UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

February 2, 1977

NOTE FOR: Bud Evans

FROM: Bob Erickson

SUBJECT: PERFORMANCE-ORIENTED RULE

Following your meeting on February 1, Tom Thayer and I discussed characteristics of a performance-oriented rule and ways of developing one. (Tom is writing his own short note to you on this subject.)

In striving for a performance-oriented rule, I believe your team must use "functional analysis." By this, I mean you need to translate requirements into safeguards functions to be performed.

Most of the safeguards functions will probably be identified in the "disaggregation of basic capabilities" being done by Andy Poltorak. You might go further, however, by functionally analyzing the minimum set of specific requirements Don Kasun is developing. If Don's list is sound, it will point at gaps in the set of safeguards functions. The next step, then, is simply to fill those gaps by translating each of Don's specific system features into statements of functions which he counts on them to perform.

Finally, as a cross check on the completeness of the new performance rule, you might consider subjecting the entire existing Part 73 to such "functional analysis" to assure that any safeguards functions, so-identified, are already covered in the new rule (or deliberately excluded).

Bob Erickson

cc: T. C. Thayer
R. Jones
D. Kasun
A. Poltorak
C. South

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SUMMARY OF THE ISSUES

The issues which presently surround the design of the Basic Capabilities can be divided for purposes of analysis into two groups.

- Boundary Crossing Issues, in particular:
  - Should a licensee be required to have a capability vis a vis personnel departing from MAA's, VA's or PA's if those personnel carry no SSNM?
  - Should a licensee be required to measure the amount and type of nuclear material entering his facility and to assess its authorization for entry?
- Area-Related Issues, in particular:
  - What constitutes unauthorized activities?
  - What is to be included in conditions:
    - All physical objects which influence the performance of the safeguards system?
    - The physical plant, equipment, and grounds?
    - The physical plant, equipment, and grounds, less the containment of SSNM?
  - What is to be included as containment?
    - Physical containers in immediate contact with SSNM?
    - All physical containers within vaults or process areas?
    - All physical containers within the MAA?
  - What capabilities shall we require a licensee to have vis a vis SSNM which is not crossing the boundary of the MAA or PA?

These two groups of issues can be analyzed separately since decisions made with regard to one do not influence decisions made with regard to the other. The purpose of this issue paper is to address the latter, the Area Related Issues, by presenting and analyzing the options pertaining to SSNM.

THE PRIMACY OF SSNM

Within the group of Area Related Issues, there is a great deal of cross-impact among the options. The selection of an option regarding one of these issues necessarily forecloses options regarding other issues. Thus, it is useful to begin the analysis by focusing our attention on the most fundamental

issue. Such an approach reserves for the most important issue the greatest freedom of action while constraining those of lesser importance.

It can be argued that the disposition of SSNM is such an issue. This is because SSNM is at once the target of the adversary and the purpose of safeguards. Therefore its treatment in the analysis of the Basic Capabilities deserves primary attention.

OPTIONS REGARDING SSNM

The issue here concerns the capabilities which we would require a licensee to have regarding SSNM which does not cross the boundaries guarded by BC3. A secondary issue, how and where the selected option should be stated, will be discussed subsequently. The substantive options which we have seem to be:

1) Assure that SSNM is in known places.

2) Assure that SSNM is in known places in known quantities.

3) Assure that SSNM is in authorized places.

4) Assure that SSNM is in authorized places in authorized quantities.

5) Assure that SSNM is in authorized containment.

6) Assure that SSNM is in authorized places in authorized quantities and in authorized containment.

7) Licensees would be required to have no special capability with regard to SSNM within MAA's.

DISCUSSION OF OPTIONS REGARDING SSNM

1. Assure that SSNM is in known places. This requirement places the minimum burden on the licensee. It merely requires that he be able to identify where SSNM is located within his facility. He need not ascertain the quantity, whether or not the SSNM should be there, or the state of the containment.

- Advantages. This does not require the licensee to have a quantitative material accounting capability.
- Disadvantages. This statement of capability is plainly inadequate to provide any increment to safeguards protection. At best, it raises the licensee's awareness of the flows of material within his facility. However, it requires no action regarding them.

2. Assure that SSNM is in known places in known quantities. This adds a quantitative burden to the licensee by requiring him to have a material accounting system.

- Advantages. This improves the licensee's information about SSNM flow within the MAA.
- Disadvantages. The licensee is still not required to respond to the information so gained.

3. Assure that SSNM is in authorized places. Achievement of this capability requires that the licensee (a) knows the location of all SSNM within the MAA, (b) compares these places with those in which SSNM is authorized, and (c) responds to correct any deficiencies.

- Advantages. This is the first SSNM capability which is complete in the sense that it requires a response. It does not require a material accounting system.
- Disadvantages. Safeguards protection is limited in that there is no quantitative requirement.* Therefore, the licensee does not know the distribution of SSNM among the places in which it is authorized.

4. Assure that SSNM is in authorized places in authorized quantities. This statement adds a quantitative requirement to the qualitative statement in Option 3.

- Advantages. This is now a complete capability with regard to SSNM.
- Disadvantages. The licensee is implicitly required to have a material accounting capability.

5. Assure that SSNM is in authorized containment. This concept assures that the SSNM is always contained within an authorized "skin". This precludes the material from being kept in a manner which could reduce the effectiveness

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*It is, of course, possible to subsume the quantity under the concept of "authorized place" or "known places". To do so makes Options 1 and 2 identical and Options 3 and 4 identical.

of the safeguards system even though the place and quantity may be authorized. Of course, this requirement could not stand alone as an effective safeguard since it contains no capability to prevent the bulk movement of SSNM, containment and all.

- Advantages. This covers the above-mentioned gap in the safeguards system.
- Disadvantages. The definition of containment will be difficult, especially in terms of separating containment from "conditions" of plant and equipment.

6. Assure that SSNM is in authorized places in authorized quantities and in authorized containment. This adds the containment concept to Option 4. As a result, Option 6 states a capability which, if perfectly executed, would by itself prevent the theft or diversion of SSNM.

- Advantages. We would have three such "independent" capabilities.
- Disadvantages. Same as Options 4 and 5.

7. Require no special SSNM capabilities within the MAA.

- Advantages:
  - No material accounting requirement.
  - The difficulty inherent in defining containment is removed.
- Disadvantages. It would be difficult to demonstrate that licensee safeguards are adequate in the absence of a capability which looks directly at SSNM.

ANDY Jan 25, 1977
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TOPICS FOR CONSIDERATION

- Detection Concept

  Detection of human activities, SNM, and certain types of contraband material can be accomplished utilizing sensors (hardware), detection algorithims (software), human observation (manual), and combinations of these. System detection performance is driven by individual component detection performance.

  When the detection component is automatic; that is, detection is simply caused by a predetermined threshold being exceeded by noise or signal plus noise condition, the performance prediction of that component as measured by probability of exceeding a threshold can usually be quantified. Thus valid specs. could be written to guarantee certain component detection performances. Usually, simple sensitivity tests will suffice to guarantee compliance, although a more elaborate mathematical modeling effort implemented on a computer would be a valid and a realizable prediction tool to simulate component performance. The model could also be used to guarantee compliance.

  Detection by human observation is much harder to predict. Tests designed to empirically measure this type of performance would obviously require considerable time, manpower, and resources to simulate potential unauthorized

activities or conditions. For this reason, it is deemed unwise to write specific performance specs. pertaining to detection performance by human observation.

System detection performance is controlled by the individual component performance, and by the configuration and interaction of various components. For "simple" systems, detection performance could well be predicted by component performance in combination with the appropriate rules of probability theory. However, when detection systems are comprised of computer-controlled interfaces, signal processing algorithms , and human interface, the prediction performance becomes more complex. Therefore, specs. written that require the system to attain certain levels of detection measured by probability quantification will be more difficult to enforce, or guarantee compliance. Perhaps the only way to measure system performance will be through a mathematical modeling and simulation effort. Here again the success of measuring or quantifying system performance will depend inversely upon the extent of human interaction as a system component.

- Classification or Assessment Concept

  This vital function of the total operational security system could be treated on a level with detection, classification, and response.

The role of the classification function is to identify the cause and source of any alarm, and localize the source of the alarm.

The classification capability interacts with the detection capability in the following manner: By reducing or relaxing the thresholds set for detections, we admit a larger amount of "noise" data that due to random fluctuations will cause the component(s) (and therefore the system) to annunciate more often. This in turn necessitates action by the on-site security force to classify each alarm according to "real" or "false". Conversely, if the detection thresholds are set high, false alarms will be greatly minimized due to random fluctuations. More probably, an alarm annunciated by a sensor with a high threshold is "real". However, we run the risk of rejecting an actual "real" alarm if the threshold is set too high. To summarize, if detection thresholds are set very low, thus causing many alarms, classification becomes very important so as not to ignore any "real" alarm. If detection thresholds are set very high, the classification is almost automatically taken care of at the moment a detection occurs; it is almost surely a "real" threat alarm.

In situations where a threat type or characteristic and the environment is controlled and well defined, classification can be designed into the system as an automatic feature using predetermined criteria or algorithms. For the fixed site security problem however, classification of alarms will probably be done manually. Operational experience will greatly facilitate and define classification methods.

In general, it would be difficult to write meaningful specs. concerning specific classification methods or algorithms. Therefore, it is recommended that any guides, rules, or regs written concerning classification of alarms cover only general performance requirements, not down to the "component" level.

- False Alarms

It should be reasonable to specify maximum permissable false alarm rates at the system level. First, there exists a body of data on intrusion detection systems that substantiates reasonable limits for false alarm rates so as not to undermine operator confidence in the "system". Second, in actual practice, daily logs should be kept that catalogue every alarm. By merely counting the number of these alarms over a given time, we can see if the specs. are being met.

- Response Times, Reaction Times, Delay Times.

  These types of requirements concern response force alertness, boundary protection, communications times, etc. In each case where a maximum or minimum time is specified, it should be possible in practice, through emergency drills, to test whether the requirement is being met.

- Reliability, Maintainability, Accuracy

  It is my opinion that the concepts of reliability and maintainability concerning security systems and components should be left to the licensee, not dictated to him through rules, guides, or performance requirements. He will, or should, through monetary and operational efficiency, choose and operate that set of equipments which exhibit the best reliability and maintainability standards.

  the quest. is whether he will have access to such info

  the quest. is whether he will maintain them adequately

  Statements concerning "accuracy" of material measurements, identification, etc. belong in a DPA-type approach, but not in physical security requirements. Measurements necessary to assess "accuracy" would require extensive analytic support.

  to what extent within a certain distance?

ANDY Jan 25, 1975

- Simplification of Conceptual Framework Format

  There is growing public pressure to simplify language or jargon in documents such as insurance policies, tax forms, etc. We should strive to simplify the analytic jargon introduced for this study, namely terms like function, sub-function, sub-sub function, ad infinitum, ad nauseum.

  As an alternative for consideration, please refer to Table I. As you can see, it presents the WHAT, and WHY referred to by the Builder memo of August 16, 1976, and also presents the HOW, if desired. The terms Performance Requirement, Purpose, and Mechanism are not married to the analytic dictionary, as are function, sub-function, etc. It would seem to be more easily understandable, consistent, and self-explanatory to use these terms.

good - we ought to use this in explaining why we're driving for

1st ORDER

Performance Requirement (Criteria or basic cap.)	Purpose (function)	Mechanism (systems, subsystem
This is WHAT	This is WHY	This is HOW

2nd ORDER

Performance Requirement	Purpose (sub-function)	Mechanism (elements)

3rd ORDER

Performance Requirement	Purpose	Mechanism (components)

The Ph.D. Illiterate

By James P. Degnan

THE SCENE is my office, and I am at work, doing what must be done if one is to assist in the cure of a disease I have come to call straight-A illiteracy. I am interrogating, I am cross-examining, I am prying and probing for the meaning of a student's paper. The student is a college senior with a straight-A average, an extremely bright, highly articulate student who has just been awarded a coveted fellowship to one of the nation's outstanding graduate schools. He and I have been going over his paper sentence by sentence, word by word, for an hour.

"The choice of exogenous variables in relation to multi-colinearity," I hear myself reading from his paper, "is contingent upon the derivations of certain multiple correlation coefficients." I pause to catch my breath. "Now that statement," I address the student — whom I shall call, allegorically, Mr. Bright — "that statement, Mr. Bright — what on earth does it mean?" Mr. Bright, his brow furrowed, tries mightily. Finally, with both of us combining our linguistic and imaginative resources, we decode it. We decide exactly what it is that Mr. Bright is trying to say, which is: "Supply determines demand."

Bright's disease attacks the best minds and gradually destroys the critical faculties, making it impossible for the sufferer to detect gibberish in his own writing or in that of others. During the years of higher education it grows worse, reaching its terminal stage, typically, when its victim receives his Ph.D.

The ordinary illiterate — perhaps providentially protected from college and graduate school — might say: "Them people down at the shop better stock up on what our customers need, or we ain't gonna be in business long." Not our man. Taking his cue from years of higher education, years of reading the textbooks and professional journals that are the major sources of his affliction, he writes: "The focus of concentration must rest upon objectives centered around the knowledge of customer areas so that a sophisticated awareness of those areas can serve as an entrepreneurial filter to screen what is relevant from what is irrelevant to future commitments."

The major cause of such illiteracy is the stuff — the textbooks and professional journals — the straight-A illiterate is forced to read during his years of higher education. If he is majoring in sociology, he must grapple with journals bulging with barbarous jargon, such as "ego-integrative action orientation" and "orientation toward improvement of the gratificational-deprivation balance of the actor."

♦♦♦

THE CURE for straight-A illiteracy is simply for the various academic disciplines to recognize and reaffirm the homely truth that the one thing they share, and must share if they are to communicate with one another, is a common language, the English language, a language with conventions and standards that determine whether it is being used well or badly.

To recognize the truth that writing well tends to mean writing simply, clearly, vividly and forcefully, whether such writing is done by a philosopher or an engineer; to recognize the truth that, having nothing to say, one should refrain from using thousands of words to say it; to recognize the truth that pretentious nonsense is not profundity, is painful for many and perhaps economically disastrous.

As one of the many straight-A illiterates I have known once explained, "If I followed your advice, I could never write the 5,000-word term papers I am regularly assigned; I could never get a fellowship to graduate school, or a contract to do a textbook, or a decent job in business or government. What you're asking is just too much. Think what it would do in the universities ... It would wipe out hundreds of courses and all of the colleges of education. And think what it would do to the economy; think of the depression it would cause in the paper and ink and business-machine industries; think what would happen in the publishing business; think of all the secretaries who would be out of work. No, I'm sorry, literacy might be okay, but I can't afford it."

Degnan teaches writing at the University of Santa Clara in California.

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Doug —
Good pt. — you're right —
we should avoid this —
Bud

Bud — 1/25

Follow-on work from
'51 on issues.
They want to know
what to do next.

4 Upgrade w/tsk
6 - issue papers