

Davis-Besse Nuclear Power Station

Unit No. 1

Administrative Procedure AD 1827.12

Protective Action Guidelines

NUCLEAR SAFETY RELATED

Record of Approval and Changes

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1. PURPOSE

To define a specific set of guidelines to be followed in determining protective actions to be taken in the event of emergencies involving radioactivity releases at the Davis-Besse Nuclear Power Station (DBNPS).

2. REFERENCES

- 2.1 10 CFR 20, Standards for Protection Against Radiation
- 2.2 10 CFR 100, Reactor Site Criteria
- 2.3 USAEC TID-14844, Calculation of Distance Factors for Power and Test Reactor Sites
- 2.4 AD 1808.00, Industrial Security Plan
- 2.5 Davis-Besse Nuclear Power Station Emergency Plan
- 2.6 AD 1827.10, Emergency Off-Site Dose Estimates
- 2.7 SAND 77-1725, Public Protection Strategies for Potential Nuclear Reactor Accidents - Sheltering Concepts with Existing Public and Private Structures
- 2.8 EPA Guidelines - September 1975, EPA-520/1-75-001
- 2.9 U.S. Food and Drug Administration, Federal Register, Vol. 43, No. 242, Dec. 15, 1978
- 2.10 Reg Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the purpose of Evaluating Compliance with 10 CFR Part 50 Appendix I

3. DEFINITIONS

3.1 Decision Dose

That value of projected thyroid dose above which evacuation is beneficial.

3.2 Evacuation Dose

That dose that a potential evacuee would receive if he were openly exposed during the evacuation.

3.3 Evacuation Exposure Period

The period during which the evacuee is exposed to the radioactive plume.

The EDO shall then implement those actions for Station personnel and communicate the recommended off-site actions to the Ottawa County Sheriff's Department (or the State and County Emergency Operations Centers if they have been activated).

- 4.2 In order to simplify evacuation instructions for the public, evacuation "subareas" (see Figure 1) have been established by municipal and geographical boundaries. When making evacuation decisions in an emergency situation, the EDO shall consider the time available (based on plume travel speed) to evacuate the affected subarea(s), in comparison to the estimated evacuation times as given in Table 1. The data sheets used in Section 6. assist in this process.

5. PROTECTIVE ACTION GUIDELINES

- 5.1 Recommended Protective Actions for the Plume Exposure Pathway (10 mile) Emergency Planning Zone to avoid whole body and thyroid dose from exposure to a gaseous plume:

Projected Dose (Rem) to the Population	Recommended Actions (a)	Comments
Whole body <1	No planned protective actions. (b) Issue an advisory to seek shelter and await further instructions. Monitor environmental radiation levels.	Previously recommended protective actions may be reconsidered or terminated.
Thyroid <5		
Whole body 1 to <5	Seek shelter as a minimum. Consider evacuation. Evacuate unless constraints make it impractical. Monitor environmental radiation levels. Control access.	If constraints exist, special consideration should be given for evacuation of children and pregnant women.
Thyroid 5 to <25		
Whole body 5 and above	Conduct mandatory evacuation. Monitor environmental radiation levels and adjust area for mandatory evacuation based on these levels. Control access.	Seeking shelter would be an alternative if evacuation were not immediately possible.
Thyroid 25 and above		

calculate the dose to the critical organ(s). Infants are the critical segment of the population

Nuclide*	Concentration in Milk or Water		Total Intake via all Food & Water Pathways		Pasture Grass (Fresh Weight)	
	(0.5	(5				
	rem WB	rem WB				
	or bone:	or bone:				
	1.5 rem thyroid)	15 rem thyroid)				
	Preventive Level	Emergency Level	Preventive	Emergency	Preventive	Emergency
	($\mu\text{Ci/l}$)	($\mu\text{Ci/l}$)	(μCi)	(μCi)	($\mu\text{Ci/kg}$)	($\mu\text{Ci/kg}$)
Cs-137 (Whole Body)	0.34	3.4	7.0	70	3.5	35
Sr-90 (bone)	0.007	0.08	0.2	2.0	0.7	7.0
Sr-89 (bone)	0.13	1.3	2.6	26	13	130

B. Recommended Protective Actions

Preventive

1. Removal of lactating dairy cows from contaminated pasture and substitution of uncontaminated stored feed.
2. Substitute source of uncontaminated water.
3. Withhold contaminated milk from market to allow radioactive decay.
4. Divert fluid milk to production of dry whole milk, butter, etc.

Emergency

Isolate food and water from its introduction into commerce after considering:

- a. availability of other possible actions;
- b. importance of particular food in nutrition;
- c. time and effort to take action;
- d. availability of other foods.

5.3

Representative shielding factors from airborne radio-nuclides:

Structure or Location	Shielding Factor ^(a)	Representative Range
Outside	1.0	--
Vehicles	1.0	--
Wood-frame house ^(b) (no basement)	0.9	--

Structure or Location	Representative Shielding Factor ^(a)	Representative Range
One and two-story wood-frame house (no basement)	0.4 ^(b)	0.2-0.5
One and two-story block and brick house (no basement)	0.2 ^(b)	0.04-0.40
House basement, one or two walls fully exposed:	0.1 ^(b)	0.03-0.15
One story, less than 2 ft of basement, walls exposed	0.05 ^(b)	0.03-0.7
Two stories, less than 2 ft of basement, walls exposed	0.03 ^(b)	0.02-0.05
Three- or four-story structures, 5000 to 10,000 ft ² per floor:		
First and second floors:	0.05 ^(b)	0.01-0.08
Basement	0.01 ^(b)	0.001-0.07
Multistory structures, >10,000 ft ² per floor:		
Upper floors	0.01 ^(b)	0.001-0.02
Basement	0.005 ^(b)	0.001-0.015

(a) The ratio of dose received inside the structure to the dose that would be received outside the structure.

(b) Away from doors and windows.

5.5

Distribution of Potassium Iodide Tablets

1. The EDO will direct Station personnel to take a KI tablet if, (a) the known iodine concentration will exceed 1×10^{-5} $\mu\text{Ci/cc}$ for greater than one hour, or (b) the total known dose to an adult thyroid will exceed 10 rems.
2. Base the distribution of KI on actual thyroid doses, not projected doses. KI is 90% effective if administered within one hour after the uptake, and 50% effective if administered within 4 hours after uptake.
3. Call Radiation Management Corporation if KI is administered for further directions regarding usage.

ACCIDENT PHASE	EXPOSURE PATHWAYS	EXAMPLES OF ACTIONS TO BE RECOMMENDED
LONG TERM PHASE ³ (over 30 days)*	Ingestion of food and water contaminated from the soil either by resuspension or uptake through roots	Decontamination, condemnation, or destruction of food; deep plowing, condemnation, or alternate use of land
	Whole body exposure from deposition material or inhalation of re-suspended material	Relocation, access control, decontamination, fixing of contamination, deep plowing

³ Long Term Phase - Recovery period.

* "Typical" Post-accident time periods.

6.4 Small Children and Pregnant Women

Any time the projected whole body dose is expected to exceed 500 mrem or the projected thyroid dose is expected to exceed 1.5 rem, advise the Ottawa County Sheriff's Department to conduct an evacuation in the area of exposure of families in which there are pregnant women or small children.

DATA SHEET 1 (Continued)

11. Use information from Items 1 and 10 to get Estimated Evacuation Time from Table 1. _____ hours

12. Exposure Time:
Item 11 - Item 9 = _____ hours

NOTE: If Item 9 is negative, keep in mind that minus a negative number gives a positive result. If Item 9 is larger than Item 11, enter zero hours.

13. Evacuation Exposure Period (EEP):
Take the smaller of Exposure Time (Item 12) or Release Duration (Item 4) _____ hours

14. Evacuation Dose = $\frac{\text{EEP hours} \times \text{Dose Rate}}{1000} = \frac{(\text{Item 13}) \times (\text{Item 3})}{1000}$ = _____ REM

15. Sheltering Dose =
Projected Dose x Structure Shielding Factor (from 5.3) = _____ REM

NOTE: Since the housing in the 10 mile Emergency Planning Zone is basically wood homes, a structure shielding factor of 0.9 should normally be used.

16. Using the above information and following table, determine the protective actions to be recommended:

<u>IF</u>		<u>THEN</u>
a.	Projected Dose (Item 5) less than 1 rem	a. NO ACTION
b.	Sheltering Dose (Item 16) is greater than 1 rem but less than 5 rem	b. SHELTER
c.	Sheltering Dose greater than 5 rem, and Evacuation Dose (Item 15) less than Sheltering Dose	c. EVACUATE
d.	Sheltering Dose greater than 5 rem and Evacuation Dose greater than or equal to Shelter Dose	d. SHELTER

TABLE 1
Evacuation Time Estimates

<u>Land</u> <u>Sub-Areas</u>	<u>Population*</u>	<u>Normal</u>	<u>Adverse</u>	<u>Severe**</u>
1	2,775 823 823	2 hr. 55 min.	4 hr. 10 min.	15-20 hr.
2	2,675 861 861	3 hr. 5 min.	4 hr. 50 min.	30-40 hr.
3	10,717 3,242 3,242	3 hr. 35 min.	6 hr. 30 min.	35-45 hr.
4	608 608 608	2 hr. 50 min.	4 hr. 15 min.	10-15 hr.
5	4,940 4,940 4,940	3 hr. 30 min.	4 hr. 30 min.	40-45 hr.
6	4,940 1,506 1,506	3 hr. 30 min.	5 hr. 10 min.	30-40 hr.
7	1,865 1,795 1,795	4 hr.	6 hr. 25 min.	50-60 hr.
TOTAL EPZ	28,484 13,775 13,775	5 hr. 15 min.	10 hr. 55 min.	75-100 hr.
<u>Lake</u> <u>Sub-Areas</u> 8 thru 13	<u>Boaters</u> Varies	<u>Normal</u> 4 hr.	<u>Adverse</u> N/A	<u>Severe</u> N/A
<u>Special</u> <u>Case</u> Port Clinton	<u>Population</u> 10,328 1,229 7,229	<u>Normal</u> 4 hr. 45 min.	<u>Adverse</u> 6 hr.	<u>Severe</u> 24-30 hr.

*Population varies due to location and transient resident variations due to season and unfavorable weather conditions.

**Time ranges are provided due to the uncertain nature of severe weather conditions (e.g., during a severe snow fall or blizzard, the time it takes to evacuate can vary depending on the direction and speed of the wind).

DATA SHEET 2 (Continued)

<u>IF</u>		<u>THEN</u>
b.	Projected Thyroid Dose greater than 5 rem but less than 25 rem	b. EVACUATE CHILDREN AND WOMEN OF CHILD-BEARING AGE IF POSSIBLE, SHELTER* OTHERS
c.	Projected Thyroid Dose greater than 25 rem, but less than the Decision Dose (Item 7)	c. EVACUATE IF POSSIBLE OR OTHERWISE SHELTER*
d.	Projected Thyroid Dose greater than Decision Dose, then	d. Perform action as follows:
	1. If EEP less than Release Duration	1. EVACUATE
	2. If EEP equal to Release Duration	2. SHELTER*

*SHELTER is to be with VENTILATION CONTROLLED.

END