NORTHEAST UTILITIES
THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut
P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 666-6911

May 21, 1984

Docket No. 50-423
B11197

Director of Nuclear Reactor Regulation
Mr. B. J. Youngblood, Chief
Licensing Branch No. 1
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

References: (1) B. J. Youngblood letter to W. G. Counsil, Request for Additional Information for Millstone Nuclear Power Station, Unit No. 3, dated May 3, 1983.

(2) B. J. Youngblood letter to W. G. Counsil, Draft SER for Millstone Nuclear Power Station, Unit No. 3, dated December 20, 1983.

Dear Mr. Youngblood:

Millstone Nuclear Power Station, Unit No. 3
Response to Radiological Assessment Branch Question 471.13

Attached is Northeast Nuclear Energy Company's (NNECO) response to Radiological Assessment Branch Question 471.13 which was transmitted to NNECO via Reference (1). This was also identified as a DSER open item in Reference (2).

If there are any questions, please contact our licensing representative directly.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY ET AL
By Northeast Nuclear Energy Company,
Their Agent

W. G. Counsil
W. G. Counsil
Senior Vice President

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1/1

STATE OF CONNECTICUT)
) ss. Berlin
COUNTY OF HARTFORD)

Then personally appeared before me W. G. Counsil, who being duly sworn, did state that he is Senior Vice President of Northeast Nuclear Energy Company, an Applicant herein, that he is authorized to execute and file the foregoing information in the name and on behalf of the Applicants herein and that the statements contained in said information are true and correct to the best of his knowledge and belief.

Lorraine J. D'Amico
Notary Public

My Commission Expires March 31, 1988

NRC Letter: May 3, 1983 1.8
Question No. Q471.13 1.10

Acceptance criteria for Section 12.3 of the SRP, NUREG-0800, include 1.11
meeting the criteria of Sections II.B.2 of NUREG-0737, Clarification 1.12
of TMI Action Plan Requirements. In accordance with II.B.2, provide 1.13
the analysis that demonstrates vital system operation and occupancy
of the TSC.

Response: 1.14

Refer to revised FSAR Sections 12.3.1.3.2 and 15.6.5.4, new FSAR 1.15
Section 9.4.13, revised FSAR Table 15.0-11, and new FSAR 1.17
Tables 15.6-21 and 15.6-22 for the response to this question.

2. Outside air temperature

A controller with auto-manual feature and indication utilized for the steam-to-water heat exchanger summer and winter temperature valves is located on the hot water heating panel.

A local differential pressure indicating controller with auto-manual feature and indication is utilized to regulate the hot water heating system supply to return differential pressure.

Indicating lights for the winter water circulating pump operation are provided at the switch gear.

The following parameters are monitored by the plant computer:

1. Winter water circulating pumps breaker position

2. Winter water circulating pump overcurrent

<u>Auxiliary Boiler Room Ventilation</u>

The auxiliary boiler room ventilation supply fans have control switches with indicator lights located on the auxiliary boiler room ventilation panel. In the automatic mode, the A supply starts automatically when room temperature reaches 85°F; the B fan starts when room temperature reaches 105°F.

The exhaust fans are interlocked to start and stop with the supply fans.

A temperature controller for each train is utilized to modulate the inlet, outlet, and recirculation dampers to maintain supply fan discharge temperature at a minimum preset value provided the supply fan is running. The supply fans discharge temperature is indicated on the auxiliary boiler room ventilation panel.

9.4.13 Technical Support Center Heating, Ventilation, Air Conditioning, and Filtration System

The technical support center (TSC) is the onsite facility from which technical direction can be administered, to relieve plant operators from peripheral duties during an emergency, by up to 15 licensee and NRC personnel. The primary functions of TSC heating, ventilation, air conditioning, and filtration (HVACF) system and to provide a suitable environment for maintaining proper equipment operation, to provide for radiological protection to personnel occupying the TSC, and to provide storage of plant records.

A portable radiation monitor located within the TSC office area will detect and respond to the presence of radioactivity.

The technical support center HVACF system is classified as nonnuclear safety-related and non-Seismic.

9.4.13.1 Design Bases

The technical support center HVACF system design is based on the following criteria:

1. American National Standard, ANSI, N509-1976, Nuclear Power Plant Air Cleaning Units and Components.

2. American National Standard, ANSI N510 - 1975, Testing of Nuclear Air Cleaning Systems.

3. System is designated as Nonnuclear safety as described in FSAR Section 3.2.

4. Regulatory Guide 1.52, Revision 2 (for carbon media).

5. The range of indoor design temperatures during normal and abnormal plant conditions is as follows:

Area	Maximum Space Temperature	Minimum Space Temperature
TSC Office	75°F	75°F
TSC Lavatory	85°F	65°F
TSC Mechanical Equipment Penthouse	104°F	40°F

6. The range of outdoor temperatures are as follows:

   Summer design temperature - 86°F db

   - 75°F wb

   Winter design temperature - 0°F db

   Outdoor daily range of db temperatures - 16°F

7. Relative humidity in the TSC office areas is controlled between 40 and 60 percent during normal plant operation.

8. Supplement 1 to NUREG 0737, Requirements for Emergency Response Capability.

9. Radiation exposure to any person occupying the TSC will not exceed 5 rem whole body, or its equivalent, to any part of the body.

9.4.13.2 System Description

The technical support center HVACF system is shown on Figure 9.4-(later). The system is comprised of the following subsystems:

1. TSC heating, ventilation, and air conditioning
2. TSC filtration
3. TSC lavatory exhaust

The system consists of a split-system air conditioning unit, evaporative pan humidifier, duct-mounted electric heating coil, solenoid-operated dampers, and associated duct work and accessories. The air is passed through a disposable type impingement filter, direct expansion (DX) coil, and blower before it enters the conditioned space. The majority of air is recirculated and is mixed with an adequate quantity of outside makeup air during normal plant operation. The system operates automatically and is controlled by a thermostat located in the TSC office area.

During the heating season when the TSC air space temperature is lower than a predetermined setpoint, the office area temperature indicating controller will activate the electric coils mounted in the duct to provide heated air to TSC office areas and the mechanical equipment penthouse. A moisture element will activate a humidifier to provide 471.13 an increase in relative humidity should the instrument sense less than a predetermined setpoint.

Upon receipt of a control building isolation (CBI) signal, which is initiated by any of the conditions listed in Section 9.4.1, solenoid-operated dampers will modulate to their respective positions to allow for building isolation. The TSC charcoal filtration assembly will start to operate in a filtered recirculation mode (2,000 cfm of recirculated air for 30 minutes) and the lavatory exhaust fan will shut down.

The filtration assembly fan will draw 2,000 cfm through a disposable type impingement prefilter, an upstream HEPA filter, a 95 percent efficient charcoal adsorber, and a downstream HEPA filter, and discharge the air to the intake of the air conditioning unit.

Thirty minutes following the isolation signal, the solenoid-operated dampers will modulate to provide 100 cfm outside air and 1,900 cfm recirculation air into the TSC charcoal filtration assembly which is discharged to the intake of the air conditioning unit.

The mixture of filtered air and recirculation air will be drawn through the air conditioning unit to provide conditioned air for breathing and a positive pressure in TSC air space to minimize infiltration of airborne radioactivity.

9.4.13.3 Safety Evaluation

The technical support center HVACF system does not have a safety-related function, and its failure will not affect operation of any other safety-related system or component. The HVACF system can operate during or after a postulated accident and can be operated during normal plant conditions.

The ventilation electrical and control circuity is not designed to meet Class 1E, single failure or seismic qualification requirements, but is powered by the normal ac power supply and, through a transfer switch, is supplied with reliable auxiliary power from the site security diesel during loss of offsite ac power.

9.4.13.4 Inspection and Testing Requirements

The TSC air conditioning and ventilation system is field tested and inspected for air balance and completeness of installation.

HEPA filters and charcoal adsorbers are procurred to the performance requirements of ANSI N509-1976, Section 5.1 and Table 5.1, respectively, as stated in Regulatory Guide 1.52, Paragraphs 3.d and 5.d.

The filter housing, HEPA filter bank, and charcoal adsorber bank are tested to the inplace leakage testing requirements of ANSI N510-1975. Test canisters are provided to allow for periodic removal of used activated carbon samples for laboratory testing to the criteria of Regulatory Guide 1.52, Table 2.

Compliance with these testing requirements allows the assigned decontamination efficiencies listed in Table 2 of Regulatory Guide 1.52, Revision 2, for 95 percent efficiency of particulate and gaseous iodine removal, to be applied in the dose analysis as discussed in Section 15.6.5.

All filters (prefilter, HEPA, and charcoal adsorbers) are provided with pressure differential indicating switches for visual maintenance checks to ensure replacement when setpoints indicate dirty filter conditions.

9.4.13.5 Instrumentation Requirements

A temperature switch controls the operation of the air conditioning unit and a temperature indicating controller energizes the electric heater mounted in the duct air stream. A switch for either STOP or START modes of operation for the air conditioner fan, and status indication lights, are provided on a local panel.

A moisture element located in the TSC office area controls the operation of the humidifier.

The TSC is automatically isolated from the outside atmosphere upon receipt of a CBI signal with modulation of solenoid-operated dampers.

The dampers are provided with indication lights on a local panel for 3.51
OPEN/CLOSED status indication. 3.52

The filtration assembly is provided with locally mounted STOP-AUTO- 3.53
START control switches and Unit OFF-RUNNING status indication lights 3.54
on a control panel located in the office area. In the AUTO mode, the 3.55
filtration fan will start by closure of a solenoid operated isolation
damper. Pressure differential indicating switches are provided 3.56
locally for filter condition surveillance. A fire detector for 3.57
indication of ignition of the carbon media will alarm locally and in Y 471.13
the control building control room.

9.4.14 References for Section 9.4 3.59

American Society of Heating, Refrigeration, and Air-Conditioning 3.60
Engineers (ASHRAE) 1968.

American Society of Heating, Refrigeration, and Air-Conditioning 4.2
Engineers (ASHRAE), 1977 Handbook of Fundamentals.

4. Fuel building - access required to realign fuel pool cooling 1.10

5. Sample analysis area - Millstone 1 and 2 chemistry 1.11
laboratories have been identified as the sample analysis
areas for Millstone 3 accidents. 1.12

Dose rates and doses within these areas and including contribution 1.14
enroute to these areas are determined, and shielding requirements 1.15
specified. In addition to the areas defined above, the following 1.16
additional areas will require post-accident access and continued
occupancy: 1.17

1. Control room - post-accident control room habitability is 1.19
discussed in Section 6.4, and control room post-LOCA doses 1.20
are presented in Section 15.6.5.

2. Technical support center - post-LOCA dose evaluation is 1.21 421.13
presented in Section 15.6.5.

It has been determined that post-accident access to areas addressed 1.27
in NUREG-0737 which have not been identified above is not required 1.28
for Millstone 3.

Following an accident, it is assumed that accident mitigation 1.29
personnel will exit the control building and travel along 1.30
predetermined routes to the previously identified vital areas at an
assumed walking speed of 3 feet per second. These predetermined 1.31
routes (primary routes and, where applicable, alternate routes) are
described below:

1. Auxiliary building - The primary route is from the control 1.33
building through the service building corridor to the 1.34
auxiliary bay and then across the road to the auxiliary
building (Primary Route No. 1 on Figure 12.3-10). The 1.36
alternate route is from the control building through the
service building (past the radioactive chemistry
laboratory), followed by a right turn just beyond the count 1.37
room, then out along the roadway to the auxiliary building
(Alternate Route No. 1 on Figure 12.3-10). 1.38

2. Main steam valve building - The primary route is the same as 1.39
Alternate Route No. 1 as far as the entrance from the 1.40
roadway to the auxiliary building, beyond which point the
primary route to the main steam valve building follows the 1.41
roadway to the end of this building, around the corner to
the ladder, and then up this ladder to the entrance of the 1.42
steam relief area (Primary Route No. 2 on Figure 12.3-10).
The alternate route (Alternate Route No. 2 on 1.43
Figure 12.3-10) is from the control building through the

collected and released to the environment through the auxiliary 1.10
building ventilation system HEPA and charcoal filtration units. The 1.12
releases are from above the turbine building, but are analyzed as
ground level releases.

Control Room Habitability 1.15

The potential radiation dose to a control room operator is evaluated 1.17
for the limiting postulated DBA, namely the LOCA. The analysis is 1.19
based on the assumptions and meteorological parameters (χ/Q values) –
given in Table 15.6-12 and 15.0-11, respectively. 1.20

The control room is designed to be continuously occupied for the 1.21
duration of the accident, i.e. 30 days. The control building 1.22
shielding serves to protect the operators from direct radiation due
to the passing cloud of radioactive effluent assumed to have leaked 1.23
from the containment structure and from the ESF system. The control 1.24
building walls also provide shielding protection for radiation
emanating from buildings located onsite which may contain significant 1.25
quantities of radioactivity.

A SIS signal from Millstone 3 initiates control room isolation, and 1.26
after a 60 second delay, pressurization with bottled air for a period 1.27 450.3
of 1 hour. After 1 hour, leakage from the containment building 1.28
terminates and the control room emergency ventilation system begins 1.29
operation, taking filtered air into the control room via HEPA and
charcoal filters. The calculated whole body dose, beta skin dose, 1.30
and thyroid dose are presented in Table 15.6-13 and are below the 450.3
General Design Criterion 19 limits. 1.31

Normally, outside air is provided to the control room by the air 1.32
intake duct, located on the roof of the control building. The intake 1.34
duct, which is equipped with redundant radiation monitors, will
automatically isolate the control room on a high alarm, and after a 1.35
60 second delay, the control room is pressurized with bottled air for 9
a period of 1 hour. Approximately 3.7 seconds of continued 1.37
unfiltered intake is assumed to account for damper actuation and 450.3
control room isolation subsequent to a signal from either radiation 1.38
monitor. After 61 minutes, the control room ventilation system will 1.39
intake outside and recirculation air into the control room via HEPA 1.40 971.13
and charcoal filters. 1.41

Since other operating reactors are located on the site, an assessment 1.42
was made of the habitability of the Millstone 3 control room 1.43
subsequent to an assumed DBA at either Millstone 1 or 2. For the 1.44
assumed DBA at Millstone Unit 2, a low wind speed condition and a
high wind speed condition have been analyzed. As described in the 1.46
Millstone Unit 2 FSAR, Question 6.15.2, Amendment 27, it has been 450.3
assumed that the high wind speed condition exists for 36 hours after 1.47
the LOCA and 10 percent of the activity in the enclosure building
bypasses the enclosure building filtration system resulting in a 1.48
ground level release to the environment.

Displacement of the enclosure building atmosphere with outside air 1.49 450.3
would begin at wind speed above 25 mph. However, for conservatism, 1.50
it is assumed that this displacement would begin with a 23 mph wind.
The releases from a postulated LOCA at Millstone 1 are shown in 1.51
Tables 15.6-14 through 15.6-17, and from a postulated LOCA at 1.52
Millstone 2 in Tables 15.6-18 through 15.6-18C. The calculated 1.53
Millstone 3 control room whole body dose and thyroid dose from
Millstone 1 releases and from Millstone 2 releases are presented in 1.54
Table 15.6-13. The tabulated control room doses also include the 1.55 450.3
calculated beta skin dose.

Technical Support Center Habitability 1.58

The potential radiation doses to a person occupying the technical 1.60
support center (TSC) have been evaluated for the following design 2.2
basis accidents:

1. Unit 3 LOCA 2.4

2. Unit 2 LOCA (high wind speed condition) 2.5

Due to the proximity of the two structures and the ventilation 2.8
intakes (see Figure 1.2-2), meteorological parameters used for the 2.9
control room habitability analysis are applicable to the TSC.

The results of the control room habitability analysis in 2.10
Table 15.6-13, show that a postulated Unit 2 LOCA under high wind 2.11
speed conditions is the limiting event for the three units on site, for the Unit 3 control room.
Therefore, [in order to verify that the Unit 3 LOCA is limiting for the TSC,] the Unit 2 LOCA high speed wind case has been analyzed in 2.12 471.13
addition to the Unit 3 LOCA. The dose results in Table 15.6-22 confirm that the Unit 3 LOCA is limiting.

The TSC is designed for continuous operation for the duration of the 2.13
accident (i.e., 30 days). The building roof and walls provide 2.14
adequate shielding to protect the occupants against direct radiation
from the external radioactive cloud and from the containment during 2.15
the postulated LOCA. Double vestibule doors are provided at the 2.16
building entrance to eliminate inleakage due to personnel
ingress/egress.

The TSC ventilation system is described in Section 9.4.13. A safety 2.18
injection signal from Unit 3 initiates isolation of the TSC. In the 2.19
event of a LOCA at either Unit 1 or Unit 2, the redundant Unit 3
control room intake duct monitors will initiate a TSC isolation 2.20
signal upon a high radioactivity alarm. This closes the damper in 2.21
the TSC ventilation intake and isolates the building from outside air
within 3.7 seconds, which accounts for the monitor response and the 2.22
damper closure times. Prior to isolation, unfiltered intake at the 2.23
normal operating rate of 100 cfm is assumed. Upon isolation, the TSC 2.24
remains isolated for 30 minutes with no ventilation intake and 2,000
cfm filtered recirculation. During this period, a conservative 2.26
unfiltered infiltration rate of 50 cfm is assumed. The actual 2.27
infiltration rate is expected to be much less, since the TSC is
predominately a below ground structure with 2-foot thick concrete 2.28
walls and a 1-foot thick concrete roof. There are a minimum number 2.30

of penetrations into the building; these penetrations are sealed to minimize infiltration of outside air. In addition, there is an upper floor atop the TSC, which further reduces the infiltration to the TSC.

After 30 minutes, there is a 100 cfm filtered ventilation intake of the outside air with 1,900 cfm filtered recirculation for the duration of the accident. During this period, the TSC is pressurized with the intake air and no infiltration is assumed.

The data and assumptions used in the TSC dose evaluation are given in Table 15.6-21. Meteorological parameters (χ/Q values) are given in Table 15.0-11. Releases due to a postulated Unit 3 LOCA are shown in Tables 15.6-19 and 15.6-20. Releases from a Unit 2 LOCA, high wind speed case are shown in Tables 15.6-18 through 15.6-18C.

The 30 day integrated thyroid dose, whole body gamma dose, and beta skin dose for an individual occupying the TSC following the DBA are presented in Table 15.6-22.

Dose Computation

The radiological dose consequences resulting from a postulated LOCA at Millstone 3 are reported in Table 15.0-8. Assumptions used to perform the evaluation are summarized in Table 15.6-9. The inventory of noble gases and halogens in the containment building atmosphere available for release are presented in Table 15.6-10. Nuclide releases to the environment from containment building leakage and ESF system leakage are shown in Tables 15.6-19 and 15.6-20, respectively. These releases together with atmospheric dispersion factors listed in Table 15.0-11 are used to compute the doses to the EAB (0-2 hr) and LPZ (0-30 day) reported in Table 15.0-8. The calculations show that the thyroid and whole body doses are within the appropriate exposure guideline values specified in 10CFR100. The dose methodology used to determine the results of the hypothetical DBAs are described in Appendix 15A.

15.6.5.5 Conclusions

Analysis shows that the acceptance criteria described in Section 15.6.5.1 are met and that the radiological consequences are with 10CFR100 guidelines. Control room doses are within the limits of General Design Criterion 19.

15.6.6 BWR Transients

Not applicable to Millstone 3.

15.6.7 References for Section 15.6

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WCAP-8622 (Proprietary) and WCAP-8623 (Non-proprietary), 1975. Westinghouse ECCS Evaluation Model - October 1975 Version. 4.2 4.3

WCAP-8970 (Proprietary) and WCAP-8971 (Non-proprietary), 1977. Skwarek, R.J.; Johnson, W.J.; and Meyer, P.E. Westinghouse Emergency Core Cooling System Small Break October 1975 Model. 4.4 4.6

WCAP-9168 (Proprietary) and WCAP-9169 (Non-proprietary), 1977. Johnson, W.J. and Thompson, C.M. Westinghouse Emergency Core Cooling System Evaluation Model - Modified October 1975 Version. 4.7 4.9

WCAP-9220-P-A (Proprietary Version) and WCAP-9221-P-A, (Non-proprietary Version), Revison 1, 1981. Eicheldinger, C. Westinghouse ECCS Evaluation Mode, 19781 Version. 4.10 4.11 4.12

TABLE 15.0-11

ATMOSPHERIC DISPERSION DATA USED FOR DESIGN BASIS ACCIDENT ANALYSIS

	Millstone 1	Millstone 2	Millstone 3
EAB χ/Qs (sec m^{-3})			
Ground level release - containment			
0-2 hr	5.4×10^{-4}		
Ground level release - ventilation vent			
0-2 hr	4.3×10^{-4}		
LPZ χ/Qs (sec m^{-3})			
Ground level release - containment			
0-8 hr	2.9×10^{-5}		
Ground level release - ventilation vent			
0-8 hr	2.9×10^{-5}		
8-24 hr	2.0×10^{-5}		
1-4 days	8.7×10^{-6}		
4-30 days	2.6×10^{-6}		
Control Room χ/Qs(4) (sec m^{-3})			
a. Ground level release - containment			
0-8 hr	1.9×10^{-3}	1.4×10^{-3}	1.9×10^{-3}
8-24 hr	1.3×10^{-3}	9.7×10^{-4}	NA
1-4 days	4.2×10^{-4}	3.4×10^{-4}	NA
4-30 days	3.8×10^{-5}	2.7×10^{-5}	NA
0-24 hr(1)	NA	8.7×10^{-5}	NA
24-36 hr(1)(3)	NA	5.2×10^{-5}	NA
b. Elevated release - Unit 1 Stack(2)			
0-4 hr	1.6×10^{-4}	1.6×10^{-4}	NA
4-8 hr	4.4×10^{-6}	4.4×10^{-6}	NA
8-24 hr	2.4×10^{-6}	2.4×10^{-6}	NA
1-4 days	6.3×10^{-7}	6.3×10^{-7}	NA
4-30 days	9.3×10^{-8}	9.3×10^{-8}	NA
0-24 hr(1)	NA	2.0×10^{-8}	NA
24-36 hr(1)(3)	NA	1.2×10^{-8}	NA

TABLE 15.0-11 (Cont)

	Millstone 1	Millstone 2	Millstone 3
c. Ground level release - ventilation vent			
0-8 hr	NA	NA	4.8×10^{-3}
8-24 hr	NA	NA	3.2×10^{-3}
1-4 days	NA	NA	1.0×10^{-3}
4-30 days	NA	NA	1.3×10^{-4}

NOTES:

1. High wind speed condition only (no fumigation).

2. Fumigation conditions assumed for 0-4 hour period. 450.3

3. χ/Q values for Unit 2 high wind speed condition after 36 hours are the same as for low wind speed condition.

4. Control room χ/Q values are applicable to the TSC due to the proximity of the air intakes of the two buildings. 471.13

TABLE 15.6-21

DATA USED IN THE TECHNICAL SUPPORT CENTER
HABITABILITY ANALYSIS

TSC Building Parameters	
Free air volume (ft^3)	33,200
Concrete wall thickness (ft)	2.0
Concrete roof thickness (ft)	1.0
Infiltration rate during isolation (cfm)	50
Ventilation Parameters	
Duration of unfiltered intake (sec)	3.7[1]
Duration of isolation (min)	30
Intake rate prior to isolation (cfm)	100
Intake rate post-isolation-filtered (cfm)	100
Recirculation rate during isolation (cfm)	2,000
Recirculation rate post-isolation (cfm)	1,900
Charcoal filter efficiency (methyl and elemental %)	95
HEPA filter efficiency (%)	95
Release Point Distances to Ventilation Intake [2] (meters)	
Unit 1 stack	351
Unit 2 containment surface	223
Unit 3 containment surface	72
Unit 3 reactor plant ventilation	38

471.13

NOTES:

1. For analysis of assumed LOCA in Unit 2 only.

2. Located on the north wall of the TSC structure.

TABLE 15.6-22

TECHNICAL SUPPORT CENTER 30-DAY INTEGRATED DOSE

Event	Thyroid Dose (rem)	Whole Body Gamma Dose (rem)	Beta Skin Dose (rem)
Unit 2 LOCA High Wind Speed Condition	1.9E+00[1]	4.1E-02	3.8E-01
Unit 3 LOCA	2.5E+01	1.9E+00	2.1E+01

NOTE:

1. 1.9E+00 = 1.9 x 10^0

471.13