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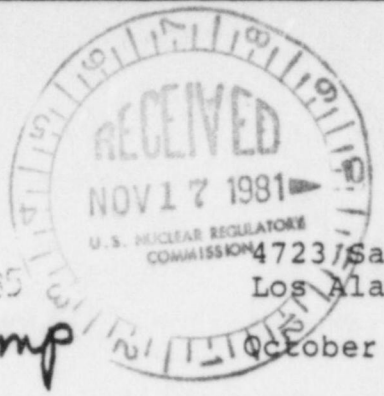

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October 29, 1981

(3)

Secretary of the Commission
Attn: Docketing and Service Branch
Nuclear Regulatory Commission
Washington, DC 20555

DOCKET NUMBER
PROPOSED RULE PR-70
(46 FR 45144)

RE: Proposed Nuclear Regulatory Commission Rulemaking: Material Control and Accounting Requirements for Facilities Possessing Formula Quantities of SSNM.

Dear Mr. Secretary:

Advanced notice of proposed rulemaking appeared in the Federal Register, V46, No. 175, September 10, 1981. The goals include: timely detection of possible loss; rapid determination of whether an actual loss occurred and identification of the source of such loss; and long-term assurances that no significant loss has occurred. Option 1 offers neither timely detection nor rapid determination of losses. Option 2 is an improvement on Option 1, but would be too difficult for a facility to execute because of the frequency of physical inventories. Options 3, 4, and 5 merit closer attention.

In setting the requirements for early loss detection for the reform amendments, the commission has not considered the associated false-alarm probabilities. If Option 3, 4, or 5 are adopted, the false-alarm rate in most cases will be much greater than 5%, resulting in an interminable number of production stoppages and unacceptably low productivity. The greater the frequency of interruptions of a plant process, the more vulnerable the process becomes to material losses.

Consider the requirement to detect a loss of 5 formula kilograms (fkgs) on a plant-wide basis with 90% probability. Assume that a materials control unit has a control quantity of 1.6 fkgs. The control quantity of 1.6 fkgs is given as a "reasonable amount" to comply with Sections 70.83.c.1,,i,ii,iii,iv, and 70.83 a.3.ii. Given this constraint, all other limiting factors

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from pertinent sections of the rules are satisfied. Under these conditions, and given the standard deviation, σ, of the estimate of the materials balance in a materials control unit (MCU), Table I lists the minimum value of the false-alarm rate α that would result. For example, if σ = 0.6 fkgs, the false-alarm rate would be at least 8.3%. Most facilities could not obtain a standard deviation as low as 0.6 fkgs for each MCU unless the throughput were very low or if it were possible to make multiple measurements. In a recent study based on an example system using realistic data,[1] 5 MCUs in an HTGR Coated Particle line of the facility were examined using computations analogous to those for Table I. Standard deviations and false-alarm probabilities are summarized as follows:

MCU	σ (fkg units)	α
1	1.66	0.62
2	1.30	0.52
3	0.69	0.15
4	0.60	0.08
5	0.30	<0.001

Note that in 3 of the 5 MCUs false alarms would occur at a rate greater than 15%. A standard deviation of less than 0.6fkg is required to have a reasonable false-alarm rate of 8.3% or lower.

The control quantity given in the above examples is based on a plant with 5 statistically independent MCUs with identical σ and each with a control quantity of 1.6 fkgs. The total quantities over all units would be 5 x 1.6 = 8 fkgs; however, 2 MCUs could be isolated and the remaining 3 MCUs would sum to 4.8 fkgs, which would fulfill the requirements.

The expected value of 2 fkg, given an unresolved false alarm as stated in paragraph 70.83.a.3.iii, is a requirement that is to be attained simultaneously with that of paragraph 70.83.a.3.ii. A third specification, a.3.i, which requires a 99% detection probability for 5 fkg of SSNM in a control unit, is not as stringent as the other two and is superfluous.

To summarize, options 3, 4, and 5 are difficult to understand and impractical to implement because of the high precision of measurements required and because of the high false-alarm rates. A suggested revision would retain the requirement to detect a 5 fkg loss within a control unit with 99% probability. It should be possible for a licensee to meet this requirement with a false-alarm rate of 5% for standard deviations of the materials balance of less than 1.3 fkg. Either detection probability or the control quantity in paragraph 70.83a.3.ii should be adjusted so that attainable standard deviations (0.6-1.3 fkg)

would have corresponding false-alarm rates close to 5%. The requirement given in 70.83a.3.iii should be deleted. Option 5, which would limit the application of MC&A reforms to new facilities and major modifications of existing facilities, should be chosen. Existing plants are not designed to permit application of process monitoring and retrofitting costs would be prohibitive.

Sincerely yours,

Aaron S. Goldman

Ralph G. Gutmacher

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Enc. Table I

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[1] D. B. Smith, R. G. Gutmacher, J. P. Shipley, D. Stirpe, and A. S. Goldman, "MC&A Reform Amendment: Example System Beta Candidate MC&A Systems and Statistical Techniques," (1981). Sent upon request.

TABLE I

STANDARD DEVIATIONS OF MATERIALS BALANCES AND CORRESPONDING FALSE-ALARM RATES - REFORM AMENDMENT OPTIONS 3, 4, AND 5

Standard Deviation (σ) (fkg)	False Alarm Rate, %
0.1	<0.1
0.2	<0.1
0.3	<0.1
0.4	0.3
0.5	2.8
0.6	8.3
0.7	15.8
0.8	23.6
0.9	31.0
1.0	37.5
1.1	43.1
1.2	47.9
1.3	52.0
1.4	55.5
1.5	58.5
1.6	61.1
1.8	65.3
2.0	68.5