.8340
156.20	0.0434	140.80	2.9491	16,993.41	12.8881	1.1413	31.2340
181.33	0.0504	141.20	2.9795	16,993.35	12.8967	1.1802	30.4940
205.70	0.0571	141.40	2.9948	16,993.29	12.9009	1.1997	29.7940
230.20	0.0639	141.50	3.0025	16,993.23	12.9030	1.2095	28.9940
255.45	0.0710	141.60	3.0101	16,993.17	12.9051	1.2193	28.3140
280.70	0.0780	141.60	3.0101	16,993.11	12.9051	1.2192	27.4840
305.95	0.0850	141.70	3.0179	16,993.05	12.9072	1.2290	26.8440
331.08	0.0920	141.70	3.0179	16,992.98	12.9071	1.2290	26.0740
356.58	0.0990	141.70	3.0179	16,992.92	12.9071	1.2289	25.4040
381.58	0.1060	141.80	3.0258	16,992.86	12.9092	1.2388	24.7140
406.83	0.1130	141.80	3.0256	16,992.80	12.9091	1.2387	24.0140
431.83	0.1200	141.80	3.0256	16,992.74	12.9091	1.2387	23.4440
451.33	0.1254	141.90	3.0333	16,992.69	12.9112	1.2485	17.6040
472.89	0.1314	142.10	3.0488	16,992.64	12.9154	1.2683	12.7240
495.83	0.1377	142.80	3.1037	16,992.58	12.9304	1.3381	10.6940
520.83	0.1447	143.90	3.1916	16,992.52	12.9540	1.4496	9.7340
545.08	0.1514	145.20	3.2982	16,992.46	12.9818	1.5840	9.2640
569.76	0.1583	146.50	3.4078	16,992.40	13.0097	1.7215	8.9740
594.45	0.1651	137.47	2.7064	16,992.34	12.8158	0.8262	8.7940
566.26	0.1851	139.76	2.8716	16,992.16	12.8649	1.0406	8.7140
805.26	0.2237	142.46	3.0773	16,991.82	12.9226	1.3039	8.7840
976.39	0.2712	144.59	3.2480	16,991.40	12.9680	1.5199	8.8040
1,155.14	0.3209	146.56	3.4125	16,990.98	13.0098	1.7263	8.8140
1,336.01	0.3711	148.27	3.5623	16,990.52	13.0463	1.9126	8.8140
1,520.39	0.4223	149.91	3.7100	16,990.07	13.0810	2.0950	8.8340
1,701.51	0.4726	151.38	3.8473	16,989.62	13.1123	2.2636	8.8540
1,888.14	0.5245	152.77	3.9809	16,989.16	13.1417	2.4267	8.8840
2,074.89	0.5764	154.00	4.1020	16,988.71	13.1677	2.5737	8.9140
2,256.89	0.6269	155.14	4.2178	16,988.26	13.1919	2.7137	8.9740
2,440.89	0.6780	156.20	4.3278	16,987.81	13.2143	2.8462	9.0440
2,622.26	0.7284	157.18	4.4315	16,987.36	13.2350	2.9705	9.1240
2,808.76	0.7802	158.08	4.5283	16,986.91	13.2539	3.0863	9.1840
2,995.14	0.8320	158.90	4.6179	16,986.45	13.2711	3.1930	9.2940
3,177.39	0.8826	159.71	4.7090	16,986.00	13.2883	3.3013	9.3640
3,365.26	0.9348	160.45	4.7922	16,985.54	13.3037	3.3999	9.4740
3,551.76	0.9866	161.18	4.8767	16,985.08	13.3191	3.4998	9.5240
3,736.64	1.0380	161.84	4.9528	16,984.63	13.3327	3.5896	9.6240
3,921.76	1.0894	162.49	5.0300	16,984.18	13.3464	3.6804	9.7140
4,106.51	1.1407	163.06	5.0983	16,983.72	13.3583	3.7606	9.7740
4,290.89	1.1919	163.63	5.1674	16,983.27	13.3702	3.8416	9.8340
4,473.89	1.2427	164.20	5.2372	16,982.82	13.3821	3.9233	9.9140
4,656.26	1.2934	164.69	5.2978	16,982.37	13.3922	3.9940	9.9940
4,836.14	1.3434	165.18	5.3589	16,981.93	13.4024	4.0652	10.0840
5,022.89	1.3952	165.59	5.4102	16,981.47	13.4108	4.1250	10.1540

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Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
5,205.89	1.4461	182.8	24.94	7.98980	0.016527	1,348.10	1.00303	182.80	90.00	65.76	166.08	126.38	56.42	76.08	65.76
5,392.51	1.4979	183.3	25.01	8.07793	0.016530	1,347.85	1.00308	183.30	90.00	66.12	166.49	126.57	56.73	76.49	66.12
5,571.01	1.5475	183.8	25.09	8.16687	0.016533	1,347.60	1.00314	183.80	90.00	66.47	166.89	126.77	57.03	76.89	66.47
5,751.64	1.5977	184.3	25.16	8.25663	0.016536	1,347.35	1.00319	184.30	90.00	66.82	167.30	126.96	57.34	77.30	66.82
5,931.76	1.6477	184.8	25.23	8.34722	0.016539	1,347.10	1.00325	184.80	90.00	67.18	167.71	127.16	57.64	77.71	67.18
6,114.76	1.6985	185.2	25.29	8.42028	0.016542	1,346.89	1.00329	185.20	90.00	67.46	168.04	127.32	57.88	78.04	67.46
6,297.76	1.7494	185.6	25.36	8.49388	0.016544	1,346.69	1.00334	185.60	90.00	67.74	168.36	127.47	58.13	78.36	67.74
6,475.14	1.7986	186.1	25.43	8.58663	0.016547	1,346.44	1.00339	186.10	90.00	68.10	168.77	127.67	58.43	78.77	68.10
6,652.14	1.8478	186.5	25.49	8.66145	0.016550	1,346.24	1.00344	186.50	90.00	68.38	169.10	127.82	58.68	79.10	68.38
6,830.89	1.8975	186.8	25.56	8.71791	0.016552	1,346.09	1.00347	186.80	90.00	68.59	169.34	127.94	58.86	79.34	68.59
7,001.51	1.9449	187.2	25.63	8.79368	0.016554	1,345.88	1.00352	187.20	90.00	68.87	169.67	128.10	59.10	79.67	68.87
7,177.89	1.9939	187.6	25.69	8.87000	0.016557	1,345.68	1.00357	187.60	90.00	69.16	169.99	128.25	59.35	79.99	69.16
7,356.76	2.0435	187.9	25.75	8.92760	0.016559	1,345.52	1.00360	187.90	90.00	69.37	170.24	128.37	59.53	80.24	69.37
7,536.76	2.0935	188.3	25.81	9.00489	0.016561	1,345.32	1.00365	188.30	90.00	69.65	170.56	128.53	59.77	80.56	69.65
7,713.51	2.1426	188.6	25.87	9.06322	0.016563	1,345.17	1.00368	188.60	90.00	69.86	170.81	128.65	59.95	80.81	69.86
7,890.51	2.1918	188.9	25.93	9.12186	0.016565	1,345.01	1.00372	188.90	90.00	70.08	171.05	128.76	60.14	81.05	70.08
8,069.14	2.2414	189.3	25.98	9.20055	0.016567	1,344.81	1.00377	189.30	90.00	70.36	171.38	128.92	60.38	81.38	70.36
8,241.14	2.2892	189.6	26.04	9.25994	0.016569	1,344.65	1.00380	189.60	90.00	70.57	171.62	129.04	60.56	81.62	70.57
8,414.39	2.3373	189.9	26.09	9.31965	0.016571	1,344.50	1.00384	189.90	90.00	70.78	171.87	129.15	60.75	81.87	70.78
8,592.64	2.3868	190.2	26.18	9.37968	0.016573	1,344.35	1.00387	190.20	90.00	71.00	172.11	129.27	60.93	82.11	71.00
8,761.76	2.4338	190.4	26.23	9.41988	0.016574	1,344.24	1.00390	190.40	90.00	71.14	172.28	129.35	61.05	82.28	71.14
8,874.26	2.4651	190.6	26.27	9.45022	0.016576	1,344.14	1.00392	190.60	90.00	71.28	172.44	129.43	61.17	82.44	71.28
8,986.76	2.4963	190.8	26.30	9.50071	0.016577	1,344.04	1.00395	190.80	90.00	71.42	172.60	129.51	61.29	82.60	71.42
9,099.26	2.5276	191.0	26.34	9.54134	0.016578	1,343.93	1.00397	191.00	90.00	71.56	172.77	129.58	61.42	82.77	71.56
9,211.76	2.5588	191.2	26.37	9.58211	0.016580	1,343.83	1.00400	191.20	90.00	71.70	172.93	129.66	61.54	82.93	71.70
9,324.26	2.5901	191.3	26.41	9.60256	0.016580	1,343.78	1.00401	191.30	90.00	71.77	173.01	129.70	61.60	83.01	71.77
9,436.76	2.6213	191.5	26.45	9.64365	0.016581	1,343.67	1.00403	191.50	90.00	71.91	173.17	129.78	61.72	83.17	71.91
9,549.26	2.6526	191.7	26.48	9.68469	0.016583	1,343.57	1.00406	191.70	90.00	72.06	173.34	129.86	61.84	83.34	72.06
9,661.76	2.6838	191.9	26.52	9.72598	0.016584	1,343.47	1.00408	191.90	90.00	72.20	173.50	129.94	61.96	83.50	72.20
9,774.26	2.7151	192.0	26.56	9.74667	0.016585	1,343.42	1.00409	192.00	90.00	72.27	173.58	129.98	62.02	83.58	72.27
9,886.76	2.7463	192.2	26.59	9.78818	0.016586	1,343.31	1.00412	192.20	90.00	72.41	173.74	130.05	62.15	83.74	72.41
9,999.26	2.7776	192.4	26.63	9.82984	0.016587	1,343.21	1.00414	192.40	90.00	72.55	173.91	130.13	62.27	83.91	72.55
10,111.77	2.8088	192.6	26.67	9.87164	0.016589	1,343.10	1.00417	192.60	90.00	72.69	174.07	130.21	62.39	84.07	72.69
10,224.27	2.8401	192.7	26.70	9.89260	0.016589	1,343.05	1.00418	192.70	90.00	72.76	174.15	130.25	62.45	84.15	72.76
10,342.89	2.8730	192.9	26.75	9.93462	0.016590	1,342.95	1.00420	192.90	90.00	72.90	174.31	130.33	62.57	84.31	72.90
10,455.39	2.9043	193.1	26.79	9.97679	0.016592	1,342.84	1.00423	193.10	90.00	73.05	174.48	130.41	62.69	84.48	73.05
10,567.89	2.9355	193.2	26.82	9.99794	0.016592	1,342.79	1.00424	193.20	90.00	73.12	174.56	130.44	62.76	84.56	73.12
10,680.39	2.9668	193.4	26.85	10.04033	0.016594	1,342.69	1.00427	193.40	90.00	73.26	174.72	130.52	62.88	84.72	73.26
10,792.89	2.9980	193.6	26.89	10.08288	0.016595	1,342.58	1.00429	193.60	90.00	73.40	174.88	130.60	63.00	84.88	73.40
10,905.39	3.0293	193.7	26.92	10.10421	0.016596	1,342.53	1.00430	193.70	90.00	73.47	174.97	130.64	63.06	84.97	73.47
11,017.89	3.0605	193.9	26.95	10.14699	0.016597	1,342.43	1.00433	193.90	90.00	73.61	175.13	130.72	63.18	85.13	73.61
11,142.64	3.0952	194.1	27.01	10.18991	0.016598	1,342.32	1.00436	194.10	90.00	73.75	175.29	130.80	63.30	85.29	73.75
11,262.39	3.1284	194.2	27.04	10.21143	0.016599	1,342.27	1.00437	194.20	90.00	73.82	175.37	130.84	63.36	85.37	73.82
11,377.77	3.1605	194.4	27.07	10.25458	0.016600	1,342.17	1.00439	194.40	90.00	73.96	175.54	130.91	63.49	85.54	73.96
11,490.14	3.1917	194.5	27.11	10.27621	0.016601	1,342.11	1.00441	194.50	90.00	74.04	175.62	130.95	63.55	85.62	74.03
11,609.77	3.2249	194.7	27.16	10.31959	0.016602	1,342.01	1.00443	194.70	90.00	74.18	175.78	131.03	63.67	85.78	74.18
11,762.77	3.2674	194.9	27.19	10.36312	0.016603	1,341.90	1.00446	194.90	90.00	74.32	175.94	131.11	63.79	85.94	74.32
11,889.14	3.3025	195.1	27.22	10.40681	0.016605	1,341.80	1.00448	195.10	90.00	74.46	176.11	131.19	63.91	86.11	74.46
12,042.02	3.3450	195.3	27.27	10.45065	0.016606	1,341.69	1.00451	195.30	90.00	74.60	176.27	131.27	64.03	86.27	74.60
12,195.52	3.3876	195.5	27.32	10.49464	0.016607	1,341.59	1.00453	195.50	90.00	74.74	176.43	131.34	64.16	86.43	74.74

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5,205.89	1.4461	166.08	5.5724	16,981.03	13.4209	4.1973	10.2440
5,392.51	1.4979	166.49	5.5247	16,980.57	13.4293	4.2580	10.3140
5,571.01	1.5475	166.89	5.5774	16,980.13	13.4377	4.3191	10.3940
5,751.64	1.5977	167.30	5.6305	16,979.69	13.4461	4.3806	10.4640
5,931.76	1.6477	167.71	5.6840	16,979.25	13.4545	4.4425	10.5340
6,114.76	1.6985	168.04	5.7272	16,978.80	13.4611	4.4923	10.5940
6,297.76	1.7494	168.36	5.7706	16,978.35	13.4675	4.5424	10.6640
6,475.14	1.7986	168.77	5.8252	16,977.91	13.4762	4.6054	10.7340
6,552.14	1.8478	169.10	5.8693	16,977.48	13.4828	4.6561	10.7940
6,830.89	1.8975	169.34	5.9025	16,977.04	13.4877	4.6942	10.8640
7,001.51	1.9449	169.67	5.9470	16,976.62	13.4944	4.7454	10.9340
7,177.89	1.9939	169.99	5.9915	16,976.19	13.5010	4.7968	10.9940
7,356.76	2.0435	170.24	6.0256	16,975.75	13.5059	4.8355	11.0540
7,536.76	2.0935	170.56	6.0708	16,975.31	13.5126	4.8874	11.1140
7,713.51	2.1426	170.81	6.1050	16,974.87	13.5175	4.9265	11.1740
7,890.51	2.1918	171.05	6.1393	16,974.44	13.5224	4.9657	11.2340
8,069.14	2.2414	171.38	6.1853	16,974.00	13.5290	5.0183	11.2840
8,241.14	2.2892	171.62	6.2200	16,973.58	13.5339	5.0579	11.3440
8,414.39	2.3373	171.87	6.2549	16,973.16	13.5388	5.0977	11.3940
8,592.64	2.3868	172.11	6.2899	16,972.72	13.5437	5.1376	11.4840
8,781.76	2.4338	172.28	6.3133	16,972.30	13.5469	5.1642	11.5340
8,874.26	2.4651	172.44	6.3368	16,972.03	13.5501	5.1910	11.5740
8,986.76	2.4963	172.60	6.3604	16,971.75	13.5534	5.2178	11.6040
9,099.26	2.5276	172.77	6.3841	16,971.48	13.5567	5.2448	11.6440
9,211.76	2.5588	172.93	6.4078	16,971.20	13.5600	5.2718	11.6740
9,324.26	2.5901	173.01	6.4197	16,970.93	13.5615	5.2852	11.7140
9,436.76	2.6213	173.17	6.4435	16,970.65	13.5648	5.3123	11.7540
9,549.26	2.6526	173.34	6.4674	16,970.3.	13.5680	5.3395	11.7840
9,661.76	2.6838	173.50	6.4914	16,970.10	13.5713	5.3667	11.8240
9,774.26	2.7151	173.58	6.5034	16,969.82	13.5728	5.3803	11.8640
9,886.76	2.7463	173.74	6.5275	16,969.54	13.5761	5.4077	11.8940
9,999.26	2.7776	173.91	6.5517	16,969.27	13.5794	5.4351	11.9340
10,111.77	2.8088	174.07	6.5760	16,968.99	13.5827	5.4626	11.9740
10,224.27	2.8401	174.15	6.5881	16,968.72	13.5842	5.4763	12.0040
10,342.89	2.8730	174.31	6.6125	16,968.42	13.5874	5.5039	12.0540
10,455.39	2.9043	174.48	6.6369	16,968.15	13.5907	5.5316	12.0940
10,567.89	2.9355	174.56	6.6491	16,967.87	13.5922	5.5454	12.1240
10,680.39	2.9668	174.72	6.6737	16,967.60	13.5955	5.5732	12.1540
10,792.89	2.9980	174.88	6.6983	16,967.32	13.5988	5.6011	12.1940
10,905.39	3.0293	174.97	6.7107	16,967.04	13.6003	5.6150	12.2240
11,017.89	3.0605	175.13	6.7354	16,966.77	13.6036	5.6430	12.2540
11,142.64	3.0952	175.29	6.7602	16,966.48	13.6068	5.6710	12.3140
11,262.39	3.1284	175.37	6.7726	16,966.17	13.6083	5.6850	12.3440
11,377.77	3.1605	175.54	6.7976	16,965.89	13.6116	5.7132	12.3740
11,490.14	3.1917	175.62	6.8101	16,965.61	13.6131	5.7272	12.4140
11,609.77	3.2249	175.78	6.8351	16,965.32	13.6164	5.7555	12.4640
11,762.77	3.2674	175.94	6.8602	16,954.94	13.6196	5.7838	12.4940
11,889.14	3.3025	176.11	6.8854	16,964.63	13.6228	5.8122	12.5240
12,042.02	3.3450	176.27	6.9107	16,964.26	13.6260	5.8407	12.5740
12,195.52	3.3876	176.43	6.9360	16,963.88	13.6292	5.8692	12.6240

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
12,350.89	3.4308	195.7	27.35	10.53878	0.016609	1,341.48	1.00456	195.70	90.00	74.88	176.60	131.42	64.28	86.60	74.88
12,505.14	3.4737	195.9	27.40	10.58308	0.016610	1,341.38	1.00459	195.90	90.00	75.02	176.76	131.50	64.40	86.76	75.02
12,660.39	3.5168	196.1	27.44	10.62754	0.016611	1,341.27	1.00461	196.10	90.00	75.17	176.92	131.58	64.52	86.92	75.17
12,813.39	3.5593	196.2	27.49	10.64983	0.016612	1,341.22	1.00462	196.20	90.00	75.24	177.00	131.62	64.58	87.00	75.24
12,970.77	3.6030	196.4	27.53	10.69452	0.016613	1,341.11	1.00465	196.40	90.00	75.38	177.17	131.70	64.70	87.17	75.38
13,117.27	3.6437	196.6	27.58	10.73936	0.016614	1,341.01	1.00468	196.60	90.00	75.52	177.33	131.77	64.83	87.33	75.52
13,275.39	3.6876	196.8	27.61	10.78436	0.016616	1,340.90	1.00470	196.80	90.00	75.66	177.49	131.85	64.95	87.49	75.66
13,438.02	3.7328	197.0	27.65	10.82952	0.016617	1,340.80	1.00473	197.00	90.00	75.80	177.65	131.93	65.07	87.65	75.80
13,593.52	3.7760	197.2	27.69	10.87484	0.016618	1,340.69	1.00476	197.20	90.00	75.94	177.82	132.01	65.19	87.82	75.94
13,748.14	3.8189	197.3	27.72	10.89756	0.016619	1,340.64	1.00477	197.30	90.00	76.01	177.90	132.05	65.25	87.90	76.01
13,907.64	3.8632	197.5	27.77	10.94311	0.016620	1,340.53	1.00479	197.50	90.00	76.16	178.06	132.13	65.37	88.06	76.15
14,071.14	3.9087	197.7	27.80	10.98882	0.016622	1,340.43	1.00482	197.70	90.00	76.30	178.22	132.20	65.50	88.22	76.30
14,222.27	3.9506	197.9	27.84	11.03469	0.016623	1,340.32	1.00485	197.90	90.00	76.44	178.39	132.28	65.62	88.39	76.44
14,383.64	3.9955	198.0	27.90	11.05769	0.016624	1,340.27	1.00486	198.00	90.00	76.51	178.47	132.32	65.68	88.47	76.51
14,549.89	4.0416	198.2	27.93	11.10380	0.016625	1,340.16	1.00489	198.20	90.00	76.65	178.63	132.40	65.80	88.63	76.65
14,706.39	4.0851	198.4	27.96	11.15007	0.016626	1,340.06	1.00491	198.40	90.00	76.79	178.79	132.48	65.92	88.79	76.79
14,866.02	4.1294	198.5	27.99	11.17326	0.016627	1,340.00	1.00493	198.50	90.00	76.86	178.88	132.52	65.98	88.88	76.86
15,027.77	4.1744	198.7	28.05	11.21977	0.016628	1,339.90	1.00495	198.70	90.00	77.00	179.04	132.59	66.11	89.04	77.00
15,188.14	4.2189	198.8	28.08	11.24309	0.016629	1,339.84	1.00497	198.80	90.00	77.07	179.12	132.63	66.17	89.12	77.07
15,343.02	4.2619	199.0	28.11	11.28984	0.016630	1,339.74	1.00499	199.00	90.00	77.22	179.28	132.71	66.29	89.28	77.22
15,495.27	4.3042	199.1	28.14	11.31328	0.016631	1,339.68	1.00501	199.10	90.00	77.29	179.36	132.75	66.35	89.36	77.29
15,660.27	4.3501	199.3	28.17	11.36027	0.016632	1,339.58	1.00504	199.30	90.00	77.43	179.53	132.83	66.47	89.53	77.43
15,819.64	4.3943	199.4	28.20	11.38383	0.016633	1,339.52	1.00505	199.40	90.00	77.50	179.61	132.87	66.53	89.61	77.50
15,979.02	4.4386	199.6	28.23	11.43107	0.016634	1,339.42	1.00508	199.60	90.00	77.64	179.77	132.95	66.65	89.77	77.64
16,132.39	4.4812	199.7	28.27	11.45475	0.016635	1,339.36	1.00509	199.70	90.00	77.71	179.85	132.99	66.71	89.85	77.71
16,298.27	4.5267	199.9	28.30	11.50223	0.016636	1,339.26	1.00512	199.90	90.00	77.85	180.02	133.06	66.84	90.02	77.85
16,447.77	4.5688	200.0	28.32	11.52604	0.016637	1,339.20	1.00513	200.00	90.00	77.92	180.10	133.10	66.90	90.10	77.92
16,604.02	4.6122	200.1	28.35	11.54988	0.016637	1,339.15	1.00514	200.10	90.00	77.99	180.18	133.14	66.96	90.18	77.99
16,766.14	4.6573	200.2	28.38	11.57376	0.016638	1,339.10	1.00516	200.20	90.00	78.06	180.26	133.18	67.02	90.26	78.06
16,922.27	4.7006	200.4	28.41	11.62166	0.016639	1,338.99	1.00518	200.40	90.00	78.21	180.42	133.26	67.14	90.42	78.21
17,086.02	4.7461	200.5	28.43	11.64567	0.016640	1,338.94	1.00520	200.50	90.00	78.28	180.50	133.30	67.20	90.50	78.28
17,248.02	4.7911	200.6	28.49	11.66972	0.016641	1,338.88	1.00521	200.60	90.00	78.35	180.59	133.34	67.26	90.59	78.35
17,414.02	4.8372	200.8	28.52	11.71794	0.016642	1,338.78	1.00524	200.80	90.00	78.49	180.75	133.42	67.38	90.75	78.49
17,568.27	4.8801	200.9	28.53	11.74211	0.016643	1,338.72	1.00525	200.90	90.00	78.56	180.83	133.45	67.45	90.83	78.56
17,730.02	4.9250	201.0	28.56	11.76633	0.016643	1,338.67	1.00527	201.00	90.00	78.63	180.91	133.49	67.51	90.91	78.63
17,890.02	4.9694	201.1	28.57	11.79058	0.016644	1,338.62	1.00528	201.10	90.00	78.70	180.99	133.53	67.57	90.99	78.70
18,045.52	5.0126	201.2	28.59	11.81488	0.016645	1,338.56	1.00530	201.20	90.00	78.77	181.07	133.57	67.63	91.07	78.77
18,204.14	5.0567	201.3	28.62	11.83922	0.016645	1,338.51	1.00531	201.30	90.00	78.84	181.16	133.61	67.69	91.16	78.84
18,363.52	5.1010	201.4	28.65	11.86360	0.016646	1,338.45	1.00532	201.40	90.00	78.91	181.24	133.65	67.75	91.24	78.91
18,512.02	5.1422	201.5	28.67	11.88803	0.016647	1,338.40	1.00534	201.50	90.00	78.98	181.32	133.69	67.81	91.32	78.98
18,671.64	5.1866	201.6	28.68	11.91249	0.016647	1,338.35	1.00535	201.60	90.00	79.05	181.40	133.73	67.87	91.40	79.05
18,825.02	5.2292	201.7	28.70	11.93700	0.016648	1,338.29	1.00536	201.70	90.00	79.12	181.48	133.77	67.93	91.48	79.12
18,984.27	5.2734	201.8	28.72	11.96155	0.016649	1,338.24	1.00538	201.80	90.00	79.19	181.56	133.81	67.99	91.56	79.19
19,141.39	5.3171	201.9	28.75	11.98614	0.016649	1,338.19	1.00539	201.90	90.00	79.27	181.64	133.85	68.05	91.64	79.27
19,301.77	5.3616	202.0	28.77	12.01077	0.016650	1,338.13	1.00541	202.00	90.00	79.34	181.73	133.88	68.12	91.73	79.34
19,458.77	5.4052	202.1	28.78	12.03545	0.016651	1,338.08	1.00542	202.10	90.00	79.41	181.81	133.92	68.18	91.81	79.41
19,613.89	5.4483	202.2	28.80	12.06016	0.016651	1,338.02	1.00543	202.20	90.00	79.48	181.89	133.96	68.24	91.89	79.48
19,766.14	5.4906	202.3	28.82	12.08492	0.016652	1,337.97	1.00545	202.30	90.00	79.55	181.97	134.00	68.30	91.97	79.55
19,920.39	5.5334	202.4	28.84	12.10973	0.016653	1,337.92	1.00546	202.40	90.00	79.62	182.05	134.04	68.36	92.05	79.62
20,079.27	5.5776	202.4	28.86	12.10973	0.016653	1,337.92	1.00546	202.40	90.00	79.62	182.05	134.04	68.36	92.05	79.62

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pres (psig)
12,350.89	3.4308	176.60	6.9615	16,963.50	13.6324	5.8978	12.6540
12,505.14	3.4737	176.76	6.9870	16,963.12	13.6356	5.9265	12.7040
12,660.39	3.5168	176.92	7.0125	16,962.74	13.6387	5.9553	12.7440
12,813.39	3.5593	177.00	7.0254	16,962.36	13.6402	5.9696	12.7940
12,970.77	3.6030	177.17	7.0511	16,961.98	13.6434	5.9984	12.8340
13,117.27	3.6437	177.33	7.0768	16,961.62	13.6466	6.0274	12.8640
13,275.39	3.6876	177.49	7.1027	16,961.23	13.6497	6.0565	12.9140
13,438.02	3.7328	177.65	7.1286	16,960.83	13.6529	6.0856	12.9540
13,593.52	3.7760	177.82	7.1547	16,960.45	13.6561	6.1148	12.9940
13,748.14	3.8189	177.90	7.1677	16,960.07	13.6575	6.1292	13.0240
13,907.64	3.8632	178.06	7.1938	16,959.68	13.6607	6.1585	13.0740
14,071.14	3.9087	178.22	7.2200	16,959.28	13.6639	6.1879	13.1040
14,222.27	3.9506	178.39	7.2463	16,958.91	13.6671	6.2174	13.1440
14,383.64	3.9955	178.47	7.2595	16,958.51	13.6685	6.2320	13.2040
14,549.89	4.0416	178.63	7.2859	16,958.10	13.6717	6.2616	13.2340
14,706.39	4.0851	178.79	7.3124	16,957.72	13.6748	6.2912	13.2640
14,866.02	4.1294	178.88	7.3257	16,957.33	13.6763	6.3060	13.2940
15,027.77	4.1744	179.04	7.3523	16,956.93	13.6794	6.3357	13.3540
15,188.14	4.2189	179.12	7.3656	16,956.54	13.6809	6.3505	13.3840
15,343.02	4.2619	179.28	7.3924	16,956.16	13.6840	6.3804	13.4140
15,495.27	4.3042	179.36	7.4058	16,955.79	13.6855	6.3952	13.4440
15,660.27	4.3501	179.53	7.4326	16,955.38	13.6886	6.4253	13.4740
15,819.64	4.3943	179.61	7.4461	16,954.99	13.6901	6.4401	13.5040
15,979.02	4.4386	179.77	7.4730	16,954.60	13.6932	6.4703	13.5340
16,132.39	4.4812	179.85	7.4866	16,954.22	13.6947	6.4853	13.5740
16,296.27	4.5267	180.02	7.5137	16,953.82	13.6978	6.5155	13.6040
16,447.77	4.5688	180.10	7.5272	16,953.45	13.6993	6.5305	13.6240
16,604.02	4.6122	180.18	7.5408	16,953.07	13.7007	6.5456	13.6540
16,766.14	4.6573	180.26	7.5545	16,952.67	13.7021	6.5606	13.6840
16,922.27	4.7006	180.42	7.5818	16,952.29	13.7053	6.5911	13.7140
17,086.02	4.7461	180.50	7.5954	16,951.88	13.7067	6.6062	13.7340
17,248.02	4.7911	180.59	7.6091	16,951.49	13.7082	6.6213	13.7940
17,414.02	4.8372	180.75	7.6366	16,951.08	13.7113	6.6519	13.8240
17,568.27	4.8801	180.83	7.6504	16,950.70	13.7128	6.6671	13.8340
17,730.02	4.9250	180.91	7.6642	16,950.30	13.7142	6.6823	13.8640
17,890.02	4.9694	180.99	7.6780	16,949.91	13.7156	6.6976	13.8740
18,045.52	5.0126	181.07	7.6918	16,949.53	13.7170	6.7128	13.8940
18,204.14	5.0567	181.16	7.7056	16,949.14	13.7185	6.7281	13.9240
18,363.52	5.1010	181.24	7.7195	16,948.75	13.7199	6.7434	13.9540
18,512.02	5.1422	181.32	7.7334	16,948.39	13.7213	6.7587	13.9740
18,671.64	5.1866	181.40	7.7473	16,947.99	13.7228	6.7741	13.9840
18,825.02	5.2292	181.48	7.7612	16,947.62	13.7242	6.7894	14.0040
18,984.27	5.2734	181.56	7.7752	16,947.23	13.7256	6.8048	14.0240
19,141.39	5.3171	181.64	7.7892	16,946.84	13.7271	6.8202	14.0540
19,301.77	5.3616	181.73	7.8031	16,946.45	13.7285	6.8356	14.0740
19,458.77	5.4052	181.81	7.8172	16,946.06	13.7299	6.8511	14.0840
19,613.89	5.4483	181.89	7.8312	16,945.68	13.7313	6.8665	14.1040
19,766.14	5.4906	181.97	7.8452	16,945.31	13.7328	6.8820	14.1240
19,920.39	5.5334	182.05	7.8593	16,944.93	13.7342	6.8976	14.1440
20,079.27	5.5776	182.05	7.8593	16,944.54	13.7339	6.8972	14.1640

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
20,233.77	5.6205	202.5	28.87	12.13457	0.016654	1,337.86	1.00548	202.50	90.00	79.69	182.13	134.08	68.42	92.13	79.69
20,388.27	5.6629	202.6	28.90	12.15946	0.016654	1,337.81	1.00549	202.60	90.00	79.76	182.21	134.12	68.48	92.21	79.76
20,537.39	5.7048	202.7	28.92	12.18438	0.016655	1,337.75	1.00550	202.70	90.00	79.83	182.30	134.16	68.54	92.30	79.83
20,690.39	5.7473	202.7	28.93	12.18438	0.016655	1,337.75	1.00550	202.70	90.00	79.83	182.30	134.16	68.54	92.30	79.83
20 845.84	5.7905	202.8	28.94	12.20935	0.016656	1,337.70	1.00552	202.80	90.00	79.90	182.38	134.20	68.60	92.38	79.90
20,998.39	5.8329	202.9	28.96	12.23437	0.016656	1,337.65	1.00553	202.90	90.00	79.97	182.46	134.24	68.66	92.46	79.97
21,152.84	5.8757	203.0	28.98	12.25942	0.016657	1,337.59	1.00555	203.00	90.00	80.04	182.54	134.28	68.72	92.54	80.04
21,304.14	5.9178	203.0	28.99	12.25942	0.016657	1,337.59	1.00555	203.00	90.00	80.04	182.54	134.28	68.72	92.54	80.04
21,461.52	5.9615	203.1	29.02	12.28452	0.016658	1,337.54	1.00556	203.10	90.00	80.11	182.62	134.31	68.79	92.62	80.11
21,618.14	6.0050	203.2	29.04	12.30966	0.016658	1,337.48	1.00558	203.20	90.00	80.18	182.70	134.35	68.85	92.70	80.18
21,780.84	6.0502	203.3	29.05	12.33485	0.016659	1,337.43	1.00559	203.30	90.00	80.25	182.78	134.39	68.91	92.78	80.25
21,934.89	6.0930	203.3	29.07	12.33485	0.016659	1,337.43	1.00559	203.30	90.00	80.25	182.78	134.39	68.91	92.78	80.25
22,090.52	6.1363	203.4	29.08	12.36008	0.016660	1,337.38	1.00560	203.40	90.00	80.33	182.87	134.43	68.97	92.87	80.33
22,239.89	6.1777	203.4	29.09	12.36008	0.016660	1,337.38	1.00560	203.40	90.00	80.33	182.87	134.43	68.97	92.87	80.33
22,391.27	6.2198	203.5	29.10	12.38535	0.016660	1,337.32	1.00562	203.50	90.00	80.40	182.95	134.47	69.03	92.95	80.40
22,546.14	6.2628	203.6	29.13	12.41066	0.016661	1,337.27	1.00563	203.60	90.00	80.47	183.03	134.51	69.09	93.03	80.47
22,700.14	6.3056	203.6	29.15	12.41066	0.016661	1,337.27	1.00563	203.60	90.00	80.47	183.03	134.51	69.09	93.03	80.47
22,856.64	6.3491	203.7	29.16	12.43601	0.016662	1,337.21	1.00565	203.70	90.00	80.54	183.11	134.55	69.15	93.11	80.54
23,015.77	6.3933	203.8	29.18	12.46141	0.016662	1,337.16	1.00566	203.80	90.00	80.61	183.19	134.59	69.21	93.19	80.61
23,168.39	6.4357	203.8	29.18	12.46141	0.016662	1,337.16	1.00566	203.80	90.00	80.61	183.19	134.59	69.21	93.19	80.61
23,322.64	6.4785	203.9	29.19	12.48685	0.016663	1,337.11	1.00567	203.90	90.00	80.68	183.27	134.63	69.27	93.27	80.68
23,476.52	6.5213	203.9	29.21	12.48685	0.016663	1,337.11	1.00567	203.90	90.00	80.68	183.27	134.63	69.27	93.27	80.68
23,631.77	6.5644	204.0	29.23	12.51234	0.016664	1,337.05	1.00569	204.00	90.00	80.75	183.35	134.67	69.33	93.35	80.75
23,787.39	6.6076	204.0	29.25	12.51234	0.016664	1,337.05	1.00569	204.00	90.00	80.75	183.35	134.67	69.33	93.35	80.75
23,938.89	6.6497	204.1	29.25	12.53787	0.016664	1,337.00	1.00570	204.10	90.00	80.82	183.43	134.71	69.39	93.43	80.82
24,094.14	6.6928	204.1	29.26	12.53787	0.016664	1,337.00	1.00570	204.10	90.00	80.82	183.43	134.71	69.39	93.43	80.82
24,246.89	6.7352	204.2	29.27	12.56344	0.016665	1,336.94	1.00572	204.20	90.00	80.89	183.52	134.74	69.46	93.52	80.89
24,400.27	6.7779	204.2	29.29	12.56344	0.016665	1,336.94	1.00572	204.20	90.00	80.89	183.52	134.74	69.46	93.52	80.89
24,552.52	6.8201	204.3	29.29	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
24,710.27	6.8640	204.3	29.30	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
24,864.39	6.9068	204.4	29.33	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
25,014.64	6.9485	204.4	29.33	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
25,165.64	6.9905	204.5	29.35	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
25,321.39	7.0337	204.5	29.35	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
25,474.14	7.0762	204.6	29.36	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
25,631.52	7.1199	204.6	29.36	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
25,785.39	7.1626	204.7	29.37	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
25,941.39	7.2059	204.7	29.39	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
26,094.89	7.2486	204.7	29.41	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
26,248.64	7.2913	204.8	29.42	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
26,405.77	7.3349	204.8	29.42	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
26,562.89	7.3786	204.9	29.43	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
26,715.77	7.4210	204.9	29.43	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
26,867.39	7.4632	204.9	29.44	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
27,027.02	7.5075	205.0	29.45	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,183.14	7.5509	205.0	29.45	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,339.52	7.5943	205.0	29.47	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,495.77	7.6377	205.1	29.48	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
27,651.27	7.6809	205.1	29.48	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
27,804.27	7.7234	205.1	29.49	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
20,233.77	5.6205	182.13	7.8734	16,944.16	13.7353	6.9128	14.1740
20,386.27	5.6629	182.21	7.8875	16,943.79	13.7368	6.9283	14.2040
20,537.39	5.7048	182.30	7.9017	16,943.42	13.7382	6.94	14.2240
20,690.39	5.7473	182.30	7.9017	16,943.04	13.7379	6.94 6	14.2340
20,845.64	5.7905	182.38	7.9158	16,942.66	13.7393	6.9592	14.2440
20,998.39	5.8329	182.46	7.9300	16,942.29	13.7408	6.9748	14.2640
21,152.64	5.8757	182.54	7.9442	16,941.91	13.7422	6.9905	14.2840
21,304.14	5.9178	182.54	7.9442	16,941.54	13.7419	6.9902	14.2940
21,461.52	5.9615	182.62	7.9584	16,941.15	13.7433	7.0058	14.3240
21,618.14	6.0050	182.70	7.9727	16,940.77	13.7448	7.0215	14.3440
21,780.64	6.0502	182.78	7.9870	16,940.37	13.7462	7.0372	14.3540
21,934.89	6.0930	182.78	7.9870	16,939.99	13.7459	7.0369	14.3740
22,090.52	6.1363	182.87	8.0012	16,939.61	13.7473	7.0526	14.3840
22,239.89	6.1777	182.87	8.0012	16,939.24	13.7470	7.0523	14.3940
22,391.27	6.2198	182.95	8.0155	16,938.87	13.7485	7.0680	14.4040
22,546.14	6.2628	183.03	8.0299	16,938.49	13.7499	7.0838	14.4340
22,700.14	6.3056	183.03	8.0299	16,938.11	13.7496	7.0835	14.4540
22,856.64	6.3491	183.11	8.0442	16,937.73	13.7510	7.0993	14.4640
23,015.77	6.3933	183.19	8.0586	16,937.34	13.7524	7.1151	14.4640
23,168.39	6.4357	183.19	8.0586	16,936.96	13.7521	7.1148	14.4840
23,322.64	6.4785	183.27	8.0730	16,936.59	13.7536	7.1306	14.4940
23,476.52	6.5213	183.27	8.0730	16,936.21	13.7533	7.1303	14.5140
23,631.77	6.5644	183.35	8.0874	16,935.83	13.7547	7.1461	14.5340
23,787.39	6.6076	183.35	8.0874	16,935.45	13.7544	7.1458	14.5540
23,938.89	6.6497	183.43	8.1018	16,935.07	13.7558	7.1617	14.5540
24,094.14	6.6928	183.43	8.1018	16,934.69	13.7555	7.1614	14.5640
24,246.89	6.7352	183.52	8.1163	16,934.32	13.7570	7.1773	14.5740
24,400.27	6.7779	183.52	8.1163	16,933.94	13.7567	7.1770	14.5940
24,552.52	6.8201	183.60	8.1308	16,933.57	13.7581	7.1929	14.5940
24,710.27	6.8640	183.60	8.1308	16,933.18	13.7578	7.1926	14.6040
24,864.39	6.9068	183.68	8.1453	16,932.80	13.7592	7.2085	14.6340
25,014.64	6.9485	183.68	8.1453	16,932.43	13.7589	7.2082	14.6340
25,165.64	6.9905	183.76	8.1598	16,932.06	13.7603	7.2242	14.6540
25,321.39	7.0337	183.76	8.1598	16,931.68	13.7600	7.2239	14.6540
25,474.14	7.0762	183.84	8.1744	16,931.31	13.7615	7.2398	14.6840
25,631.52	7.1199	183.84	8.1744	16,930.92	13.7612	7.2395	14.6640
25,785.39	7.1626	183.92	8.1889	16,930.54	13.7626	7.2555	14.6740
25,941.39	7.2059	183.92	8.1889	16,930.16	13.7623	7.2552	14.6940
26,094.89	7.2486	183.92	8.1889	16,929.78	13.7620	7.2549	14.7140
26,248.64	7.2913	184.00	8.2035	16,929.41	13.7634	7.2709	14.7240
26,405.77	7.3349	184.00	8.2035	16,929.02	13.7631	7.2706	14.7240
26,562.89	7.3786	184.09	8.2181	16,928.64	13.7645	7.2866	14.7340
26,715.77	7.4210	184.09	8.2181	16,928.26	13.7642	7.2863	14.7340
26,867.39	7.4632	184.09	8.2181	16,927.89	13.7639	7.2860	14.7440
27,027.02	7.5075	184.17	8.2327	16,927.50	13.7653	7.3021	14.7540
27,183.14	7.5509	184.17	8.2327	16,927.12	13.7650	7.3018	14.7540
27,339.52	7.5943	184.17	8.2327	16,926.73	13.7647	7.3015	14.7740
27,495.77	7.6377	184.25	8.2474	16,926.35	13.7661	7.3175	14.7840
27,651.27	7.6809	184.25	8.2474	16,925.97	13.7658	7.3172	14.7840
27,804.27	7.7234	184.25	8.2474	16,925.59	13.7655	7.3169	14.7940

PECO ENERGY
NUCLEAR GROU

CALCULATION SHEET

CALC. NO. : PM-1013
PAGE : 29
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196-21453 8/96

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Thc (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
27,959.02	7.7664	205.2	29.49	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,112.14	7.8089	205.2	29.50	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,272.64	7.8535	205.2	29.50	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,415.27	7.8931	205.3	29.51	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,567.52	7.9354	205.3	29.51	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,717.64	7.9771	205.3	29.53	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,875.39	8.0209	205.3	29.53	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
29,028.27	8.0634	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,185.64	8.1071	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,344.64	8.1513	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,497.89	8.1939	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,656.39	8.2379	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
29,802.52	8.2785	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
29,953.77	8.3205	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,106.39	8.3629	205.5	29.56	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,268.77	8.4080	205.5	29.56	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,420.39	8.4501	205.5	29.57	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,578.27	8.4940	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
30,733.14	8.5370	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
30,893.64	8.5816	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,047.77	8.6244	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,203.39	8.6676	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,358.89	8.7108	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,512.64	8.7535	205.6	29.60	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,667.02	8.7964	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
31,818.89	8.8386	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
31,966.52	8.8796	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,113.52	8.9204	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,267.14	8.9631	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,421.39	9.0059	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,573.14	9.0481	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,721.77	9.0894	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,872.52	9.1313	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,024.02	9.1733	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,171.27	9.2142	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,326.39	9.2573	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,481.02	9.3003	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,630.52	9.3424	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,777.39	9.3826	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,931.52	9.4254	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,085.02	9.4681	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,235.14	9.5098	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,390.02	9.5528	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,548.64	9.5968	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,706.64	9.6407	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,860.89	9.6836	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,018.89	9.7275	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,176.89	9.7714	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,332.89	9.8147	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,487.64	9.8577	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
27,959.02	7.7664	184.33	8.2621	16,925.21	13.7670	7.3330	14.7940
28,112.14	7.8089	184.33	8.2621	16,924.84	13.7667	7.3327	14.8040
28,272.64	7.8535	184.33	8.2621	16,924.44	13.7663	7.3324	14.8040
28,415.27	7.8931	184.41	8.2768	16,924.09	13.7678	7.3486	14.8140
28,567.52	7.9354	184.41	8.2768	16,923.72	13.7675	7.3483	14.8140
28,717.64	7.9771	184.41	8.2768	16,923.35	13.7672	7.3480	14.8340
28,875.39	8.0209	184.41	8.2768	16,922.96	13.7669	7.3476	14.8340
29,028.27	8.0634	184.49	8.2915	16,922.59	13.7683	7.3638	14.8440
29,185.64	8.1071	184.49	8.2915	16,922.20	13.7680	7.3635	14.8440
29,344.64	8.1513	184.49	8.2915	16,921.81	13.7677	7.3632	14.8440
29,497.89	8.1939	184.49	8.2915	16,921.44	13.7674	7.3629	14.8440
29,656.39	8.2379	184.57	8.3062	16,921.05	13.7688	7.3790	14.8440
29,802.52	8.2785	184.57	8.3062	16,920.69	13.7685	7.3787	14.8440
29,953.77	8.3205	184.57	8.3062	16,920.32	13.7682	7.3784	14.8440
30,106.39	8.3629	184.57	8.3062	16,919.94	13.7679	7.3781	14.8640
30,268.77	8.4080	184.57	8.3062	16,919.55	13.7676	7.3778	14.8640
30,420.39	8.4501	184.57	8.3062	16,919.17	13.7673	7.3775	14.8740
30,578.27	8.4940	184.66	8.3210	16,918.79	13.7687	7.3937	14.8740
30,733.14	8.5370	184.66	8.3210	16,918.41	13.7684	7.3934	14.8740
30,893.64	8.5816	184.66	8.3210	16,918.01	13.7681	7.3930	14.8740
31,047.77	8.6244	184.66	8.3210	16,917.64	13.7677	7.3927	14.8740
31,203.39	8.6676	184.66	8.3210	16,917.25	13.7674	7.3924	14.8740
31,358.89	8.7108	184.66	8.3210	16,916.87	13.7671	7.3921	14.8740
31,512.64	8.7535	184.66	8.3210	16,916.49	13.7668	7.3918	14.9040
31,667.02	8.7964	184.74	8.3358	16,916.12	13.7683	7.4080	14.9040
31,818.89	8.8386	184.74	8.3358	16,915.74	13.7679	7.4077	14.9040
31,966.52	8.8796	184.74	8.3358	16,915.38	13.7677	7.4074	14.9040
32,113.52	8.9204	184.74	8.3358	16,915.02	13.7674	7.4071	14.9040
32,267.14	8.9631	184.74	8.3358	16,914.64	13.7671	7.4068	14.9040
32,421.39	9.0059	184.74	8.3358	16,914.27	13.7667	7.4065	14.9040
32,573.14	9.0481	184.74	8.3358	16,913.89	13.7664	7.4062	14.9040
32,721.77	9.0894	184.74	8.3358	16,913.53	13.7661	7.4059	14.8940
32,872.52	9.1313	184.74	8.3358	16,913.16	13.7658	7.4056	14.8940
33,024.02	9.1733	184.74	8.3358	16,912.79	13.7655	7.4053	14.8940
33,171.27	9.2142	184.74	8.3358	16,912.43	13.7652	7.4050	14.8940
33,326.39	9.2573	184.74	8.3358	16,912.05	13.7649	7.4047	14.8940
33,481.02	9.3003	184.74	8.3358	16,911.67	13.7646	7.4044	14.8840
33,632.52	9.3424	184.74	8.3358	16,911.29	13.7643	7.4041	14.8840
33,777.39	9.3826	184.74	8.3358	16,910.94	13.7640	7.4038	14.8740
33,931.52	9.4254	184.74	8.3358	16,910.56	13.7637	7.4035	14.8740
34,085.02	9.4681	184.74	8.3358	16,910.18	13.7634	7.4032	14.8840
34,235.14	9.5098	184.74	8.3358	16,909.82	13.7631	7.4029	14.8740
34,390.02	9.5528	184.74	8.3358	16,909.44	13.7628	7.4026	14.8740
34,548.64	9.5968	184.74	8.3358	16,909.05	13.7625	7.4023	14.8640
34,706.64	9.6407	184.74	8.3358	16,908.66	13.7622	7.4020	14.8640
34,860.89	9.6836	184.74	8.3358	16,908.28	13.7619	7.4016	14.8840
35,018.89	9.7275	184.74	8.3358	16,907.89	13.7616	7.4013	14.8840
35,176.89	9.7714	184.74	8.3358	16,907.51	13.7612	7.4010	14.8640
35,332.89	9.8147	184.74	8.3358	16,907.12	13.7609	7.4007	14.8640
35,487.64	9.8577	184.74	8.3358	16,906.74	13.7606	7.4004	14.8640

PECO ENERGY
NUCLEAR GROUP

CALCULATION SHEET

CALC. NO.: PM-1013
PAGE: 31
REVISION: 1

196-21453 8/96

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
35,646.64	9.9018	205.7	29.55	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,796.64	9.9435	205.7	29.54	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,952.52	9.9868	205.7	29.54	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,102.14	10.0284	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,255.39	10.0709	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,406.39	10.1134	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,560.39	10.1557	205.7	29.52	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,712.52	10.1979	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,867.02	10.2408	205.7	29.52	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
37,027.52	10.2854	205.6	29.51	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,177.27	10.3270	205.6	29.51	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,331.39	10.3698	205.6	29.50	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,488.89	10.4136	205.6	29.49	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,643.39	10.4565	205.6	29.49	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,798.14	10.4995	205.6	29.48	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,956.52	10.5435	205.6	29.47	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
38,108.89	10.5858	205.5	29.47	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,271.52	10.6310	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,421.14	10.6725	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,577.64	10.7160	205.5	29.44	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,732.14	10.7589	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,888.64	10.8024	205.5	29.44	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
39,047.27	10.8465	205.4	29.43	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,204.14	10.8900	205.4	29.42	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,363.89	10.9344	205.4	29.42	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,520.77	10.9780	205.4	29.40	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,677.02	11.0214	205.4	29.40	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,837.39	11.0659	205.3	29.38	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
39,989.64	11.1082	205.3	29.37	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,152.52	11.1535	205.3	29.37	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,299.02	11.1942	205.3	29.36	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,450.27	11.2362	205.2	29.35	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,607.64	11.2799	205.2	29.35	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,763.14	11.3231	205.2	29.34	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,915.52	11.3654	205.2	29.33	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
41,076.14	11.4100	205.1	29.32	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,232.14	11.4534	205.1	29.31	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,381.27	11.4948	205.1	29.31	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,534.64	11.5374	205.1	29.33	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,688.02	11.5800	205.0	29.32	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
41,838.14	11.6217	205.0	29.30	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
41,992.14	11.6645	205.0	29.30	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
42,153.02	11.7092	205.0	29.29	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
42,307.52	11.7521	204.9	29.29	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
42,458.64	11.7941	204.9	29.27	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
42,612.52	11.8368	204.9	29.26	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
42,761.02	11.8781	204.9	29.25	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.39	184.09	135.02	69.88	94.09	81.38
42,916.89	11.9214	204.8	29.25	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
43,067.89	11.9633	204.8	29.24	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
43,221.64	12.0060	204.8	29.23	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
35,646.64	9.9018	184.74	8.3358	16,906.35	13.7603	7.4001	14.8540
35,796.64	9.9435	184.74	8.3358	16,905.99	13.7600	7.3998	14.8440
35,952.52	9.9868	184.74	8.3358	16,905.60	13.7597	7.3995	14.8440
36,102.14	10.0284	184.74	8.3358	16,905.24	13.7594	7.3992	14.8340
36,255.39	10.0709	184.74	8.3358	16,904.86	13.7591	7.3989	14.8340
36,408.39	10.1134	184.74	8.3358	16,904.49	13.7588	7.3986	14.8340
36,580.39	10.1557	184.74	8.3358	16,904.11	13.7585	7.3983	14.8240
36,712.52	10.1979	184.74	8.3358	16,903.74	13.7582	7.3980	14.8340
36,867.02	10.2408	184.74	8.3358	16,903.36	13.7579	7.3976	14.8240
37,027.52	10.2854	184.66	8.3210	16,902.97	13.7558	7.3808	14.8140
37,177.27	10.3270	184.66	8.3210	16,902.60	13.7555	7.3805	14.8140
37,331.39	10.3698	184.66	8.3210	16,902.22	13.7552	7.3802	14.8040
37,488.89	10.4136	184.66	8.3210	16,901.84	13.7549	7.3799	14.7940
37,643.39	10.4565	184.66	8.3210	16,901.46	13.7546	7.3796	14.7940
37,798.14	10.4995	184.66	8.3210	16,901.08	13.7543	7.3793	14.7840
37,956.52	10.5435	184.66	8.3210	16,900.69	13.7540	7.3789	14.7740
38,108.89	10.5858	184.57	8.3062	16,900.31	13.7519	7.3621	14.7740
38,271.52	10.6310	184.57	8.3062	16,899.92	13.7516	7.3618	14.7540
38,421.14	10.6725	184.57	8.3062	16,899.55	13.7513	7.3615	14.7540
38,577.64	10.7160	184.57	8.3062	16,899.16	13.7510	7.3612	14.7440
38,732.14	10.7589	184.57	8.3062	16,898.79	13.7507	7.3609	14.7540
38,888.64	10.8024	184.57	8.3062	16,898.40	13.7504	7.3606	14.7440
39,047.27	10.8465	184.49	8.2915	16,898.01	13.7483	7.3438	14.7340
39,204.14	10.8900	184.49	8.2915	16,897.63	13.7480	7.3435	14.7240
39,363.89	10.9344	184.49	8.2915	16,897.24	13.7477	7.3432	14.7240
39,520.77	10.9780	184.49	8.2915	16,896.85	13.7474	7.3429	14.7040
39,677.02	11.0214	184.49	8.2915	16,896.47	13.7470	7.3425	14.7040
39,837.39	11.0659	184.41	8.2768	16,896.07	13.7450	7.3258	14.6840
39,989.64	11.1082	184.41	8.2768	16,895.70	13.7447	7.3255	14.6740
40,152.52	11.1535	184.41	8.2768	16,895.30	13.7444	7.3251	14.6740
40,299.02	11.1942	184.41	8.2768	16,894.94	13.7441	7.3248	14.6640
40,450.27	11.2362	184.33	8.2621	16,894.57	13.7420	7.3081	14.6540
40,607.64	11.2799	184.33	8.2621	16,894.18	13.7417	7.3078	14.6540
40,763.14	11.3231	184.33	8.2621	16,893.80	13.7414	7.3075	14.6440
40,915.52	11.3654	184.33	8.2621	16,893.43	13.7411	7.3072	14.6340
41,076.14	11.4100	184.25	8.2474	16,893.04	13.7390	7.2905	14.6240
41,232.14	11.4534	184.25	8.2474	16,892.65	13.7387	7.2901	14.6140
41,381.27	11.4948	184.25	8.2474	16,892.29	13.7384	7.2898	14.6140
41,534.64	11.5374	184.25	8.2474	16,891.91	13.7381	7.2895	14.6340
41,685.02	11.5800	184.17	8.2327	16,891.53	13.7361	7.2728	14.6240
41,838.14	11.6217	184.17	8.2327	16,891.17	13.7358	7.2725	14.6040
41,992.14	11.6645	184.17	8.2327	16,890.79	13.7355	7.2722	14.6040
42,153.02	11.7092	184.17	8.2327	16,890.39	13.7352	7.2719	14.5940
42,307.52	11.7521	184.09	8.2181	16,890.01	13.7331	7.2552	14.5940
42,458.64	11.7941	184.09	8.2181	16,889.64	13.7328	7.2549	14.5740
42,612.52	11.8368	184.09	8.2181	16,889.27	13.7325	7.2546	14.5640
42,761.02	11.8781	184.09	8.2181	16,888.90	13.7322	7.2543	14.5540
42,916.89	11.9214	184.00	8.2035	16,888.52	13.7302	7.2377	14.5540
43,067.89	11.9633	184.00	8.2035	16,888.15	13.7299	7.2374	14.5440
43,221.64	12.0060	184.00	8.2035	16,887.77	13.7296	7.2371	14.5340

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger									
						Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
43,377.02	12.0492	204.7	29.22	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,521.52	12.0893	204.7	29.21	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,672.39	12.1312	204.7	29.21	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,827.77	12.1744	204.7	29.19	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,984.02	12.2178	204.6	29.19	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,139.39	12.2609	204.6	29.17	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,300.39	12.3057	204.6	29.17	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,453.02	12.3481	204.5	29.15	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,607.89	12.3911	204.5	29.15	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,765.64	12.4349	204.5	29.13	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,921.27	12.4781	204.4	29.13	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,072.64	12.5202	204.4	29.12	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,229.89	12.5639	204.4	29.11	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,381.77	12.6060	204.4	29.10	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,533.77	12.6483	204.3	29.09	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
45,684.02	12.6900	204.3	29.08	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
Maxima		205.7	47.51												

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Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressure (psig)
43,377.02	12.0492	183.92	8.1889	16,887.39	13.7275	7.2204	14.5240
43,521.52	12.0893	183.92	8.1889	16,887.04	13.7272	7.2202	14.5140
43,672.39	12.1312	183.92	8.1889	16,886.67	13.7269	7.2199	14.5140
43,827.77	12.1744	183.92	8.1889	16,886.29	13.7266	7.2195	14.4940
43,984.02	12.2178	183.84	8.1744	16,885.90	13.7246	7.2029	14.4940
44,139.39	12.2609	183.84	8.1744	16,885.52	13.7243	7.2026	14.4740
44,300.39	12.3057	183.84	8.1744	16,885.13	13.7239	7.2023	14.4740
44,453.02	12.3481	183.76	8.1598	16,884.75	13.7219	7.1857	14.4540
44,607.89	12.3911	183.76	8.1598	16,884.37	13.7216	7.1854	14.4540
44,765.64	12.4349	183.76	8.1598	16,883.99	13.7213	7.1851	14.4340
44,921.27	12.4781	183.68	8.1453	16,883.60	13.7192	7.1685	14.4340
45,072.64	12.5202	183.68	8.1453	16,883.23	13.7189	7.1682	14.4240
45,229.89	12.5639	183.68	8.1453	16,882.85	13.7186	7.1679	14.4140
45,381.77	12.6060	183.68	8.1453	16,882.47	13.7183	7.1676	14.4040
45,533.77	12.6483	183.60	8.1308	16,882.10	13.7163	7.1511	14.3940
45,684.02	12.6900	183.60	8.1308	16,881.73	13.7160	7.1508	14.3840
Maxima		184.74				7.41	

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8.B Spreadsheet Printout for the MCPA following a DBA-LOCA, with containment purge, 14 pages, beginning on the next page.

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
0.00	0.0000	95.0	15.45	0.81534	0.016114	1,382.67	0.99801	95.00	95.00	0.00	95.00	90.00	5.00	0.00	0.00
49.26	0.0137	136.3	47.51	2.62519	0.016276	1,368.92	0.99933	136.30	136.30	0.00	136.30	90.00	46.30	0.00	0.00
70.39	0.0196	139.0	47.43	2.81569	0.016288	1,367.86	0.99948	139.00	139.00	0.00	139.00	90.00	49.00	0.00	0.00
86.08	0.0239	139.4	47.25	2.84489	0.016290	1,367.70	0.99950	139.40	139.40	0.00	139.40	90.00	49.40	0.00	0.00
106.89	0.0297	139.8	46.94	2.87435	0.016292	1,367.54	0.99952	139.80	139.80	0.00	139.80	90.00	49.80	0.00	0.00
131.33	0.0365	140.3	46.53	2.91154	0.016295	1,367.34	0.99955	140.30	140.30	0.00	140.30	90.00	50.30	0.00	0.00
156.20	0.0434	140.8	45.93	2.94914	0.016297	1,367.13	0.99958	140.80	140.80	0.00	140.80	90.00	50.80	0.00	0.00
181.33	0.0504	141.2	45.19	2.97951	0.016299	1,366.97	0.99960	141.20	141.20	0.00	141.20	90.00	51.20	0.00	0.00
205.70	0.0571	141.4	44.49	2.99480	0.016300	1,366.89	0.99961	141.40	141.40	0.00	141.40	90.00	51.40	0.00	0.00
230.20	0.0639	141.5	43.69	3.00246	0.016300	1,366.85	0.99962	141.50	141.50	0.00	141.50	90.00	51.50	0.00	0.00
255.45	0.0710	141.6	43.01	3.01015	0.016301	1,366.81	0.99963	141.60	141.60	0.00	141.60	90.00	51.60	0.00	0.00
280.70	0.0780	141.6	42.18	3.01015	0.016301	1,366.81	0.99963	141.60	141.60	0.00	141.60	90.00	51.60	0.00	0.00
305.95	0.0850	141.7	41.54	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
331.08	0.0920	141.7	40.77	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
356.58	0.0990	141.7	40.10	3.01785	0.016301	1,366.77	0.99963	141.70	141.70	0.00	141.70	90.00	51.70	0.00	0.00
381.58	0.1060	141.8	39.41	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
406.83	0.1130	141.8	38.71	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
431.83	0.1200	141.8	38.14	3.02557	0.016302	1,366.73	0.99964	141.80	141.80	0.00	141.80	90.00	51.80	0.00	0.00
451.33	0.1254	141.9	32.30	3.03330	0.016302	1,366.69	0.99964	141.90	141.90	0.00	141.90	90.00	51.90	0.00	0.00
472.89	0.1314	142.1	27.42	3.04883	0.016303	1,366.61	0.99966	142.10	142.10	0.00	142.10	90.00	52.10	0.00	0.00
495.83	0.1377	142.8	25.39	3.10368	0.016307	1,366.32	0.99970	142.80	142.80	0.00	142.80	90.00	52.80	0.00	0.00
520.83	0.1447	143.9	24.43	3.19158	0.016312	1,365.87	0.99976	143.90	143.90	0.00	143.90	90.00	53.90	0.00	0.00
545.08	0.1514	145.2	23.96	3.29818	0.016318	1,365.33	0.99985	145.20	145.20	0.00	145.20	90.00	55.20	0.00	0.00
569.76	0.1583	146.5	23.67	3.40780	0.016325	1,364.79	0.99993	146.50	146.50	0.00	146.50	90.00	56.50	0.00	0.00
594.45	0.1651	147.8	23.49	3.52049	0.016331	1,364.25	1.00001	147.80	90.00	40.99	137.47	112.67	35.13	47.47	40.99
666.26	0.1851	150.6	23.41	3.77400	0.016346	1,363.06	1.00020	150.60	90.00	42.97	139.76	113.77	36.83	49.76	42.97
805.26	0.2237	153.9	23.48	4.09250	0.016363	1,361.63	1.00043	153.90	90.00	45.31	142.46	115.06	38.84	52.46	45.31
976.39	0.2712	156.5	23.50	4.35921	0.016376	1,360.49	1.00062	156.50	90.00	47.15	144.59	116.08	40.42	54.59	47.15
1,155.14	0.3209	158.9	23.51	4.61832	0.016389	1,359.43	1.00081	158.90	90.00	48.85	146.56	117.02	41.88	56.56	48.85
1,336.01	0.3711	161.0	23.51	4.85560	0.016401	1,358.48	1.00097	161.00	90.00	50.34	148.27	117.84	43.16	58.27	50.34
1,520.39	0.4223	163.0	23.53	5.09108	0.016412	1,357.57	1.00114	163.00	90.00	51.75	149.91	118.63	44.37	59.91	51.75
1,701.51	0.4726	164.8	23.55	5.31119	0.016422	1,356.75	1.00129	164.80	90.00	53.03	151.38	119.33	45.47	61.38	53.03
1,888.14	0.5245	166.5	23.58	5.52638	0.016431	1,355.96	1.00143	166.50	90.00	54.23	152.77	120.00	46.50	62.77	54.23
2,074.89	0.5764	168.0	23.61	5.72232	0.016440	1,355.26	1.00156	168.00	90.00	55.29	154.00	120.58	47.42	64.00	55.29
2,256.89	0.6269	169.4	23.67	5.91044	0.016448	1,354.60	1.00169	169.40	90.00	56.28	155.14	121.13	48.27	65.14	56.28
2,440.89	0.6780	170.7	23.74	6.08976	0.016455	1,353.99	1.00181	170.70	90.00	57.20	156.20	121.64	49.06	66.20	57.20
2,622.26	0.7284	171.9	23.82	6.25932	0.016462	1,353.42	1.00192	171.90	90.00	58.05	157.18	122.11	49.79	67.18	58.05
2,808.76	0.7802	173.0	23.88	6.41823	0.016468	1,352.89	1.00202	173.00	90.00	58.83	158.08	122.54	50.46	68.08	58.83
2,995.14	0.8320	174.0	23.99	6.56563	0.016474	1,352.41	1.00212	174.00	90.00	59.54	158.90	122.93	51.07	68.90	59.54
3,177.39	0.8826	175.0	24.06	6.71586	0.016480	1,351.93	1.00222	175.00	90.00	60.24	159.71	123.32	51.68	69.71	60.24
3,365.26	0.9348	175.9	24.17	6.85352	0.016485	1,351.50	1.00231	175.90	90.00	60.88	160.45	123.68	52.22	70.45	60.88
3,551.76	0.9866	176.8	24.22	6.99355	0.016491	1,351.06	1.00240	176.80	90.00	61.52	161.18	124.03	52.77	71.18	61.52
3,736.64	1.0380	177.6	24.32	7.12002	0.016496	1,350.67	1.00248	177.60	90.00	62.08	161.84	124.34	53.26	71.84	62.08
3,921.76	1.0894	178.4	24.41	7.24841	0.016500	1,350.28	1.00256	178.40	90.00	62.65	162.49	124.66	53.74	72.49	62.65
4,106.51	1.1407	179.1	24.47	7.36234	0.016505	1,349.93	1.00263	179.10	90.00	63.15	163.06	124.93	54.17	73.06	63.15
4,290.89	1.1919	179.8	24.53	7.47777	0.016509	1,349.59	1.00270	179.80	90.00	63.64	163.63	125.20	54.60	73.63	63.64
4,473.89	1.2427	180.5	24.61	7.59471	0.016513	1,349.24	1.00278	180.50	90.00	64.14	164.20	125.48	55.02	74.20	64.14
4,656.26	1.2934	181.1	24.69	7.69617	0.016517	1,348.95	1.00284	181.10	90.00	64.56	164.69	125.71	55.39	74.69	64.56
4,836.14	1.3434	181.7	24.78	7.79875	0.016520	1,348.65	1.00291	181.70	90.00	64.98	165.18	125.95	55.75	75.18	64.98
5,022.89	1.3952	182.2	24.85	7.88511	0.016523	1,348.40	1.00296	182.20	90.00	65.34	165.59	126.14	56.06	75.59	65.34

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Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
0.00	0.0000	95.00	3.5549	15,902.80	11.1410	0.0000	0.7540
49.26	0.0137	136.30	2.6252	15,902.68	11.9705	-0.1003	32.8140
70.39	0.0196	139.00	2.8157	15,902.62	12.0247	0.1444	32.7840
86.08	0.0239	139.40	2.8449	15,902.58	12.0327	0.1816	32.5540
106.89	0.0297	139.80	2.8744	15,902.53	12.0407	0.2191	32.2440
131.33	0.0365	140.30	2.9115	15,902.47	12.0507	0.2662	31.8340
156.20	0.0434	140.80	2.9491	15,902.41	12.0607	0.3138	31.2340
181.33	0.0504	141.20	2.9795	15,902.35	12.0687	0.3522	30.4940
205.70	0.0571	141.40	2.9948	15,902.29	12.0727	0.3715	29.7940
230.20	0.0639	141.50	3.0025	15,902.23	12.0746	0.3811	28.9940
255.45	0.0710	141.60	3.0101	15,902.17	12.0766	0.3907	28.3140
280.70	0.0780	141.60	3.0101	15,902.11	12.0765	0.3907	27.4840
305.95	0.0850	141.70	3.0179	15,902.05	12.0785	0.4004	26.8440
331.08	0.0920	141.70	3.0179	15,901.98	12.0784	0.4003	26.0740
356.58	0.0990	141.70	3.0179	15,901.92	12.0784	0.4003	25.4040
381.58	0.1060	141.80	3.0256	15,901.86	12.0804	0.4099	24.7140
406.83	0.1130	141.80	3.0256	15,901.80	12.0803	0.4099	24.0140
431.83	0.1200	141.80	3.0256	15,901.74	12.0803	0.4098	23.4440
451.33	0.1254	141.90	3.0333	15,901.69	12.0822	0.4196	17.6040
472.89	0.1314	142.10	3.0488	15,901.64	12.0862	0.4391	12.7240
495.83	0.1377	142.80	3.1037	15,901.58	12.1002	0.5079	10.6940
520.83	0.1447	143.90	3.1916	15,901.52	12.1223	0.6179	9.7340
545.08	0.1514	145.20	3.2982	15,901.46	12.1483	0.7505	9.2640
569.76	0.1583	146.50	3.4078	15,901.40	12.1744	0.8862	8.9740
594.45	0.1651	137.47	2.7064	15,901.34	11.9930	0.0034	8.7940
666.26	0.1851	139.76	2.8716	15,901.16	12.0389	0.2145	8.7140
805.26	0.2237	142.46	3.0773	15,900.82	12.0929	0.4742	8.7840
976.39	0.2712	144.59	3.2480	15,900.40	12.1353	0.6873	8.8040
1,155.14	0.3209	146.56	3.4125	15,899.96	12.1744	0.8910	8.8140
1,336.01	0.3711	148.27	3.5623	15,899.52	12.2086	1.0748	8.8140
1,520.39	0.4223	149.91	3.7100	15,899.07	12.2411	1.2551	8.8340
1,701.51	0.4726	151.38	3.8473	15,898.62	12.2703	1.4216	8.8540
1,888.14	0.5245	152.77	3.9809	15,898.16	12.2978	1.5827	8.8840
2,074.89	0.5764	154.00	4.1020	15,897.71	12.3221	1.7281	8.9140
2,256.89	0.6269	155.14	4.2178	15,897.26	12.3447	1.8665	8.9740
2,440.89	0.6780	156.20	4.3278	15,896.81	12.3657	1.9975	9.0440
2,622.26	0.7284	157.18	4.4315	15,896.36	12.3850	2.1205	9.1240
2,808.76	0.7802	158.08	4.5283	15,895.91	12.4027	2.2350	9.1840
2,995.14	0.8320	158.90	4.6179	15,895.45	12.4187	2.3407	9.2940
3,177.39	0.8826	159.71	4.7090	15,895.00	12.4348	2.4478	9.3640
3,365.26	0.9348	160.45	4.7922	15,894.54	12.4492	2.5454	9.4740
3,551.76	0.9866	161.18	4.8767	15,894.08	12.4636	2.6443	9.5240
3,736.64	1.0380	161.84	4.9528	15,893.63	12.4763	2.7332	9.6240
3,921.76	1.0894	162.49	5.0300	15,893.18	12.4891	2.8230	9.7140
4,106.51	1.1407	163.06	5.0983	15,892.72	12.5002	2.9025	9.7740
4,290.89	1.1919	163.63	5.1674	15,892.27	12.5113	2.9827	9.8340
4,473.89	1.2427	164.20	5.2372	15,891.82	12.5224	3.0636	9.9140
4,656.26	1.2934	164.69	5.2978	15,891.37	12.5319	3.1336	9.9940
4,836.14	1.3434	165.18	5.3589	15,890.93	12.5413	3.2042	10.0840
5,022.89	1.3952	165.59	5.4102	15,890.47	12.5492	3.2634	10.1540

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
5,205.89	1.4461	182.8	24.84	7.98980	0.016527	1,348.10	1.00303	182.80	90.00	65.76	166.08	126.38	56.42	76.08	65.78
5,392.51	1.4979	183.3	25.01	8.07793	0.016530	1,347.85	1.00308	183.30	90.00	66.12	166.49	126.57	56.73	76.49	66.12
5,571.01	1.5475	183.8	25.09	8.16687	0.016533	1,347.60	1.00314	183.80	90.00	66.47	166.89	126.77	57.03	76.89	66.47
5,751.64	1.5977	184.3	25.16	8.25663	0.016536	1,347.35	1.00319	184.30	90.00	66.82	167.30	126.96	57.34	77.30	66.82
5,931.76	1.6477	184.8	25.23	8.34722	0.016539	1,347.10	1.00325	184.80	90.00	67.18	167.71	127.16	57.64	77.71	67.18
6,114.76	1.6985	185.2	25.29	8.42028	0.016542	1,346.89	1.00329	185.20	90.00	67.46	168.04	127.32	57.88	78.04	67.46
6,297.76	1.7494	185.6	25.36	8.49388	0.016544	1,346.69	1.00334	185.60	90.00	67.74	168.36	127.47	58.13	78.36	67.74
6,475.14	1.7986	186.1	25.43	8.58663	0.016547	1,346.44	1.00339	186.10	90.00	68.10	168.77	127.67	58.43	78.77	68.10
6,652.14	1.8478	186.5	25.49	8.66145	0.016550	1,346.24	1.00344	186.50	90.00	68.38	169.10	127.82	58.68	79.10	68.38
6,830.89	1.8975	186.8	25.56	8.71791	0.016552	1,346.08	1.00347	186.80	90.00	68.59	169.34	127.94	58.86	79.34	68.59
7,001.51	1.9449	187.2	25.63	8.79368	0.016554	1,345.88	1.00352	187.20	90.00	68.87	169.67	128.10	59.10	79.67	68.87
7,177.89	1.9939	187.6	25.69	8.87000	0.016557	1,345.68	1.00357	187.60	90.00	69.16	169.99	128.25	59.35	79.99	69.16
7,356.76	2.0435	187.9	25.75	8.92760	0.016559	1,345.52	1.00360	187.90	90.00	69.37	170.24	128.37	59.53	80.24	69.37
7,536.76	2.0935	188.3	25.81	9.00489	0.016561	1,345.32	1.00365	188.30	90.00	69.65	170.56	128.53	59.77	80.56	69.65
7,713.51	2.1426	188.6	25.87	9.06322	0.016563	1,345.17	1.00368	188.60	90.00	69.86	170.81	128.65	59.95	80.81	69.86
7,890.51	2.1918	188.9	25.93	9.12186	0.016565	1,345.01	1.00372	188.90	90.00	70.08	171.05	128.76	60.14	81.05	70.08
8,069.14	2.2414	189.3	25.98	9.20055	0.016567	1,344.81	1.00377	189.30	90.00	70.36	171.38	128.92	60.38	81.38	70.36
8,241.14	2.2892	189.6	26.04	9.25994	0.016569	1,344.65	1.00380	189.60	90.00	70.57	171.62	129.04	60.56	81.62	70.57
8,414.39	2.3373	189.9	26.09	9.31965	0.016571	1,344.50	1.00384	189.90	90.00	70.78	171.87	129.15	60.75	81.87	70.78
8,592.64	2.3868	190.2	26.18	9.37968	0.016573	1,344.35	1.00387	190.20	90.00	71.00	172.11	129.27	60.93	82.11	71.00
8,761.76	2.4338	190.4	26.23	9.41988	0.016574	1,344.24	1.00390	190.40	90.00	71.14	172.28	129.35	61.05	82.28	71.14
8,874.26	2.4651	190.6	26.27	9.46022	0.016576	1,344.14	1.00392	190.60	90.00	71.28	172.44	129.43	61.17	82.44	71.28
8,986.76	2.4963	190.8	26.30	9.50071	0.016577	1,344.04	1.00395	190.80	90.00	71.42	172.60	129.51	61.29	82.60	71.42
9,099.26	2.5276	191.0	26.34	9.54134	0.016578	1,343.93	1.00397	191.00	90.00	71.56	172.77	129.58	61.42	82.77	71.56
9,211.76	2.5588	191.2	26.37	9.58211	0.016580	1,343.83	1.00400	191.20	90.00	71.70	172.93	129.66	61.54	82.93	71.70
9,324.26	2.5901	191.3	26.41	9.60256	0.016580	1,343.78	1.00401	191.30	90.00	71.77	173.01	129.70	61.60	83.01	71.77
9,436.76	2.6213	191.5	26.45	9.64355	0.016581	1,343.67	1.00403	191.50	90.00	71.91	173.17	129.78	61.72	83.17	71.91
9,549.26	2.6526	191.7	26.48	9.68469	0.016583	1,343.57	1.00406	191.70	90.00	72.06	173.34	129.86	61.84	83.34	72.06
9,561.76	2.6838	191.9	26.52	9.72598	0.016584	1,343.47	1.00408	191.90	90.00	72.20	173.50	129.94	61.96	83.50	72.20
9,774.26	2.7151	192.0	26.56	9.74667	0.016585	1,343.42	1.00409	192.00	90.00	72.27	173.58	129.97	62.03	83.58	72.27
9,886.76	2.7463	192.2	26.59	9.78818	0.016586	1,343.31	1.00412	192.20	90.00	72.41	173.74	130.05	62.15	83.74	72.41
9,999.26	2.7776	192.4	26.63	9.82984	0.016587	1,343.21	1.00414	192.40	90.00	72.55	173.91	130.13	62.27	83.91	72.55
10,111.77	2.8088	192.6	26.67	9.87164	0.016589	1,343.10	1.00417	192.60	90.00	72.69	174.07	130.21	62.39	84.07	72.69
10,224.27	2.8401	192.7	26.70	9.89260	0.016589	1,343.05	1.00418	192.70	90.00	72.76	174.15	130.25	62.45	84.15	72.76
10,342.89	2.8730	192.9	26.75	9.93462	0.016590	1,342.95	1.00420	192.90	90.00	72.90	174.31	130.33	62.57	84.31	72.90
10,455.39	2.9043	193.1	26.79	9.97679	0.016592	1,342.84	1.00423	193.10	90.00	73.05	174.48	130.41	62.69	84.48	73.05
10,567.89	2.9355	193.2	26.82	9.99794	0.016592	1,342.79	1.00424	193.20	90.00	73.12	174.56	130.44	62.76	84.56	73.12
10,680.39	2.9668	193.4	26.85	10.04033	0.016594	1,342.69	1.00427	193.40	90.00	73.26	174.72	130.52	62.88	84.72	73.26
10,792.89	2.9980	193.6	26.89	10.08288	0.016595	1,342.58	1.00429	193.60	90.00	73.40	174.88	130.60	63.00	84.88	73.40
10,905.39	3.0293	193.7	26.92	10.10421	0.016596	1,342.53	1.00430	193.70	90.00	73.47	174.97	130.64	63.06	84.97	73.47
11,017.89	3.0605	193.9	26.95	10.14699	0.016597	1,342.43	1.00433	193.90	90.00	73.61	175.13	130.72	63.18	85.13	73.61
11,142.64	3.0952	194.1	27.01	10.18991	0.016598	1,342.32	1.00436	194.10	90.00	73.75	175.29	130.80	63.30	85.29	73.75
11,262.39	3.1284	194.2	27.04	10.21143	0.016599	1,342.27	1.00437	194.20	90.00	73.82	175.37	130.84	63.36	85.37	73.82
11,377.77	3.1605	194.4	27.07	10.25458	0.016600	1,342.17	1.00439	194.40	90.00	73.96	175.54	130.91	63.49	85.54	73.96
11,490.14	3.1917	194.5	27.11	10.27621	0.016601	1,342.11	1.00441	194.50	90.00	74.04	175.62	130.95	63.55	85.62	74.04
11,609.77	3.2249	194.7	27.16	10.31959	0.016602	1,342.01	1.00443	194.70	90.00	74.18	175.78	131.03	63.67	85.78	74.18
11,762.77	3.2674	194.9	27.19	10.36312	0.016603	1,341.90	1.00446	194.90	90.00	74.32	175.94	131.11	63.79	85.94	74.32
11,889.14	3.3025	195.1	27.22	10.40681	0.016605	1,341.80	1.00448	195.10	90.00	74.46	176.11	131.19	63.91	86.11	74.46
12,042.02	3.3450	195.3	27.27	10.45065	0.016606	1,341.69	1.00451	195.30	90.00	74.60	176.27	131.27	64.03	86.27	74.60
12,195.52	3.3876	195.5	27.32	10.49464	0.016607	1,341.59	1.00453	195.50	90.00	74.74	176.43	131.34	64.16	86.43	74.74

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
5,205.89	1.4461	166.08	5.4724	15,890.03	12.5586	3.3351	10.2440
5,392.51	1.4979	166.49	5.5247	15,889.57	12.5685	3.3952	10.3140
5,571.01	1.5475	166.89	5.5774	15,889.13	12.5743	3.4557	10.3940
5,751.64	1.5977	167.30	5.6305	15,888.69	12.5821	3.5166	10.4840
5,931.76	1.6477	167.71	5.6840	15,888.25	12.5900	3.5780	10.5340
6,114.76	1.6985	168.04	5.7272	15,887.80	12.5962	3.6273	10.5940
6,297.76	1.7494	168.36	5.7706	15,887.35	12.6024	3.6769	10.6640
6,475.14	1.7986	168.77	5.8252	15,886.91	12.6102	3.7394	10.7340
6,652.14	1.8478	169.10	5.8693	15,886.48	12.6164	3.7897	10.7940
6,830.89	1.8975	169.34	5.9025	15,886.04	12.6209	3.8274	10.8640
7,001.51	1.9449	169.67	5.9470	15,885.62	12.6272	3.8781	10.9340
7,177.89	1.9939	169.99	5.9918	15,885.19	12.6334	3.9291	10.9940
7,356.76	2.0435	170.24	6.0256	15,884.75	12.6379	3.9675	11.0540
7,536.76	2.0935	170.56	6.0708	15,884.31	12.6441	4.0190	11.1140
7,713.51	2.1426	170.81	6.1050	15,883.87	12.6487	4.0577	11.1740
7,890.51	2.1918	171.05	6.1393	15,883.44	12.6532	4.0966	11.2340
8,069.14	2.2414	171.38	6.1853	15,883.00	12.6594	4.1488	11.2840
8,241.14	2.2892	171.62	6.2200	15,882.58	12.6640	4.1880	11.3440
8,414.39	2.3373	171.87	6.2549	15,882.16	12.6686	4.2274	11.3940
8,592.64	2.3868	172.11	6.2899	15,881.72	12.6731	4.2670	11.4840
8,761.76	2.4338	172.28	6.3133	15,881.30	12.6761	4.2934	11.5340
8,874.26	2.4651	172.44	6.3368	15,881.03	12.6791	4.3199	11.5740
8,988.76	2.4963	172.60	6.3604	15,880.75	12.6822	4.3466	11.6040
9,099.26	2.5276	172.77	6.3841	15,880.48	12.6852	4.3733	11.6440
9,211.76	2.5588	172.93	6.4078	15,880.20	12.6883	4.4001	11.6740
9,324.26	2.5901	173.01	6.4197	15,879.92	12.6897	4.4134	11.7140
9,436.76	2.6213	173.17	6.4435	15,879.65	12.6927	4.4403	11.7540
9,549.26	2.6526	173.34	6.4674	15,879.37	12.6958	4.4672	11.7840
9,661.76	2.6838	173.50	6.4914	15,879.10	12.6988	4.4942	11.8240
9,774.26	2.7151	173.58	6.5034	15,878.82	12.7002	4.5077	11.8540
9,886.76	2.7463	173.74	6.5275	15,878.54	12.7033	4.5348	11.8940
9,999.26	2.7776	173.91	6.5517	15,878.27	12.7063	4.5620	11.9340
10,111.77	2.8088	174.07	6.5760	15,877.99	12.7094	4.5893	11.9740
10,224.27	2.8401	174.15	6.5881	15,877.72	12.7108	4.6029	12.0040
10,342.89	2.8730	174.31	6.6125	15,877.42	12.7138	4.6303	12.0540
10,455.39	2.9043	174.48	6.6369	15,877.15	12.7169	4.6578	12.0940
10,567.89	2.9355	174.56	6.6491	15,876.87	12.7183	4.6714	12.1240
10,680.39	2.9668	174.72	6.6737	15,876.60	12.7213	4.6990	12.1540
10,792.89	2.9980	174.88	6.6983	15,876.32	12.7244	4.7267	12.1940
10,905.39	3.0293	174.97	6.7107	15,876.04	12.7258	4.7405	12.2240
11,017.89	3.0605	175.13	6.7354	15,875.77	12.7288	4.7682	12.2540
11,142.64	3.0952	175.29	6.7602	15,875.46	12.7319	4.7961	12.3140
11,262.39	3.1284	175.37	6.7726	15,875.17	12.7333	4.8099	12.3440
11,377.77	3.1605	175.54	6.7976	15,874.89	12.7363	4.8379	12.3740
11,490.14	3.1917	175.62	6.8101	15,874.61	12.7377	4.8518	12.4140
11,609.77	3.2249	175.78	6.8351	15,874.32	12.7407	4.8799	12.4640
11,762.77	3.2674	175.94	6.8602	15,873.94	12.7437	4.9079	12.4940
11,889.14	3.3025	176.11	6.8854	15,873.63	12.7467	4.9362	12.5240
12,042.02	3.3450	176.27	6.9107	15,873.26	12.7497	4.9644	12.5740
12,195.52	3.3876	176.43	6.9360	15,872.88	12.7527	4.9927	12.6240

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
12,350.89	3.4308	195.7	27.35	10.53878	0.016609	1,341.48	1.00456	195.70	90.00	74.88	176.60	131.42	64.28	86.60	74.88
12,505.14	3.4737	195.9	27.40	10.58308	0.016610	1,341.38	1.00459	195.90	90.00	75.02	176.76	131.50	64.40	86.76	75.02
12,660.39	3.5168	196.1	27.44	10.62754	0.016611	1,341.27	1.00461	196.10	90.00	75.17	176.92	131.58	64.52	86.92	75.17
12,813.39	3.5593	196.2	27.49	10.64983	0.016612	1,341.22	1.00462	196.20	90.00	75.24	177.00	131.62	64.58	87.00	75.24
12,970.77	3.6030	196.4	27.53	10.69452	0.016613	1,341.11	1.00465	196.40	90.00	75.38	177.17	131.70	64.70	87.17	75.38
13,117.27	3.6437	196.6	27.56	10.73936	0.016614	1,341.01	1.00468	196.60	90.00	75.52	177.33	131.77	64.83	87.33	75.52
13,275.39	3.6876	196.8	27.61	10.78436	0.016616	1,340.90	1.00470	196.80	90.00	75.66	177.49	131.85	64.95	87.49	75.66
13,438.02	3.7328	197.0	27.65	10.82952	0.016617	1,340.80	1.00473	197.00	90.00	75.80	177.65	131.93	65.07	87.65	75.80
13,593.52	3.7760	197.2	27.69	10.87484	0.016618	1,340.69	1.00476	197.20	90.00	75.94	177.82	132.01	65.19	87.82	75.94
13,748.14	3.8189	197.3	27.72	10.89756	0.016619	1,340.64	1.00477	197.30	90.00	76.01	177.90	132.05	65.25	87.90	76.01
13,907.64	3.8632	197.5	27.77	10.94311	0.016620	1,340.53	1.00479	197.50	90.00	76.16	178.06	132.13	65.37	88.06	76.16
14,071.14	3.9087	197.7	27.80	10.98882	0.016622	1,340.43	1.00482	197.70	90.00	76.30	178.22	132.20	65.50	88.22	76.30
14,222.27	3.9506	197.9	27.84	11.03469	0.016623	1,340.32	1.00485	197.90	90.00	76.44	178.39	132.28	65.62	88.39	76.44
14,383.64	3.9955	198.0	27.90	11.05769	0.016624	1,340.27	1.00486	198.00	90.00	76.51	178.47	132.32	65.68	88.47	76.51
14,549.89	4.0416	198.2	27.93	11.10380	0.016625	1,340.16	1.00489	198.20	90.00	76.65	178.63	132.40	65.80	88.63	76.65
14,706.39	4.0851	198.4	27.96	11.15007	0.016626	1,340.06	1.00491	198.40	90.00	76.79	178.79	132.48	65.92	88.79	76.79
14,866.02	4.1294	198.5	27.99	11.17326	0.016627	1,340.00	1.00493	198.50	90.00	76.86	178.88	132.52	65.98	88.88	76.86
15,027.77	4.1744	198.7	28.05	11.21977	0.016628	1,339.90	1.00495	198.70	90.00	77.00	179.04	132.59	66.11	89.04	77.00
15,188.14	4.2189	198.8	28.08	11.24309	0.016629	1,339.84	1.00497	198.80	90.00	77.07	179.12	132.63	66.17	89.12	77.07
15,343.02	4.2619	199.0	28.11	11.28984	0.016630	1,339.74	1.00499	199.00	90.00	77.22	179.28	132.71	66.29	89.28	77.22
15,495.27	4.3042	199.1	28.14	11.31328	0.016631	1,339.68	1.00501	199.10	90.00	77.29	179.36	132.75	66.35	89.36	77.29
15,660.27	4.3501	199.3	28.17	11.36027	0.016632	1,339.58	1.00504	199.30	90.00	77.43	179.53	132.83	66.47	89.53	77.43
15,819.64	4.3943	199.4	28.20	11.38383	0.016633	1,339.52	1.00505	199.40	90.00	77.50	179.61	132.87	66.53	89.61	77.50
15,979.02	4.4386	199.6	28.23	11.43107	0.016634	1,339.42	1.00508	199.60	90.00	77.64	179.77	132.95	66.65	89.77	77.64
16,132.39	4.4812	199.7	28.27	11.45475	0.016635	1,339.36	1.00509	199.70	90.00	77.71	179.85	132.99	66.71	89.85	77.71
16,296.27	4.5267	199.9	28.30	11.50223	0.016636	1,339.26	1.00512	199.90	90.00	77.85	180.02	133.06	66.84	90.02	77.85
16,447.77	4.5685	200.0	28.32	11.52604	0.016637	1,339.20	1.00513	200.00	90.00	77.92	180.10	133.10	66.90	90.10	77.92
16,604.02	4.6122	200.1	28.35	11.54988	0.016637	1,339.15	1.00514	200.10	90.00	77.99	180.18	133.14	66.96	90.18	77.99
16,766.14	4.6573	200.2	28.38	11.57376	0.016638	1,339.10	1.00516	200.20	90.00	78.06	180.26	133.18	67.02	90.26	78.06
16,922.27	4.7006	200.4	28.41	11.62166	0.016639	1,338.99	1.00518	200.40	90.00	78.21	180.42	133.26	67.14	90.42	78.21
17,086.02	4.7461	200.5	28.43	11.64567	0.016640	1,338.94	1.00520	200.50	90.00	78.28	180.50	133.30	67.20	90.50	78.28
17,248.02	4.7911	200.6	28.49	11.66972	0.016641	1,338.88	1.00521	200.60	90.00	78.35	180.59	133.34	67.26	90.59	78.35
17,414.02	4.8372	200.8	28.52	11.71794	0.016642	1,338.78	1.00524	200.80	90.00	78.49	180.75	133.42	67.38	90.75	78.49
17,568.27	4.8801	200.9	28.53	11.74211	0.016643	1,338.72	1.00525	200.90	90.00	78.56	180.83	133.45	67.45	90.83	78.56
17,730.02	4.9250	201.0	28.56	11.76633	0.016643	1,338.67	1.00527	201.00	90.00	78.63	180.91	133.49	67.51	90.91	78.63
17,890.02	4.9694	201.1	28.57	11.79058	0.016644	1,338.62	1.00528	201.10	90.00	78.70	180.99	133.53	67.57	90.99	78.70
18,045.52	5.0126	201.2	28.59	11.81488	0.016645	1,338.56	1.00530	201.20	90.00	78.77	181.07	133.57	67.63	91.07	78.77
18,204.14	5.0567	201.3	28.62	11.83922	0.016645	1,338.51	1.00531	201.30	90.00	78.84	181.16	133.61	67.69	91.16	78.84
18,363.52	5.1010	201.4	28.65	11.86360	0.016646	1,338.45	1.00532	201.40	90.00	78.91	181.24	133.65	67.75	91.24	78.91
18,512.02	5.1422	201.5	28.67	11.88803	0.016647	1,338.40	1.00534	201.50	90.00	78.98	181.32	133.69	67.81	91.32	78.98
18,671.64	5.1866	201.6	28.68	11.91249	0.016647	1,338.35	1.00535	201.60	90.00	79.05	181.40	133.73	67.87	91.40	79.05
18,825.02	5.2292	201.7	28.70	11.93700	0.016648	1,338.29	1.00536	201.70	90.00	79.12	181.48	133.77	67.93	91.48	79.12
18,984.27	5.2734	201.8	28.72	11.96155	0.016649	1,338.24	1.00538	201.80	90.00	79.19	181.56	133.81	67.99	91.56	79.19
19,141.39	5.3171	201.9	28.75	11.98614	0.016649	1,338.19	1.00539	201.90	90.00	79.27	181.64	133.85	68.05	91.64	79.27
19,301.77	5.3616	202.0	28.77	12.01077	0.016650	1,338.13	1.00541	202.00	90.00	79.34	181.73	133.88	68.12	91.73	79.34
19,458.77	5.4052	202.1	28.78	12.03545	0.016651	1,338.08	1.00542	202.10	90.00	79.41	181.81	133.92	68.18	91.81	79.41
19,613.89	5.4483	202.2	28.80	12.06016	0.016651	1,338.02	1.00543	202.20	90.00	79.48	181.89	133.96	68.24	91.89	79.48
19,766.14	5.4906	202.3	28.82	12.08492	0.016652	1,337.97	1.00545	202.30	90.00	79.55	181.97	134.00	68.30	91.97	79.55
19,920.39	5.5334	202.4	28.84	12.10973	0.016653	1,337.92	1.00546	202.40	90.00	79.62	182.05	134.04	68.36	92.05	79.62
20,079.27	5.5776	202.4	28.86	12.10973	0.016653	1,337.92	1.00546	202.40	90.00	79.62	182.05	134.04	68.36	92.05	79.62

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
12,356.39	3.4308	176.60	6.9615	15,872.50	12.7556	5.0211	12.6540
12,505.14	3.4737	176.76	6.9870	15,872.12	12.7736	5.0496	12.7040
12,660.39	3.5168	176.92	7.0126	15,871.74	12.7615	5.0781	12.7440
12,813.39	3.5593	177.00	7.0254	15,871.36	12.7629	5.0923	12.7940
12,970.77	3.60[illegible]	177.17	7.0511	15,870.98	12.7658	5.1209	12.8340
13,117.27	3.6437	177.33	7.0768	15,870.62	12.7688	5.1497	12.8640
13,275.39	3.68[illegible]	177.49	7.1027	15,870.23	12.7718	5.1785	12.9140
13,438.02	3.7328	177.65	7.1286	15,869.83	12.7747	5.2074	12.9540
13,593.52	3.7760	177.82	7.1547	15,869.45	12.7777	5.2363	12.9940
13,74[illegible].14	3.8189	177.90	7.1677	15,869.07	12.7790	5.2507	13.0240
13,907.64	3.8632	178.06	7.1938	15,868.68	12.7819	5.2798	13.0740
14,071.14	3.9087	178.22	7.2200	15,868.28	12.7849	5.3089	13.1040
14,222.27	3.9506	178.39	7.2463	15,867.91	12.7878	5.3382	13.1440
14,383.64	3.9955	178.47	7.2595	15,867.51	12.7892	5.3527	13.2040
14,549.89	4.0416	178.63	7.2859	15,867.10	12.7921	5.3820	13.2340
14,706.39	4.0851	178.79	7.3124	15,866.72	12.7950	5.4115	13.2640
14,866.02	4.1294	178.88	7.3257	15,866.33	12.7964	5.4261	13.2940
15,027.77	4.17[illegible]	179.04	7.3523	15,865.93	12.7993	5.4556	13.3540
15,188.14	[illegible]	179.12	7.3656	15,865.54	12.8006	5.4703	13.3840
15,343.02	4.[illegible]619	179.28	7.3924	15,865.16	12.8036	5.5000	13.4140
15,495.27	4.3042	179.36	7.4058	15,864.78	12.8049	5.5147	13.4440
15,660.27	4.3501	179.53	7.4326	15,864.38	12.8078	5.5445	13.4740
15,819.64	4.3943	179.61	7.4461	15,863.99	12.8092	5.5592	13.5040
15,979.02	4.4386	179.77	7.4730	15,863.60	12.8121	5.5892	13.5340
16,132.39	4.4812	179.85	7.4866	15,863.22	12.8134	5.6040	13.5740
16,296.27	4.5267	180.02	7.5137	15,862.82	12.8164	5.6340	13.6040
16,447.77	4.5688	180.10	7.5272	15,862.45	12.8177	5.6490	13.6240
16,604.02	4.6122	180.18	7.5408	15,862.07	12.8190	5.6639	13.6540
16,766.14	4.6573	180.26	7.5545	15,861.67	12.8203	5.6788	13.6840
16,922.27	4.7006	180.42	7.5818	15,861.29	12.8233	5.7091	13.7140
17,086.02	4.7461	180.50	7.5954	15,860.88	12.8246	5.7240	13.7340
17,248.02	4.7911	180.59	7.6091	15,860.49	12.8259	5.7391	13.7940
17,414.02	4.8372	180.75	7.6366	15,860.08	12.8288	5.7695	13.8240
17,568.27	4.8801	180.83	7.6504	15,859.70	12.8302	5.7845	13.8340
17,730.02	4.9250	180.91	7.6642	15,859.30	12.8315	5.7996	13.8640
17,890.02	4.9694	180.99	7.6780	15,858.91	12.8328	5.8148	13.8740
18,045.52	5.0126	181.07	7.6918	15,858.53	12.8341	5.8299	13.8940
18,204.14	5.0567	181.16	7.7056	15,858.14	12.8354	5.8451	13.9240
18,363.52	5.1010	181.24	7.7195	15,857.75	12.8367	5.8603	13.9540
18,512.02	5.1422	181.32	7.7334	15,857.39	12.8381	5.8755	13.9740
18,671.64	5.1866	181	7.7473	15,856.99	12.8394	5.8907	13.9840
18,825.02	5.2292	181.4[illegible]	7.7612	15,856.62	12.8407	5.9060	14.0040
18,984.27	5.2734	181.56	7.7752	15,856.23	12.8420	5.9212	14.0240
19,141.39	5.3171	181.64	7.7892	15,855.84	12.8433	5.9365	14.0540
19,301.77	5.3616	181.73	7.8031	15,855.45	12.8447	5.9518	14.0740
19,458.77	5.4052	181.81	7.8172	15,855.06	12.8460	5.9671	14.0840
19,613.89	5.4483	181.89	7.8312	15,854.68	12.8473	5.9825	14.1040
19,766.14	5.4906	181.97	7.8452	15,854.31	12.8486	5.9979	14.1240
19,920.39	5.5334	182.05	7.8593	15,853.93	12.8499	6.0133	14.1440
20,079.27	5.5776	182.05	7.8593	15,853.54	12.8496	6.0130	14.1640

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
20,233.77	5.6205	202.5	28.87	12.13457	0.016654	1,337.86	1.00548	202.50	90.00	79.69	182.13	134.06	68.42	92.13	79.69
20,386.27	5.6629	202.6	28.90	12.15946	0.016654	1,337.81	1.00549	202.60	90.00	79.76	182.21	134.12	68.48	92.21	79.76
20,537.39	5.7048	202.7	28.92	12.18438	0.016655	1,337.75	1.00550	202.70	90.00	79.83	182.30	134.16	68.54	92.30	79.83
20,690.39	5.7473	202.7	28.93	12.18438	0.016655	1,337.75	1.00550	202.70	90.00	79.83	182.30	134.16	68.54	92.30	79.83
20,845.64	5.7905	202.8	28.94	12.20935	0.016656	1,337.70	1.00552	202.80	90.00	79.90	182.38	134.20	68.60	92.38	79.90
20,998.39	5.8329	202.9	28.96	12.23437	0.016656	1,337.65	1.00553	202.90	90.00	79.97	182.46	134.24	68.66	92.46	79.97
21,152.64	5.8757	203.0	28.98	12.25942	0.016657	1,337.59	1.00555	203.00	90.00	80.04	182.54	134.28	68.72	92.54	80.04
21,304.14	5.9178	203.0	28.99	12.25942	0.016657	1,337.59	1.00555	203.00	90.00	80.04	182.54	134.28	68.72	92.54	80.04
21,461.52	5.9615	203.1	29.02	12.28452	0.016658	1,337.54	1.00556	203.10	90.00	80.11	182.62	134.31	68.79	92.62	80.11
21,618.14	6.0050	203.2	29.04	12.30966	0.016658	1,337.48	1.00558	203.20	90.00	80.18	182.70	134.35	68.85	92.70	80.18
21,780.64	6.0502	203.3	29.05	12.33485	0.016659	1,337.43	1.00559	203.30	90.00	80.25	182.78	134.39	68.91	92.78	80.25
21,934.89	6.0930	203.3	29.07	12.33485	0.016659	1,337.43	1.00559	203.30	90.00	80.25	182.78	134.39	68.91	92.78	80.25
22,090.52	6.1363	203.4	29.08	12.36008	0.016660	1,337.38	1.00560	203.40	90.00	80.33	182.87	134.43	68.97	92.87	80.33
22,239.89	6.1777	203.4	29.09	12.36008	0.016660	1,337.38	1.00560	203.40	90.00	80.33	182.87	134.43	68.97	92.87	80.33
22,391.27	6.2198	203.5	29.10	12.38535	0.016660	1,337.32	1.00562	203.50	90.00	80.40	182.95	134.47	69.03	92.95	80.40
22,545.14	6.2626	203.6	29.13	12.41066	0.016661	1,337.27	1.00563	203.60	90.00	80.47	183.03	134.51	69.09	93.03	80.47
22,700.14	6.3056	203.6	29.15	12.41066	0.016661	1,337.27	1.00563	203.60	90.00	80.47	183.03	134.51	69.09	93.03	80.47
22,858.84	6.3491	203.7	29.16	12.43601	0.016662	1,337.21	1.00565	203.70	90.00	80.54	183.11	134.55	69.15	93.11	80.54
23,015.77	6.3933	203.8	29.16	12.46141	0.016662	1,337.16	1.00566	203.80	90.00	80.61	183.19	134.59	69.21	93.19	80.61
23,168.39	6.4357	203.8	29.18	12.46141	0.016662	1,337.16	1.00566	203.80	90.00	80.61	183.19	134.59	69.21	93.19	80.61
23,322.64	6.4785	203.9	29.19	12.48685	0.016663	1,337.11	1.00567	203.90	90.00	80.68	183.27	134.63	69.27	93.27	80.68
23,478.52	6.5213	203.9	29.21	12.48685	0.016663	1,337.11	1.00567	203.90	90.00	80.68	183.27	134.63	69.27	93.27	80.68
23,631.77	6.5644	204.0	29.23	12.51234	0.016664	1,337.05	1.00569	204.00	90.00	80.75	183.35	134.67	69.33	93.35	80.75
23,787.39	6.6078	204.0	29.25	12.51234	0.016664	1,337.05	1.00569	204.00	90.00	80.75	183.35	134.67	69.33	93.35	80.75
23,938.89	6.6497	204.1	29.25	12.53787	0.016664	1,337.00	1.00570	204.10	90.00	80.82	183.43	134.71	69.39	93.43	80.82
24,094.14	6.6928	204.1	29.26	12.53787	0.016664	1,337.00	1.00570	204.10	90.00	80.82	183.43	134.71	69.39	93.43	80.82
24,246.89	6.7352	204.2	29.27	12.56344	0.016665	1,336.94	1.00572	204.20	90.00	80.89	183.52	134.74	69.46	93.52	80.89
24,400.27	6.7779	204.2	29.29	12.56344	0.016665	1,336.94	1.00572	204.20	90.00	80.89	183.52	134.74	69.46	93.52	80.89
24,552.52	6.8201	204.3	29.29	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
24,710.27	6.8640	204.3	29.30	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
24,864.39	6.9068	204.4	29.33	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
25,014.64	6.9485	204.4	29.33	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
25,165.64	6.9905	204.5	29.35	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
25,321.39	7.0337	204.5	29.35	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
25,474.14	7.0762	204.6	29.36	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
25,631.52	7.1199	204.6	29.36	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
25,785.39	7.1626	204.7	29.37	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
25,941.39	7.2059	204.7	29.39	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
26,094.89	7.2486	204.7	29.41	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
26,248.64	7.2913	204.8	29.42	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
26,405.77	7.3349	204.8	29.42	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
26,562.89	7.3786	204.9	29.43	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
26,715.77	7.4210	204.9	29.43	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
26,867.39	7.4632	204.9	29.44	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
27,027.02	7.5075	205.0	29.45	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,183.14	7.5509	205.0	29.45	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,339.52	.5943	205.0	29.47	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
27,495.77	7.6377	205.1	29.48	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
27,651.27	7.6809	205.1	29.48	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
27,804.27	7.7234	205.1	29.49	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
20,233.77	5.6205	182.13	7.8734	15,853.16	12.8516	6.0284	14.1740
20,386.27	5.6629	182.21	7.8875	15,852.79	12.8523	6.0438	14.2040
20,537.39	5.7048	182.30	7.9017	15,852.42	12.8536	6.0593	14.2240
20,690.39	5.7473	182.30	7.9017	15,852.04	12.8533	6.0590	14.2340
20,845.64	5.7905	182.38	7.9158	15,851.66	12.8546	6.0745	14.2440
20,998.39	5.8329	182.46	7.9300	15,851.29	12.8559	6.0900	14.2640
21,152.64	5.8757	182.54	7.9442	15,850.91	12.8573	6.1055	14.2840
21,304.14	5.9178	182.54	7.9442	15,850.54	12.8570	6.1052	14.2940
21,461.52	5.9615	182.62	7.9584	15,850.15	12.8583	6.1207	14.3240
21,618.14	6.0050	182.70	7.9727	15,849.77	12.8596	6.1363	14.3440
21,780.64	6.0502	182.78	7.9870	15,849.37	12.8609	6.1519	14.3540
21,934.89	6.0930	182.78	7.9870	15,848.99	12.8606	6.1516	14.3740
22,090.52	6.1363	182.87	8.0012	15,848.61	12.8619	6.1672	14.3840
22,239.89	6.1777	182.87	8.0012	15,848.24	12.8616	6.1669	14.3940
22,391.27	6.2198	182.95	8.0156	15,847.87	12.8630	6.1825	14.4040
22,546.14	6.2628	183.03	8.0299	15,847.49	12.8643	6.1982	14.4340
22,700.14	6.3056	183.03	8.0299	15,847.11	12.8640	6.1979	14.4540
22,856.64	6.3491	183.11	8.0442	15,846.73	12.8653	6.2135	14.4640
23,015.77	6.3933	183.19	8.0586	15,846.34	12.8666	6.2292	14.4640
23,168.39	6.4357	183.19	8.0586	15,845.96	12.8663	6.2289	14.4840
23,322.64	6.4785	183.27	8.0730	15,845.59	12.8676	6.2446	14.4940
23,476.52	6.5213	183.27	8.0730	15,845.21	12.8673	6.2443	14.5140
23,631.77	6.5644	183.35	8.0874	15,844.83	12.8686	6.2601	14.5340
23,787.39	6.6076	183.35	8.0874	15,844.45	12.8683	6.2597	14.5540
23,938.89	6.6497	183.43	8.1019	15,844.07	12.8696	6.2755	14.5540
24,094.14	6.6928	183.43	8.1019	15,843.69	12.8693	6.2752	14.5840
24,246.89	6.7352	183.52	8.1163	15,843.32	12.8707	6.2910	14.5740
24,400.27	6.7779	183.52	8.1163	15,842.94	12.8704	6.2907	14.5940
24,552.52	6.8201	183.60	8.1308	15,842.57	12.8717	6.3065	14.5940
24,710.27	6.8640	183.60	8.1308	15,842.18	12.8714	6.3062	14.6040
24,864.39	6.9068	183.68	8.1453	15,841.80	12.8727	6.3220	14.6340
25,014.64	6.9485	183.68	8.1453	15,841.43	12.8724	6.3217	14.6340
25,165.64	6.9905	183.76	8.1598	15,841.06	12.8737	6.3375	14.6540
25,321.39	7.0337	183.76	8.1598	15,840.68	12.8734	6.3372	14.6540
25,474.14	7.0762	183.84	8.1744	15,840.31	12.8747	6.3531	14.6640
25,631.52	7.1199	183.84	8.1744	15,839.92	12.8744	6.3528	14.6640
25,785.39	7.1626	183.92	8.1889	15,839.54	12.8757	6.3687	14.6740
25,941.39	7.2059	183.92	8.1889	15,839.16	12.8754	6.3684	14.6940
26,094.89	7.2486	183.92	8.1889	15,838.78	12.8751	6.3681	14.7140
26,248.64	7.2913	184.00	8.2035	15,838.41	12.8764	6.3840	14.7240
26,405.77	7.3349	184.00	8.2035	15,838.02	12.8761	6.3836	14.7240
26,562.89	7.3786	184.09	8.2181	15,837.64	12.8774	6.3996	14.7340
26,715.77	7.4210	184.09	8.2181	15,837.26	12.8771	6.3993	14.7340
26,867.39	7.4632	184.09	8.2181	15,836.89	12.8768	6.3990	14.7440
27,027.02	7.5075	184.17	8.2327	15,836.50	12.8781	6.4149	14.7540
27,183.14	7.5509	184.17	8.2327	15,836.12	12.8778	6.4146	14.7540
27,339.52	7.5943	184.17	8.2327	15,835.73	12.8775	6.4143	14.7740
27,495.77	7.6377	184.25	8.2474	15,835.35	12.8788	6.4302	14.7840
27,651.27	7.6809	184.25	8.2474	15,834.97	12.8785	6.4299	14.7840
27,804.27	7.7234	184.25	8.2474	15,834.59	12.8782	6.4296	14.7940

PECO ENERGY
NUCLEAR GROUP

CALCULATION SHEET

CALC. NO.: PM-1013
PAGE: 45
REVISION: 1

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
27,959.02	7.7664	205.2	29.49	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,112.14	7.8089	205.2	29.50	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,272.64	7.8535	205.2	29.50	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
28,415.27	7.8931	205.3	29.51	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,567.52	7.9354	205.3	29.51	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,717.64	7.9771	205.3	29.53	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
28,875.39	8.0209	205.3	29.53	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
29,028.27	8.0634	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,185.64	8.1071	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,344.64	8.1513	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,497.89	8.1939	205.4	29.54	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
29,656.39	8.2379	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
29,802.52	8.2785	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
29,953.77	8.3205	205.5	29.54	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,106.39	8.3629	205.5	29.56	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,268.77	8.4080	205.5	29.56	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,420.39	8.4501	205.5	29.57	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
30,578.27	8.4940	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
30,733.14	8.5370	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
30,893.64	8.5816	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,047.77	8.6244	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,203.39	8.6676	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,358.89	8.7108	205.6	29.57	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,512.64	8.7535	205.6	29.60	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
31,667.02	8.7964	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
31,818.89	8.8386	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
31,966.52	8.8796	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,113.52	8.9204	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,267.14	8.9631	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,421.39	9.0059	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,573.14	9.0481	205.7	29.60	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,721.77	9.0894	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
32,872.52	9.1313	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,024.02	9.1733	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,171.27	9.2142	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,326.39	9.2573	205.7	29.59	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,481.02	9.3003	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,632.52	9.3424	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,777.39	9.3826	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
33,931.52	9.4254	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,085.02	9.4681	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,235.14	9.5098	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,390.02	9.5528	205.7	29.57	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,548.64	9.5968	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,706.64	9.6407	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
34,860.89	9.6836	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,018.89	9.7275	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,178.89	9.7714	205.7	29.58	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,332.89	9.8147	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,487.64	9.8577	205.7	29.56	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
27,959.02	7.7664	184.33	8.2621	15,834.21	12.8795	6.4456	14.7940
28,112.14	7.8089	184.33	8.2621	15,833.84	12.8792	6.4453	14.8040
28,272.64	7.8535	184.33	8.2621	15,833.44	12.8789	6.4450	14.8040
28,415.27	7.8931	184.41	8.2768	15,833.09	12.8803	6.4610	14.8140
28,567.52	7.9354	184.41	8.2768	15,832.72	12.8800	6.4607	14.8140
28,717.64	7.9771	184.41	8.2768	15,832.35	12.8797	6.4604	14.8340
28,875.39	8.0209	184.41	8.2768	15,831.96	12.8793	6.4601	14.8340
29,028.27	8.0634	184.49	8.2915	15,831.59	12.8807	6.4762	14.8440
29,185.64	8.1071	184.49	8.2915	15,831.20	12.8803	6.4758	14.8440
29,344.64	8.1513	184.49	8.2915	15,830.81	12.8800	6.4755	14.8440
29,497.89	8.1939	184.49	8.2915	15,830.44	12.8797	6.4752	14.8440
29,656.39	8.2379	184.57	8.3062	15,830.05	12.8810	6.4913	14.8440
29,802.52	8.2785	184.57	8.3062	15,829.69	12.8807	6.4910	14.8440
29,953.77	8.3205	184.57	8.3062	15,829.32	12.8804	6.4907	14.8440
30,106.39	8.3629	184.57	8.3062	15,828.94	12.8801	6.4904	14.8640
30,268.77	8.4080	184.57	8.3062	15,828.55	12.8798	6.4900	14.8640
30,420.39	8.4501	184.57	8.3062	15,828.17	12.8795	6.4897	14.8740
30,578.27	8.4940	184.66	8.3210	15,827.79	12.8808	6.5058	14.8740
30,733.14	8.5370	184.66	8.3210	15,827.41	12.8805	6.5055	14.8740
30,893.64	8.5816	184.66	8.3210	15,827.01	12.8802	6.5052	14.8740
31,047.77	8.6244	184.66	8.3210	15,826.64	12.8799	6.5049	14.8740
31,203.39	8.6676	184.66	8.3210	15,826.25	12.8796	6.5046	14.8740
31,358.89	8.7108	184.66	8.3210	15,825.87	12.8793	6.5043	14.8740
31,512.64	8.7535	184.66	8.3210	15,825.49	12.8790	6.5040	14.9040
31,667.02	8.7964	184.74	8.3358	15,825.12	12.8803	6.5201	14.9040
31,818.89	8.8386	184.74	8.3358	15,824.74	12.8800	6.5197	14.9040
31,966.52	8.8796	184.74	8.3358	15,824.38	12.8797	6.5195	14.9040
32,113.52	8.9204	184.74	8.3358	15,824.02	12.8794	6.5192	14.9040
32,267.14	8.9631	184.74	8.3358	15,823.64	12.8791	6.5189	14.9040
32,421.39	9.0059	184.74	8.3358	15,823.27	12.8788	6.5185	14.9040
32,573.14	9.0481	184.74	8.3358	15,822.89	12.8785	6.5182	14.9040
32,721.77	9.0894	184.74	8.3358	15,822.53	12.8782	6.5179	14.8940
32,872.52	9.1313	184.74	8.3358	15,822.16	12.8779	6.5176	14.8940
33,024.02	9.1733	184.74	8.3358	15,821.79	12.8776	6.5173	14.8940
33,171.27	9.2142	184.74	8.3358	15,821.43	12.8773	6.5170	14.8940
33,326.39	9.2573	184.74	8.3358	15,821.05	12.8770	6.5167	14.8940
33,481.02	9.3003	184.74	8.3358	15,820.67	12.8767	6.5164	14.8840
33,632.52	9.3424	184.74	8.3358	15,820.29	12.8763	6.5161	14.8840
33,777.39	9.3826	184.74	8.3358	15,819.94	12.8761	6.5158	14.8740
33,931.52	9.4254	184.74	8.3358	15,819.56	12.8758	6.5155	14.8740
34,085.02	9.4681	184.74	8.3358	15,819.18	12.8754	6.5152	14.8840
34,235.14	9.5098	184.74	8.3358	15,818.82	12.8751	6.5149	14.8740
34,390.02	9.5528	184.74	8.3358	15,818.44	12.8748	6.5146	14.8740
34,548.64	9.5968	184.74	8.3358	15,818.05	12.8745	6.5143	14.8640
34,706.64	9.6407	184.74	8.3358	15,817.66	12.8742	6.5140	14.8640
34,860.89	9.6836	184.74	8.3358	15,817.28	12.8739	6.5137	14.8840
35,018.89	9.7275	184.74	8.3358	15,816.89	12.8736	6.5134	14.8840
35,176.89	9.7714	184.74	8.3358	15,816.51	12.8733	6.5130	14.8640
35,332.89	9.8147	184.74	8.3358	15,816.12	12.8730	6.5127	14.8640
35,487.64	9.8577	184.74	8.3358	15,815.74	12.8726	6.5124	14.8640

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
35,646.64	9.9018	205.7	29.55	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,796.64	9.9435	205.7	29.54	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
35,952.52	9.9868	205.7	29.54	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,102.14	10.0284	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,255.39	10.0709	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,408.39	10.1134	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,560.39	10.1557	205.7	29.52	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,712.52	10.1979	205.7	29.53	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
36,867.02	10.2408	205.7	29.52	12.95224	0.016675	1,336.13	1.00593	205.70	90.00	81.95	184.74	135.33	70.37	94.74	81.95
37,027.52	10.2854	205.6	29.51	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,177.27	10.3270	205.6	29.51	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,331.39	10.3698	205.6	29.50	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,488.89	10.4136	205.6	29.49	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,643.39	10.4565	205.6	29.49	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,798.14	10.4995	205.6	29.48	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
37,956.52	10.5435	205.6	29.47	12.92601	0.016674	1,336.18	1.00592	205.60	90.00	81.88	184.66	135.29	70.31	94.66	81.88
38,108.89	10.5858	205.5	29.47	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,271.52	10.6310	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,421.14	10.6725	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,577.64	10.7160	205.5	29.44	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,732.14	10.7589	205.5	29.45	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
38,888.64	10.8024	205.5	29.44	12.89983	0.016674	1,336.24	1.00591	205.50	90.00	81.81	184.57	135.25	70.25	94.57	81.81
39,047.27	10.8465	205.4	29.43	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,204.14	10.8900	205.4	29.42	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,363.89	10.9344	205.4	29.42	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,520.77	10.9780	205.4	29.40	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,677.02	11.0214	205.4	29.40	12.87369	0.016673	1,336.29	1.00589	205.40	90.00	81.74	184.49	135.21	70.19	94.49	81.74
39,837.39	11.0659	205.3	29.38	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
39,989.64	11.1082	205.3	29.37	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,152.52	11.1535	205.3	29.37	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,299.02	11.1942	205.3	29.36	12.84759	0.016672	1,336.34	1.00588	205.30	90.00	81.67	184.41	135.17	70.13	94.41	81.67
40,450.27	11.2362	205.2	29.35	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,607.64	11.2799	205.2	29.35	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,763.14	11.3231	205.2	29.34	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
40,915.52	11.3654	205.2	29.33	12.82154	0.016672	1,336.40	1.00586	205.20	90.00	81.60	184.33	135.14	70.06	94.33	81.60
41,076.14	11.4100	205.1	29.32	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,232.14	11.4534	205.1	29.31	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,381.27	11.4948	205.1	29.31	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,534.64	11.5374	205.1	29.33	12.79554	0.016671	1,336.45	1.00585	205.10	90.00	81.53	184.25	135.10	70.00	94.25	81.53
41,688.02	11.5800	205.0	29.32	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
41,838.14	11.6217	205.0	29.30	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
41,992.14	11.6645	205.0	29.30	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
42,153.02	11.7092	205.0	29.29	12.76957	0.016670	1,336.51	1.00583	205.00	90.00	81.46	184.17	135.06	69.94	94.17	81.46
42,307.52	11.7521	204.9	29.29	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
42,458.64	11.7941	204.9	29.27	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
42,612.52	11.8368	204.9	29.26	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
42,761.02	11.8781	204.9	29.25	12.74365	0.016670	1,336.56	1.00582	204.90	90.00	81.38	184.09	135.02	69.88	94.09	81.38
42,916.89	11.9214	204.8	29.25	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
43,067.89	11.9633	204.8	29.24	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31
43,221.64	12.0060	204.8	29.23	12.71778	0.016669	1,336.62	1.00580	204.80	90.00	81.31	184.00	134.98	69.82	94.00	81.31

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressur (psig)
35,646.64	9.9018	184.74	8.3358	15,815.35	12.8723	6.5121	14.8540
35,796.64	9.9435	184.74	8.3358	15,814.99	12.8720	6.5118	14.8440
35,952.52	9.9868	184.74	8.3358	15,814.60	12.8717	6.5115	14.8440
36,102.14	10.0284	184.74	8.3358	15,814.24	12.8714	6.5112	14.8340
36,255.39	10.0709	184.74	8.3358	15,813.86	12.8711	6.5109	14.8340
36,408.39	10.1134	184.74	8.3358	15,813.49	12.8708	6.5106	14.8340
36,560.39	10.1557	184.74	8.3358	15,813.11	12.8705	6.5103	14.8240
36,712.52	10.1979	184.74	8.3358	15,812.74	12.8702	6.5100	14.8340
36,867.02	10.2408	184.74	8.3358	15,812.36	12.8699	6.5097	14.8240
37,027.52	10.2854	184.66	8.3210	15,811.97	12.8679	6.4929	14.8140
37,177.27	10.3270	184.66	8.3210	15,811.60	12.8676	6.4926	14.8140
37,331.39	10.3698	184.66	8.3210	15,811.22	12.8673	6.4923	14.8040
37,488.89	10.4136	184.66	8.3210	15,810.84	12.8670	6.4920	14.7940
37,643.39	10.4565	184.66	8.3210	15,810.46	12.8667	6.4917	14.7940
37,798.14	10.4995	184.66	8.3210	15,810.08	12.8664	6.4914	14.7840
37,956.52	10.5435	184.66	8.3210	15,809.69	12.8661	6.4911	14.7740
38,108.89	10.5858	184.57	8.3062	15,809.31	12.8642	6.4744	14.7740
38,271.52	10.6310	184.57	8.3062	15,808.92	12.8638	6.4741	14.7540
38,421.14	10.6725	184.57	8.3062	15,808.55	12.8635	6.4738	14.7540
38,577.64	10.7160	184.57	8.3062	15,808.16	12.8632	6.4735	14.7440
38,732.14	10.7589	184.57	8.3062	15,807.79	12.8629	6.4732	14.7540
38,888.64	10.8024	184.57	8.3062	15,807.40	12.8626	6.4728	14.7440
39,047.27	10.8465	184.49	8.2915	15,807.01	12.8607	6.4562	14.7340
39,204.14	10.8900	184.49	8.2915	15,806.63	12.8604	6.4558	14.7240
39,363.89	10.9344	184.49	8.2915	15,806.24	12.8600	6.4555	14.7240
39,520.77	10.9780	184.49	8.2915	15,805.85	12.8597	6.4552	14.7040
39,677.02	11.0214	184.49	8.2915	15,805.47	12.8594	6.4549	14.7040
39,837.39	11.0659	184.41	8.2768	15,805.07	12.8575	6.4382	14.6840
39,989.64	11.1082	184.41	8.2768	15,804.70	12.8572	6.4379	14.6740
40,152.52	11.1535	184.41	8.2768	15,804.30	12.8568	6.4376	14.6740
40,299.02	11.1942	184.41	8.2768	15,803.94	12.8565	6.4373	14.6640
40,450.27	11.2362	184.33	8.2621	15,803.57	12.8546	6.4207	14.6540
40,607.64	11.2799	184.33	8.2621	15,803.18	12.8543	6.4204	14.6540
40,763.14	11.3231	184.33	8.2621	15,802.80	12.8540	6.4201	14.6440
40,915.52	11.3654	184.33	8.2621	15,802.43	12.8537	6.4198	14.6340
41,076.14	11.4100	184.25	8.2474	15,802.04	12.8517	6.4032	14.6240
41,232.14	11.4534	184.25	8.2474	15,801.65	12.8514	6.4028	14.6140
41,381.27	11.4948	184.25	8.2474	15,801.29	12.8511	6.4025	14.6140
41,534.64	11.5374	184.25	8.2474	15,800.91	12.8508	6.4022	14.6340
41,688.02	11.5800	184.17	8.2327	15,800.53	12.8489	6.3857	14.6240
41,838.14	11.6217	184.17	8.2327	15,800.17	12.8486	6.3854	14.6040
41,992.14	11.6645	184.17	8.2327	15,799.79	12.8483	6.3851	14.6040
42,153.02	11.7092	184.17	8.2327	15,799.39	12.8480	6.3847	14.5840
42,307.52	11.7521	184.09	8.2181	15,799.01	12.8460	6.3682	14.5940
42,458.64	11.7941	184.09	8.2181	15,798.64	12.8457	6.3679	14.5740
42,612.52	11.8368	184.09	8.2181	15,798.27	12.8454	6.3676	14.5640
42,761.02	11.8781	184.09	8.2181	15,797.90	12.8451	6.3673	14.5540
42,916.89	11.9214	184.00	8.2035	15,797.52	12.8432	6.3507	14.5540
43,067.89	11.9633	184.00	8.2035	15,797.15	12.8429	6.3504	14.5440
43,221.64	12.0060	184.00	8.2035	15,796.77	12.8426	6.3501	14.5340

Time (seconds)	Time (hours)	SP Temp (°F)	Original DW Pressure (psia)	Psat (psia)	Vf (cuft/lbm)	RHR Heat Exchanger Mass Flow (lbm/sec)	Cp (BTU/lbm °F)	Thi (°F)	Tci (°F)	LMTD (°F)	Tho (°F)	Tco (°F)	GTD (°F)	LTD (°F)	LMTD (°F)
43,377.02	12.0492	204.7	29.22	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,521.52	12.0893	204.7	29.21	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,672.39	12.1312	204.7	29.21	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,827.77	12.1744	204.7	29.19	12.69195	0.016668	1,336.67	1.00579	204.70	90.00	81.24	183.92	134.94	69.76	93.92	81.24
43,984.02	12.2178	204.6	29.19	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,139.39	12.2609	204.6	29.17	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,300.39	12.3057	204.6	29.17	12.66616	0.016668	1,336.73	1.00578	204.60	90.00	81.17	183.84	134.90	69.70	93.84	81.17
44,453.02	12.3481	204.5	29.15	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,607.89	12.3911	204.5	29.15	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,765.64	12.4349	204.5	29.13	12.64041	0.016667	1,336.78	1.00576	204.50	90.00	81.10	183.76	134.86	69.64	93.76	81.10
44,921.27	12.4781	204.4	29.13	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,072.54	12.5202	204.4	29.12	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,229.89	12.5639	204.4	29.11	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,381.77	12.6060	204.4	29.10	12.61471	0.016666	1,336.83	1.00575	204.40	90.00	81.03	183.68	134.82	69.58	93.68	81.03
45,533.77	12.6483	204.3	29.09	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
45,684.02	12.6900	204.3	29.08	12.58905	0.016666	1,336.89	1.00573	204.30	90.00	80.96	183.60	134.78	69.52	93.60	80.96
Maxima		205.7	47.51												

PECO ENERGY
NUCLEAR GROUP

CALCULATION SHEET

CALC. NO.: PM-1013
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196-21453 8/96

Time (seconds)	Time (hours)	Temp (°F)	Pv (psia)	Ma (lbm)	Pa (psia)	MCPA (psig)	Original DW Pressure (psig)
[illegible]7.02	12.0492	183.92	8.1889	15,796.39	12.8407	6.3338	14.5240
43,521.52	12.0893	183.92	8.1889	15,796.04	12.8404	6.3333	14.5140
43,672.39	12.1312	183.92	8.1889	15,795.67	12.8401	6.3330	14.5140
43,827.77	12.1744	183.92	8.1889	15,795.29	12.8398	6.3327	14.4940
43,984.02	12.2178	183.84	8.1744	15,794.90	12.8378	6.3162	14.4940
44,139.39	12.2609	183.84	8.1744	15,794.52	12.8375	6.3159	14.4740
44,300.39	12.3057	183.84	8.1744	15,794.13	12.8372	6.3156	14.4740
44,453.02	12.3481	183.76	8.1598	15,793.75	12.8353	6.2991	14.4540
44,607.89	12.3911	183.76	8.1598	15,793.37	12.8350	6.2988	14.4540
44,765.64	12.4349	183.76	8.1598	15,792.99	12.8346	6.2985	14.4340
44,921.27	12.4781	183.68	8.1453	15,792.60	12.8327	6.2820	14.4340
45,072.64	12.5202	183.68	8.1453	15,792.23	12.8324	6.2817	14.4240
45,[illegible]9.89	12.5639	183.68	8.1453	15,791.85	12.8321	6.2814	14.4140
45,3[illegible]7	12.6060	183.68	8.1453	15,791.47	12.8318	6.2811	14.4040
45,533.[illegible]	12.6483	183.60	8.1308	15,791.10	12.8299	6.2647	14.3940
45,684.02	12.6900	183.60	8.1308	15,790.73	12.8296	6.2644	14.3840
Maxima		184.74				6.52	