Felix M. Killar, Jr.
Director
Material Licensees and Nuclear Insurance
Tel: (202) 739-808126
Fax: (202) 533-0157
E-mail: fmk@nei.org

April 14, 2000

Mr. Theodore S. Sherr
Chief, Regulatory and International Safeguards Branch
U.S. Nuclear Regulatory Commission
Two White Flint North 8A33
Washington, D.C. 20555

Reference: Comments on the March 2000 Draft Version of NUREG-1520 '*Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility*': Chapter 5 – Nuclear Criticality Safety

Dear Mr. Sherr:

The Nuclear Energy Institute (NEI)[1] and its industry members have reviewed the March 2000 revision of draft Standard Review Plan (SRP) Chapter 5 entitled 'Nuclear Criticality Safety'. Time has not permitted a comprehensive clause-by-clause review of this latest revision, but we have attempted to identify any significant, outstanding issues of concern. We have examined how the staff has addressed issues raised by NEI in its letter to you dated August 18, 1999 on the previous version of Chapter 5 (May 1999). We have also taken into consideration discussions that took place at the February 9-10, 2000 NRC Public Meeting ('*Comment Resolution on Part 70 Standard Review Plan*').

NEI appreciates the opportunity to have been able to review the March 2000 revisions to draft NUREG-1520 chapters. We are encouraged by the ongoing

[1] NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

resolution of industry concerns and with other improvements that have been made to this guidance document. We look forward to working with you and your staff at the upcoming April 18-19, 2000 NRC Public Meeting on NUREG-1520 to continue these discussions.

Please feel free to contact me should you have any questions concerning the proposed improvements in the attachment to this letter.

Sincerely,

Felix M. Killar, Jr.
Director, Material Licensees and Nuclear Insurance

c. Mr. Marvin S. Fertel
Dr. William F. Kane, Director NMSS

Ref: I:\Files\Part 70\SRP (March '00) Ch. 8 Comment Letter..msw

REVIEW OF MARCH 2000 REVISION OF NUREG-1520
CHAPTER 5: NUCLEAR CRITICALITY SAFETY

General Comments:

Chapter 5 has been improved through incorporation of several of industry's August 1999 comments. However, new sub-chapters on licensee commitments have been added -- which simply exacerbate the excessive redundancy and repetition of this chapter. Problems remain with license applicant commitments to ANSI standards (e.g. requiring commitment to appendices that only provide examples rather than guidance). There are varying and inconsistent degrees of detail called for in the contents of the ISA Summary and NCS program description in the license application. Some attempt has been made to shorten Chapter 5 (e.g. through elimination of reference material titles), but in many cases the guidance has become too open-ended and broad to ensure consistency in license application reviews. This chapter requires a thorough editing and revision.

NEI encourages editors of Chapter 5 to consult draft NUREG-1718, which is the latest SRP that has been prepared using NUREG-1520 as a model. In many chapters of NUREG-1718 the guidance is more concisely and logically expressed than in NUREG-1520 without any loss of substance.

Outstanding Issues of Concern:

- *License Application*: the SRP should clarify that the NCS review will be based on material presented in the license application and on information placed on the docket (ISA Summary). The chapter frequently provides inconsistent guidance as to the level of detail expected in information in each locale. This is especially apparent in Chapter 5. For example, §5.3.4 (referring to the ISA), stipulates that specific controls relied on to provide reasonable assurance that an inadvertent nuclear criticality will not occur are to be specified in the ISA Summary. However, for example, §5.4.3.4.2 seeks designation (and description) of such controlled parameters in the license application. NEI recommends that the more general controlled parameters be described in the ISA Summary -- which will significantly reduce the regulatory burden once a facility becomes operational. Less detailed commitments in the ISA Summary to a controlled parameter are sufficient, given the commitment to associated acceptance criteria, along with management measures and other results of the ISA. The introduction should provide some general statements linking NCS with the ISA. Specifically, it should state that the criticality safety evaluations provide the information needed to establish criticality controls and that such criticality controls are incorporated into the ISA Summary as IROFS.

Specific controls used for criticality safety should be fully documented in the criticality safety evaluations and the ISA, but only the controlled parameter should be mentioned in the ISA Summary document. Only IROFS should be mentioned in the ISA Summary.

- *SRP Philosophy*: This chapter has been written to address treatment of nuclear criticality events -- which are high-consequence events (10 CFR 70.62(b). However, not all provisions in Chapter 5 (e.g. management measures) need to have this highest level of robustness or comprehensiveness applied. We recommend addition of a sentence in the chapter introduction to address this concern: "*...Management measures may be graded in accordance with 10 CFR 70.62(d) based upon the results of the ISA...*". NEI does not support the approach in Chapter 5 that requires a license applicant to defend why the highest level of assurance or a particular industry standard is *not* being used; an applicant must describe why a selected approach will provided reasonable assurance that a performance objective will be satisfied.

- *Consistency in Terminology*: several instances of inconsistent references to 10 CFR 70 or to terminology are noted. For example, '*nuclear criticality safety*' and '*criticality safety*' are interchangeably used. (The former should be consistently used). '*SNM*' is frequently referred to as '*fissile material*' or '*licensed material*'; consistency in referring to it as SNM is recommended for agreement with 10 CFR 70.

Specific Concerns:

- *§5.1: ('Purpose of Review'):* while the purpose expressed in §5.1 is technically correct, we recommend addition of some more specific language, such as that proposed in draft NUREG-1718, to assist the reviewer:

> *"The purpose of this review is to determine whether the applicant, in the license application and supported by materials on the docket, has (1) established an adequate organization with which to implement the NCS program, (2) established an adequate NCS program to ensure safe operation of the facility, (3) implemented adequate controls and limits on parameters relied on to prevent nuclear criticality, and (4) assessed accident sequences that could lead to a nuclear criticality that were identified in the Criticality Safety Evaluations (CSEs) and documented in the Integrated Safety Analysis (ISA)."*

- *§5.3 ('Areas of Review')*:

(i) 1st sentence, item (4): the last 6 lines of this item (all Rule references) are repeated in §5.3.4 and are not needed in a general introduction to 'Areas of Review'. Replace item (4) to read: "*…technical practices used to ensure the safe operation of the facility, and (5) the applicant has committed to establish an adequate criticality accident alarm system (CAAS)…*"

- *§5.3.1 ('Management of the NCS Program')*
  - (i) the title of this section and the contents do not match. Inclusion of objectives of an effective NCS program in Chapter 5 is recommended, but not in this section. There is no discussion of management of the NCS program in this section. Misplaced text?
  - (ii) Item 1(b): How is the sequence identified? Re-word sentence to read: "*…occurrence of an accident sequence identified in the ISA Summary that could*
- *§5.3.2 ('Organization and Administration')*
  - (i) first sentence is unclear: '*organization and administration*' probably refers to '*applicant*'. Reword: "*…to determine whether the applicant has identified the responsibilities and authorities for organizations and individuals to develop and implement the NCS program. This review should include:…*"
  - (ii) re-write item (2) to read "*…The administrative organization of the NCS program as discussed in SRP Section 2.3, including authority and responsibilities for each position identified and individuals having responsibility for NCS…*"
  - (iii) the correction in (ii) obviates the need for item (4). Delete.
  - (iv) item (5) addresses '*program resources*'. This is not an organization and administration issue and should be re-located elsewhere in Chapter 5.
- *§5.3.4 ('Methodologies and Technical Practices')*
  - (i) item (8) should logically be the first item (item (1)) -- i.e you first have to derive and implement NCS controls before anything else. Suggest, for consistency, with the language in items (1)-(7), this item be reworded: "*… The commitment to derive and implement NCS controls and limits in accordance with appropriate NCS methodologies and technical practices described in the application…*" and that it be renumbered item (1)
  - *(ii)* item (7): suggest expanding this item: "*…the areas of review listed in SRP section 3.3 as they relate to NCS, specifically: (1) potential accident sequences that could result in a nuclear criticality, (2) specific controls relied on to provide reasonable assurance that an inadvertent nuclear criticality will not occur, and (3) demonstration that the likelihood of failure is sufficiently low so as to demonstrate compliance with the double contingency principle…"*

- *§5.4 ('Acceptance Criteria')*
  - (i) 1st sentence [new text]: "*…acceptance criteria are relevant to the operations and materials to be licensed…*": the meaning of this sentence is unclear. Obviously, the acceptance criteria in SRP Chapter 5 will be limited to those that are '*relevant to the operations and materials to be licensed*' -- otherwise they should be deleted. Clarify.
  - (ii) 3rd sentence: a licensee should *never* be expected to 'commit' to recommendations (i.e. "shoulds") in a standard. "Shoulds" are only recommendations and were never intended to be "shalls" in an ANSI/ANS standard.
- *§5.4.3.1 ('Management of the NCS Program')*
  - (i) item (8) only applies only to new facilities. Re-write this item to read: "*…the applicant commits to adhere to the NCS baseline design criteria requirements in §70.64(a) for new facilities and new processes at existing facilities that require a license amendment under §70.72…*".
- *§5.4.3.2 ('Organization and Administration')*
  - (i) item (6): should read: "*…organizational positions, experience of…*" (not plural)
  - (ii) item (1) is too broad. The SRP should provide the reviewer with more guidance as to what to look for under the Organization and Administration section of SRP Chapter 2.4. Re-write this point to read: "*…The applicant meets the acceptance criteria related to NCS in SRP Chapter 2.4, and describes organizational positions, functional responsibilities, experience and required qualifications of persons responsible for NCS…*"
  - (iii) items (2) and (3) are redundant with one another. If the applicant has committed to ANSI/ANS in item (2), why require a re-commitment in item (3)? Merge these two requirements.
  - (iv) item (5) -- 2 concerns: (1) requires written procedures for all activities, including maintenance, for simple recovery actions. The word '*analyze*' in the last sentence should be changed to '*evaluate*' as the meanings differ and ANSI/ANS 8.19 uses the term '*process evaluation*'. '*Analyzed*' could be interpreted to require calculations. The NCS function should be allowed to provide guidance and not procedures at times when it is important to act quickly. Most licensees are required to provide formal training before using procedures, and time may not permit this. (2) insert the words "*…with licensed material…*" in the policy statement. Many maintenance activities performed on cleaned equipment need not be done by a licensed procedure and the associated administrative controls. Thus modify the policy

statement to read, in part: "*…personnel shall report defective NCS conditions to the NCS function and perform actions <u>with licensed material</u> only in accordance with written, approved procedures…*"

- *<u>§5.4.3.3 ('Management Measures')</u>*
  - (i) in the introduction to this section, the reviewer should be advised of the '*grading*' of management measures that 10 CFR 70 permits. Add the sentence: "*…Management measures may be graded in accordance with 10 CFR 70.62(d)…*"
  - (ii) Training: the policy outlined in item (c) is an exact copy of §5.4.3.2(5). There is no need to repeat this policy. Re-write item (c) to read: "… *<u>the applicant commits to provide instruction in the training program regarding the policy stated in Item (5) of Section 5.4.3.2(5)</u>*…"
  - (iii) Procedures: Items 2(a) and 2(b) are repetitive. Committing to ANSI/ANS 8-19 will, by default, include commitment to Section 7.2. Item 2(b) is simply a restatement of ANSI/ANS 8-19 Section 7.2. Delete Item 2(b) as redundant.
  - (iv) Audits and Assessments: Item 3(b) remains unnecessarily prescriptive by establishing weekly as the base threshold value against which alternate schedules are to be defended.
- *<u>§5.4.3.4.1 ('Methodologies')</u>*
  - (i) item (4): delete '*inadvertent*'. This criterion should apply to both deliberate and inadvertent nuclear criticalities
  - (ii) item (6): there is no technical basis for the demand that the administrative margin of sub-criticality be "large" compared to the uncertainty in calculating k_{eff}. The relative magnitude of their values is irrelevant.
  - (iii) items (7) and (8): these two criteria are identical other than the fact that item (7) wants a <u>summary</u> of the validation report (which, based upon sub-items (a) through (i) is just a list of nine commitment statements), and item (8) seeks the validation <u>report</u>. NEI recommends:
    - delete item (7) entirely & rely on item (8)
    - delete the requirement for a date and revision number of the validation report. Otherwise, the NRC will have to approve any modification of the validation report, as the date and revision number of the report will be included in the application. This could simply mean that NRC approval would be required if the licensee uses a new type of computer and duplicates the existing calculations on a new computer platform. Requiring the listing by date and revision number of the

validation report would not allow timely updating of the validation report when new data need to be incorporated. This is not risk-significant, offers no increase in safety and is a waste of limited NRC resources.

(iv) item (8a): if you have clarity, you should not have ambiguity. Delete '*lack of ambiguity*'. Same argument: is the glass half-full or half-empty?

(v) item (8f): re-word the requirement for '*plant-specific benchmark experiments*' to '*a commitment to use benchmarks applicable to plant specific operations*'. For a licensee to find 'plant specific benchmark experiments' at the time of license application will constitute an all but impossible task.

(vi) item (8g): these items are conservative, but technically incorrect. This position discourages using calculation tools that have demonstrated conservative results over those that are non-conservative, but with a relatively small bias.

(vii) item (10): 1st sentence: the thrust of this sentence -- the applicant should incorporate into the facility's management measures principles for conducting NCS determinations -- is incorrect. The confusion appears to be a misunderstanding in defining 'management measures' in a manner that differs from 10 CFR 70.62(d) and 70.4. Management measures apply to oversight of the NCS determinations (i.e. properly trained NCS engineers, etc.), but do not include the detailed requirements of item (10(a)-(d). Replace in 1st sentence to read: "*…to incorporating these methods into the facility's safety program…*"

(viii) item (10b & c): the following terms are undefined in the SRP:

- '*NCS operating limit'*
- '*NCS safety limit*'
- '*NCS subcritical limit*'

Definitions from NUREG-1718 (§6.8) should be considered for inclusion in Chapter 5

(ix) item (11): the content of this section was recommended by NEI as a partial replacement for this §5.4.3.4.1. Its inclusion is recommended as a replacement for item (10) -- the two are identical. Merge items (10) and (11), or simply delete the former

(x) item (11f): '*relative*' makes no sense. See comment for item(6) [above].

- *§5.4.3.4.2 ('Technical Practices')*

(i) Item (3): suggest adding "*…in the criticality safety evaluation…*" at the end of the sentence for clarification: "*…should be justified in the criticality safety evaluation…*"

(ii) Item (5): correction to the terminology is needed. The sentence requires "*…[designation of] controlled parameters used in NCS as IROFS*…". However, if the controlled parameter is mass, the IROFS should be the weigh scale that controls the mass, and not the mass of the container. Thus, the sentence should be modified : "*…commits to designate the mechanisms for controlling controlled parameters used in NCS as IROFS*…" If the level of detail in the ISA Summary were commensurate with the specification of the controlled parameter, then only the fact that process parameters are used to control the quantity of SNM would be identified in the ISA Summary, and the specific controls on process parameters that control the process to within specified limits that should be identified in the criticality safety evaluation and ISA (but not the ISA Summary).

(iii) Item (6): this item requires the licensee to ensure that control of a controlled parameter will never be lost. The reason that facilities implement double contingency is to provide safety in the event of failure of one defense (controlled process parameter in some cases). This criterion for an evaluation of the maintainability of controlled parameters seems unnecessary in light of the commitments to management measures for IROFS in Chapter 11. Delete this criterion.

(iv) For clarity, recommend inserting a new sub-heading before the controlled parameters are discussed. After item (7) we suggest making the following modification:

> **5.4.3.2.0 Methods of NCS Control**
> Several methods of NCS control are available. These controlled parameters are discussed below. The controls used to establish limits on the following nuclear criticality parameters should be identified as IROFS in the criticality safety evaluations and ISA Summary.

(v) Item (10a): this sentence is erroneous. Re-write: "*…when process variables can affect the density, the process variables are identified as IROFS in the ISA Summary*…"

(vi) Item (13): incorrect use of the terms 'moderation' and 'moderator' exist:

- *13c: "…measurement of the moderator is needed…*
- *13e: "…sampling of the moderator is needed,,,"*
- *13g: "…sources of moderator for the potential….ingress of moderator is precluded…"*

(vii) items 13(d)-(g): these criteria are all covered by ANSI/ANS 8.22 and do not need to be repeated, especially as the licensee has already committed to ANSI/ANS-8.22 in item 13(a).

(viii) Item (13b): this sentence is erroneous. Re-write: "*...when process variables can affect the moderation, the process variables are identified as IROFS in the ISA Summary...*"

(ix) Item (13d): this criterion should be modified to limit its applicability to cases in which the structure is credited for providing moderation control

(x) Item (14a): this sentence is erroneous. Re-write: "*...when process variables can affect the concentration, the process variables are identified as IROFS in the ISA Summary...*"

(xi) Item (14b): rephrase the criterion to read: "*...sufficient controls should be established to preclude the introduction of high concentration materials, unless the process is analyzed to be safe at any credible SNM concentration...*"

- *§5.4.3.4.3 ('Requirements in 10 CFR 70.24')*

(i) items (4) and (5) address the reliability of a CAAS. A facility is designed so that earthquakes, fires, etc. cannot induce a nuclear criticality accident. In that light, it is not credible to postulate the simultaneous occurrence of a criticality event. As a result there is no basis under 10 CFR 70.61 to qualify the CAAS to withstand those accidental condition (i.e. operability of the deterministically-required CAAS during a design basis seismic event that exceeds the regulation). In addition, evacuation of the workers takes place for other reasons, based on other alarm systems, if necessary, under those accidental conditions. NEI recommends that these two items be deleted.

(ii) Item (8c): this commitment for PADs (people) and NADs (fixed locations) is not based on a regulatory requirement. Current industry practice is to not issue PADS to all employees working in the facility, but to make them available for use by emergency response personnel. Item (c) requires that a licensee provide personnel accident dosimeters in areas that require CAAS and a method for prompt on-site dosimeter readouts. A reviewer could conclude that all personnel who enter an area covered by a CAAS are required to have both gamma- and neutron-sensitive dosimeters, that accident dosimeters be located throughout the facility and that a mechanism to read such dosimeters on site be available. This is not current industry practice. In the event of a nuclear criticality, having the ability to read TLDs on site would be of little benefit because personnel will be evacuated from the area and would not be allowed to return until the accident has

terminated and little risk of recurrence has been determined. What is only required is a method of quickly determining which personnel may need urgent medical attention and assurance that emergency response personnel will be provided with dosimeters so that any radiation exposure to them is tracked. Recommend modifying this item to read: "*…The applicant commits to provide fixed and personnel accident dosimeters in areas that require CAAS. These dosimeters should be readily available to personnel responding to an emergency…*"

- *§5.4.3.4.4 ('Requirements in 10 CFR 70.61(d)')*
  - (i) Items (4) & (7): clarity is needed in use of the term '*margin*' in these two items. Does it refer to the same thing? Is the administrative margin referred to as 0.03 or 0.05 for abnormal and normal conditions, respectively, or is the SRP referring to something else?
  - (ii) Item (6): this item reads incorrectly. '*controls*' and '*control barriers*' are not part of management measures. Revise this sentence to read: "*…The applicant commits to apply management measures to IROFS to provide reasonable assurance that they are available and reliable when needed…*"
  - (iii) Last sentence in section: revise to read: "*…Note: these are the acceptance criteria…*"
- *§5.4.3.4.5 ('Requirements in 10 CFR 70.64(a)')*
  - (i) this section is supposed to provide guidance in application of 70.64 BDC relevant to NCS for the design of new facilities. And yet, the contents do not address BDC, but rather discuss application of the double contingency principle. Is there missing (or misplaced) text?
  - (ii) 1st sentence: revise to read: "*…the following acceptance criterion or has…*"
  - (iii) item (1): the 10 CFR 70.72 rule citation is incomplete. Revise to read: "*…and IROFS in the design of new facilities or new processes at existing facilities that require a license amendment under 70.72…*"
- *§5.4.3.4.6 ('Requirements in 10 CFR 70.65(b)')*
  - (i) Item (1a): clarify reference to §3.4: it pertains to the ISA Summary
  - (ii) Item (1b): this commitment is stated incorrectly. An applicant does *not* commit to the appendix of an ANSI/ANS standard. Appendices provide examples and are not suggested practices. Appendix A includes a statement that it does not constitute part of ANSI/ANS-8.1 and that it is only provided for information purposes. Revise this item to read: "*…The applicant commits to*

evaluate the loss of each nuclear criticality control as a separate accident sequence (Appendix A of ANSI/ANS-8.1 provides guidance on the types of accident sequences that should be considered…"

(iii) Item (3): several problems with this item:

- clarify reference to §3.4: it pertains to the ISA Summary
- meeting the §3.4 acceptance criteria for the ISA Summary could lead a reviewer to expect definition of likelihood in numerical probabilistic terms -- an approach that Part 70 licensees are not expected to satisfy. To obviate this potential confusion, NEI recommends adding words such as those in NUREG-1718 §6.4.3.3.6(c)(ii) to make the sentence read: "*…for NCS accident sequences. The term 'unlikely' is taken to mean that an event -- or set of events credited as one leg of double contingency -- is not anticipated to occur during the lifetime of the facility at any particular point in the process or in any particular accident sequence…*" The SRP fails to acknowledge that performance data do not exist to support probabilities for IROFS failures in fuel cycle facilities.

- *§5.4.3.4.7 ('Additional NCS Program Commitments')*
  - (i) the text that has been inserted into this §5.4.3.4.7 was recommended by NEI in August 1999 as replacement text for much of §5.4. By not deleting many of the redundant passages of text, these new additional commitments are themselves redundant and should all be deleted. (They are presented elsewhere throughout Chapter 5.)
  - (ii) item (2) correct rule citation (10 CFR 70.72): "*…at existing facilities that require a license amendment under §70.72 the applicant…*"
  - (iii) item (4): correct English to read: "*…NCS methodologies, and to modify operating and maintenance procedures in ways that could reduce…*"
- *§5.5 ('Review Procedures')*
  - (i) delete references to '*NRC Bulletin 91-01*'. 10 CFR 70.74 supercedes this report.
  - (ii) Delete the redundant '*10 CFR Part 70, Appendix A, reporting requirements*' as this is implicit in the earlier citation of 10 CFR 70.74.
- *§5.5.1('Acceptance Review')*

(i) this is the only SRP chapter in which reference is made to 'Licensing and International Safeguards Branch Materials Licensing Procedures Manual' . For consistency, confine this reference to §5.7 ('References'). Delete the clause "*...using guidance....manuals...*" and replace by : "*...<u>if the primary reviewer identifies significant</u> deficiencies <u>in the material provided, the primary review should request that</u> the applicant...*"

- *<u>§5.6 ('Evaluation Findings')</u>*
  - (i) 1st sentence makes no sense and does not even apply to Chapter 5. Delete it.
  - (ii) Item (2): replace '*fissile material*' by '*SNM*'
  - (iii) Item (3): delete '*in*' after '*10 CFR 70.24 and*'