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Memorandum

TO : Edson G. Case, Assistant Director
Division of Reactor Licensing

DATE: June 22, 1965

FROM : Walter G. Belter, Chief
Environmental & Sanitary Engineering Branch, RDT

SUBJECT: U. S. WEATHER BUREAU HAZARDS SUMMARY REPORT

RDT:NS

Reference is made to your letter of May 20, 1965, to the U. S. Weather Bureau requesting comments on the following:

File Copy

Dresden Nuclear Power Station Unit 2 → 50-237

Volumes I, II, III

The comments of the Weather Bureau's Environmental Meteorological Research Branch are attached.

Attachments:
Comments (orig. & 1 cy.)

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U.S. ATOMIC ENERGY COMM.
REGULATORY
MAIL SECTION

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Comments on

Dresden Nuclear Power Station Unit 2
Volumes I, II, III

Prepared by

Environmental Meteorological Research Branch
Office of Meteorological Research
June 17, 1965

A comprehensive analysis of meteorological data pertinent to atmospheric diffusion has been made for the Dresden area using data from the nearby Argonne Laboratory meteorological tower installation. We agree that the Argonne Data are climatologically representative of the Dresden site. From the Argonne data which covers a 5-year period, the following pertinent stability statistics result:

	0000-2400 hours (entire day)	1900-0700 hours (night-time)
Inversion	46%	71%
Neutral (-0.4 to 0.0 °C/140 ft)	28%	26%
Unstable	26%	3%

Similarly with regard to wind speed:

	0000-2400 hours	1900-0700 hours
Wind, 0 to 3 mph (19 feet)	17%	33%
Wind, 0 to 3 mph (150 feet)	4%	6%

The inversion frequency of 46% for a 140-ft height interval compares with the annual low-level inversion frequency of 30-35% obtained by Hosler (Monthly Weather Review, vol. 89, Sept. 1961) for the Dresden area for a 500-ft interval. A lower frequency for a greater height interval is to be expected. The low wind speed frequency of 17% at the 19-ft level at Argonne compares to 13% at the 15-ft level at

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Dresden for 1 year of data. It is important to note that wind speeds in the 0-3 mph category decrease markedly at the 150-ft level at Argonne. Consequently, at a stack height of 300 ft. one would expect a similar low frequency of wind speeds less than 3 mph.

The site atmospheric diffusion characteristics as discussed in sections III-7 and XI-6 is largely based on an analysis of wind direction range data over an hour period from a one-year record of the Dresden "Aerovane" anemometer at a height of 15 feet. It should be noted that large direction fluctuations (range) are frequently associated with a decrease of wind speed to a value below the "starting speed threshold" of the vane of the anemometer. An instrument such as the Aerovane has a starting speed between 2 and 3 miles per hour. The attached figure, which is a sample Aerovane trace at a height of about 10 meters, illustrates the difficulty of using "range" data to estimate diffusion characteristics at very low wind speeds. Note that in trace A, with wind speeds above 3 mph, the wind direction range (difference in wind direction extremes) over an hour is about 80 degrees. In traces B and C, the vane is obviously stationary for long periods as indicated by the step-like changes in wind direction. If these extreme changes in direction under low wind speeds are included in the average range statistics, the application of these statistics to diffusion characteristics becomes less meaningful. Therefore, a graph such as Exhibit III-7-7 is probably not indicative of the horizontal spread, σ_y, of the cloud. Also, wind range statistics taken under inversion conditions at 15 feet are not necessarily applicable to such statistics at the 150-ft level of the Argonne tower or the assumed 600-ft effective stack height of the Dresden ventilation system. Regardless of height, if wind range statistics are to be used as a probability estimate of minimum diffusion rates, care should be taken not to average together the "steady" fluctuations in wind direction with the unsteady", step-like fluctuations characteristic of standard anemometers at low wind speeds.

A comparison of the horizontal and vertical cloud distributions (σ_y and σ_z) for the condition labeled VS-2 (very stable -2 mph) with those resulting from the Pasquill F condition used in TID 14844 shows the σ_y - σ_z product at a distance of $\frac{1}{2}$ mile to be about twice as great (therefore better diffusion) for the VS-2 condition, while at a distance of 5 miles the products are about equal. As a further comparison, using figure 6 of reference (1) cited on page XI-6-7, the σ_y versus time curve resulting from the TID-14844 assumption (C_y = .40, n = .50, u = 1 m/s) would be more nearly equal to a $\sigma_\theta \bar{u}$ value of 0.05 radian-meter/sec as opposed to the 0.16 value used in the VS-2 condition. As implied in the previous paragraph, the σ_θ statistics available in the report are probably not sufficiently meaningful in the low wind speed categories to be able to determine the probability of occurence of this parameter.

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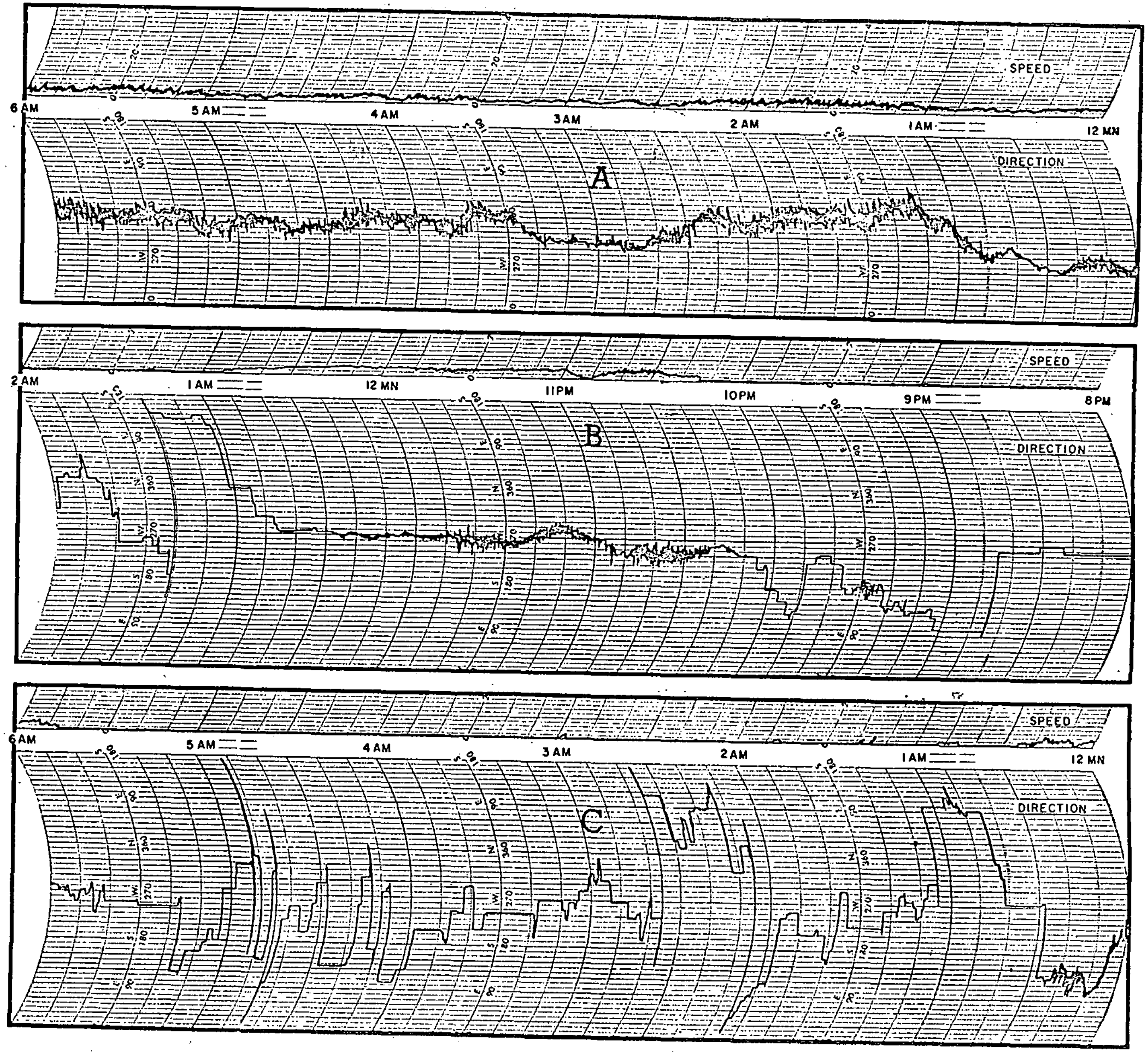
The most critical parameter in the calculation of the downwind ground concentrations summarized in Table XI-7 is the assumption of an appreciable effective stack height. At first glance, it would appear that the very stable-2 mph condition is not the controlling case with regard to the off-site dose. In fact, with the use of a 170 m effective stack height and the very conservative value for vertical mixing in the VS-2 condition, it is safe to say that the cloud never reaches the ground within the first ten miles despite calculated dilution factors such as $(10)^{-120}$! However, using TID-14844 meteorological assumptions, an effective stack height of 170 meters and Sutton's continuous point source equation, a maximum ground concentration of 1.4×10^{-6} µc-sec/cc per curie at a distance of about 20 miles is computed. Thus, with these latter assumptions (TID-14844 with H = 170 m) which we feel are not unreasonably conservative and can be justified as well as the VS-2 assumptions, the ground concentration at 20 miles approach the point at which it becomes the controlling value.

In summary, it is felt that the Dresden site is typical of a continental, non-mountainous, non-desert location in the United States with a probability of having inversion conditions with low surface wind speeds about 20% of the time, during the night half of the day. The diffusion model used in the report is extremely sensitive especially for stable conditions, to the assumed effective stack height. Using the TID-14844 meteorological model and an effective stack height of 170 m, controlling concentrations can be found at distances of 20 miles, which is not apparent from either of the air concentration summaries found in Chapter XI. If for any reason, a ground release of effluent can be postulated, concentrations at a distance of ½ mile could well be on the order of 10^{-3} µc-sec/cc per curie released, which is three orders of magnitude greater than any values found in the report.

Attachment

631.4



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