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MAY 25 1984

NUCLEAR POWER DEPARTMENT
Calvert Cliffs Nuclear Power Plant
Lusby, Maryland 20657

ATTENTION: Mr. P. T. Crinigan
BG&E/Chemistry

Subject: RETS

As a follow up to our discussions on gaseous dose calculations, both at our May 22 meeting and our May 24 Telecon, I am enclosing copies of three NRC memos that clarify and explain our positions.

Original Signed By

Wayne Meinke
Radiological Assessment Branch
(301) 492-9430

Enclosure:
As stated

cc: W. Gammill
C. Willis
F. Congel
D. Jaffe
L. Cunningham

50-317
50-318

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JAN 20 1984

MEMORANDUM FOR: Daniel R. Muller, Assistant Director for Radiation Protection, DSI

FROM: Charles A. Willis, Leader, Effluent Treatment Systems Section, METB, DSI

THRU: William P. Gammill, Chief, METB, DSI

SUBJECT: NOTIFICATION AND REPORTING OF RELEASES OF RADIOACTIVE MATERIALS

As requested, we have reviewed our requirements for notification about, and reporting of, releases of radioactive material from nuclear power plants. The impetus for this review was the apparent uncertainty in coping with the January 1, 1984 release from San Onofre Unit 3. We conclude that the staff position is clearly defined and that this position has been transmitted to the Regional Offices. If further clarification is needed, the appropriate action could be an information notice to the licensees.

The enclosure provides further information and we are prepared to discuss the matter at your convenience. We are also prepared to make a follow-up presentation at a future events briefing as requested by Gary Holahan in his January 13, 1984 memorandum.

The principal problem in this area is the slow progress on updating the radiological effluent technical specifications (RETS) for ORs. Unless something is done to promote cooperation by the licensees, it seems that a number of the ORs will not have approved dose calculation methods in the forseeable future.

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Original signed by

Charles A. Willis, Leader
Effluent Treatment Systems Section
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Enclosure:
As Stated

cc: R. Mattson
W. Gammill
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NRC FORM 318 (11-80) NRCM 0240 USGPO: 1981—335-960

REQUIREMENTS FOR NOTIFYING THE NRC ABOUT RELEASES OF RADIOACTIVE MATERIALS FROM NUCLEAR POWER PLANTS

Requirements

Requirements for notifying, and for reporting to, the NRC about radioactive releases from NPP are established by the regulations and by the technical specifications. The regulations are:

§ 20.403. Notification:

(a) Immediate: 5000 x MPC averaged over 24 hours

(b) One day: 500 x MPC averaged over 24 hours

§ 20.405. Reports (30 days):

(a) Any release requiring notification

(b) Concentration as much as 10 x limit

(c) Any violation of 40CFR190 (.05 x MPC averaged over 1 year)

§ 50.72. Notification:

(a) Immediate (1 hour)

(1) Emergency plan initiation

(2) Technical specification violation

(b) Four-hour

(1) 2 x MPC averaged over 1 hour

(2) Any event resulting in a news release

(3) Any event resulting in notification of another government agency

Despite our concerted efforts, the requirements of the technical specifications (TS) are not the same for all plants. Generally the TS do not require notification based on releases but the TS do include several reporting requirements. Also the TS include release limits that, in principle, could trigger notification under § 50.72. The TS release limits generally will not precipitate

notification because the TS include "action" requirements that keep releases from constituting TS violations. In some cases (such as San Onofre), where an alarm-level release results in a press release and/or notification of the State Government, § 50.72 requires notification of the NRC within 4 hours.

Generally the TS limits on airborne releases that may lead to notification of the NRC are equivalent to:

(a) noble gas: 1 x MPC instantaneous

(b) iodine and particulates: 1 x MPC over 1 week

Atmospheric Dilution

NRC limits are expressed in terms of concentration or dose but these quantities are not directly observable. Licensees measure releases and meteorological parameters. Doses and concentrations are inferred from these measurements. Usually the dilution provided by the exhaust gas flow is negligible in comparison to atmospheric dilution. Therefore, the downwind concentration is taken as

$$\chi = QF/u.$$

Q is the release rate (Ci/sec), u is wind speed (m/sec) and F is a function of distance and atmospheric stability (m^{-2}). Both F and u are subject to large (2 orders of magnitude) fluctuations in short periods of time.

The instantaneous concentrations are of little practical importance. The radiation doses that result are determined by the integral of the concentrations over time. Most of the relevant limits are for a one year period; for example, 500 mrems in one year. Since the release rates are relatively constant and since changes in release rates usually are independent of meteorological conditions, exposure estimates are based on annual average meteorological dispersion. This quantity differs greatly from one site to another (Figure 1).

Potential Problem From Notification Requirements

Today the technology is available to permit evaluation of offsite concentrations using meteorology that is concurrent with releases. If this were done and the results used as a basis for notification, such notifications would be quite frequent.

To understand the problem, consider that in 1980 the average BWR released noble gases at the rate of about 1.7 mCi/sec. This meets the ALARA criteria (of Appendix I) if the annual average dispersion factor is 1×10^{-5} or less. However, at some such plants, about 5% of the time (400 hours/yr) the dispersion can be expected to be so poor (type F stability with 1 m/sec wind) that the offsite concentration exceeds 2 times the MPC. Thus, if the requirement of 50.72 were interpreted as requiring the use of concurrent meteorology, some plants would be notifying the NRC about releases almost daily even though releases were normal.

The problem is further complicated by the practical limitations on wind speed measurements. At most sites the measured value is zero on the order of 1% of the time (90 hours/year). Whenever the wind speed falls to zero the calculated concentration will exceed twice the MPC unless the radioactivity release rate also is zero. Thus, even a PWR on a large site would be required to notify the NRC about releases frequently, perhaps once or twice per week.

Significance of Notification-Level Concentrations

Even the highest of the notification levels (5000 x MPC averaged over 1 day) is about a factor of 10 below a level at which any health effect (nausea)

might be detected. While every release may be assumed to increase the cancer risk, thousands of releases at this level would be required to produce a discernible increase. Thus the notification levels are not levels at which there is a real concern about public health and safety.

The notification levels were established to call NRC attention to poor radiation control practices by licensees.

Limiting Frequency of Notifications

It is important that the NRC not be notified every time the wind speed drops below the limit of measurement. In fact, notification should be limited to relatively important events. In principle this could be done by keeping concentrations below the MPC levels at the release points, thereby eliminating reliance on atmospheric dilution. In practice, however, this would be quite costly if not completely infeasible. Even for plants with minimal releases (such as Yankee Rowe in 1980) it would be necessary either to reduce releases or to increase airflow if MPC levels were to be reached at the release points.

The practical solution is to permit the use of annual average atmospheric dispersion in assessing compliance with the notification requirements. This approach, in various guises, has been standard for many years and was recently reaffirmed.* The Technical specifications (usually) are clear on this point but the regulations need interpretation. This is expected to hold notification frequency to an acceptable level. The use of annual average atmospheric dispersion permits the use of alarm set-points that do not fluctuate

* L. J. Cunningham, "Inspection Guidance - 50.72," Memorandum to Robert Greger, November 15, 1983.

with the wind. It also avoids over-reliance on complex computer systems and permits reactor operation at constant power through changing weather conditions.

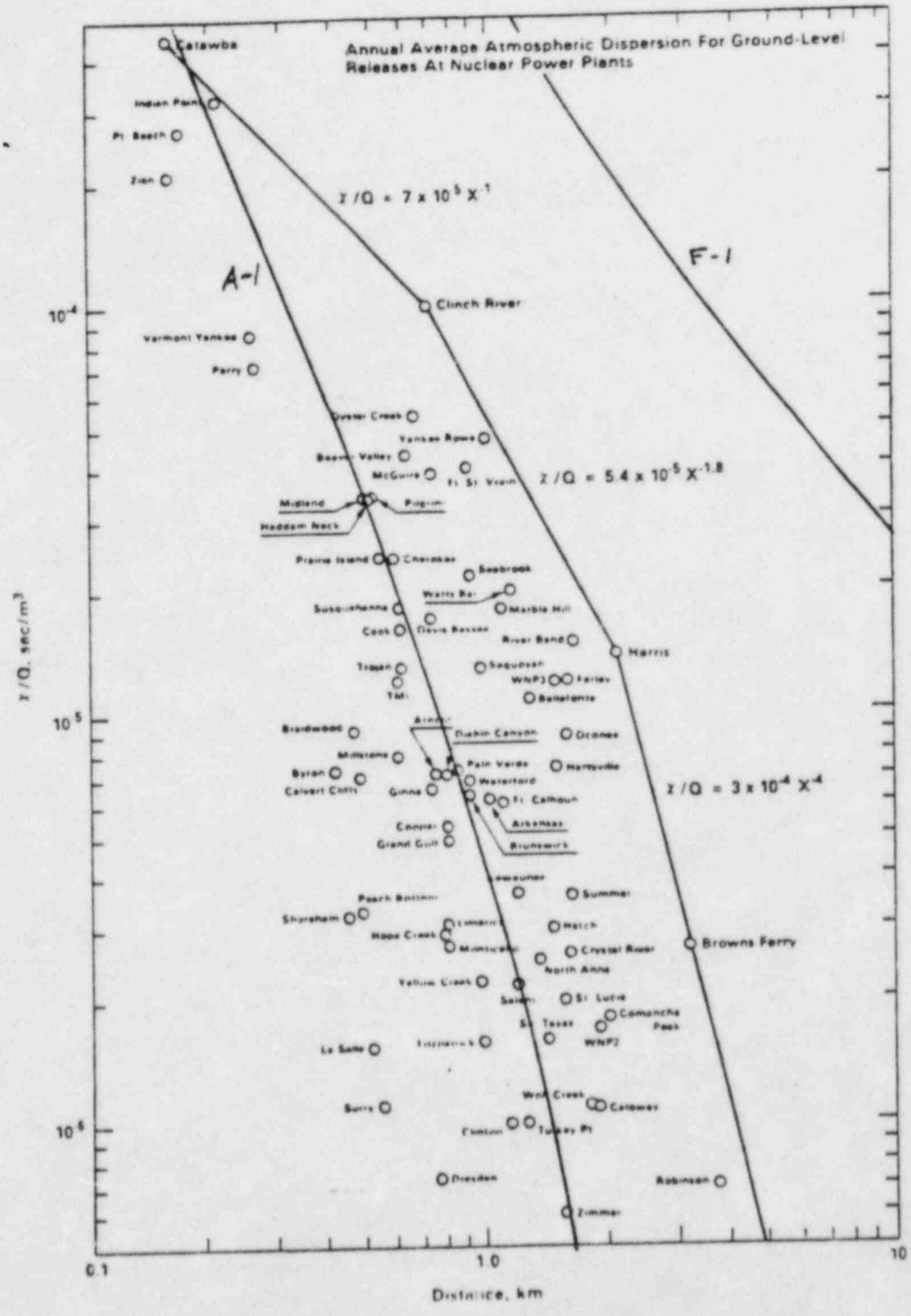
The use of annual average atmospheric dispersion is intended as an option for the licensee. In some situations the use of "real time" dispersion may be desirable. For example, the NRC does not object if a licensee wants to empty a waste gas tank relatively rapidly at a time when the wind will carry the radioactive gas out to sea or when dispersion conditions are good.

Dose Calculation Methodology

The methods for calculating doses are well established by regulatory guides and topical reports. Further, the NRC has recently published a textbook on radiological assessment that compiles this information in a single document and that provides additional clarification.

Many of the NPP licensees have established their own dose calculation methods in NRC-approved documents called "offsite dose calculation manuals." When the current effort to update the radiological effluent technical specifications (RETS) for ORs is complete, all NPP licensees will have approved dose calculation methods.

The most significant remaining problem in this area is the slow progress on RETS. About half the ORs do not yet have approved dose calculation methods. Current indications are that about a quarter of the ORs will not have approved methods in the forseeable future.


Annual Average Atmospheric Dispersion For Ground-Level Releases At Nuclear Power Plants
χ/Q = 7 x 10⁵ X⁻¹
A-1
F-1
χ/Q = 5.4 x 10⁻⁵ X⁻¹·⁸
χ/Q = 3 x 10⁻⁴ X⁻²
Catawba
Indian Point
Ft Beach
Zion
Clinch River
Vermont Yankee
Perry
Oyster Creek
Yankee Rowe
Beaver Valley
McGuire
Ft St Vrain
Midland
Pilgrim
Haddam Neck
Prairie Island
Charlestown
Seabrook
Watts Bar
Susquehanna
Marble Hill
Cook
Davis Besse
River Bend
Harris
Trojan
Sequoyah
WNP3
Fermi
TMI
Bellefonte
Braidwood
Diablo Canyon
Oconee
Millstone
Palo Verde
Hartsville
Byron
Calvert Cliffs
Ginna
Waterford
Ft Calhoun
Conroe
Grand Gulf
Arkansas
Brunswick
Shearon
Summer
Peach Bottom
Shoreham
Hope Creek
Limerick
Hatch
Crystal River
Browns Ferry
North Anna
Yellow Creek
Salem
St Lucie
Comanche Peak
Texas
WNP2
La Salle
Surry
Watts Creek
Calloway
Clinton
Turkey Pt
Dresden
Robinson
Zimmer
χ/Q, sec/m³
10⁻⁴
10⁻⁵
10⁻⁶
0.1
1.0
10
Distance, km