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Draft Letter to the Nuclear Energy Institute Regarding the Clarification of Regulatory Paths for Lead Test Assemblies

Comment On: NRC-2018-0109-0002
Draft Letter to Nuclear Energy Institute Regarding Clarification of Regulatory Paths for Lead Test Assemblies

Document: NRC-2018-0109-DRAFT-0033
Comment on FR Doc # 2018-14121

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General Comment

I do not approve of plant owners conducting unreviewed and unapproved fuel experiments in our backyards and I endorse Harold Chernoff's views as stated in the att. non-concurrence package.

Attachments

7+2+18+20180531-non-concurrence-package-chernoff-lta-letter-ML18151B016

NON-CONCURRENCE PROCESS
COVER PAGE

The U.S. Nuclear Regulatory Commission (NRC) strives to establish and maintain an environment that encourages all employees to promptly raise concerns and differing views without fear of reprisal and to promote methods for raising concerns that will enhance a strong safety culture and support the agency's mission.

Employees are expected to discuss their views and concerns with their immediate supervisors on a regular, ongoing basis. If informal discussions do not resolve concerns, employees have various mechanisms for expressing and having their concerns and differing views heard and considered by management.

Management Directive, MD 10.158, "NRC Non-Concurrence Process," describes the Non-Concurrence Process (NCP), http://nrcweb.nrc.gov:8600/policy/directives/catalog/md10.158.pdf.

The NCP allows employees to document their differing views and concerns early in the decision-making process, have them responded to (if requested), and attach them to proposed documents moving through the management approval chain to support the decision-making process.

NRC Form 757, "Non-Concurrence Process" is used to document the process.

Section A of the form includes the personal opinions, views, and concerns of a non-concurring NRC employee.

Section B of the form includes the personal opinions and views of the non-concurring employee's immediate supervisor.

Section C of the form includes the agency's evaluation of the concerns and the agency's final position and outcome.

NOTE: Content in Sections A and B reflects personal opinions and views and does not represent official factual representation of the issues, nor official rationale for the agency decision. Section C includes the agency's official position on the facts, issues, and rationale for the final decision.

At the end of the process, the non-concurring employee(s):

- ☐ Concurred
- ☒ Continued to non-concur
- ☐ Agreed with some of the changes to the subject document, but continued to non-concur
- ☐ Requested that the process be discontinued

  - ☐ The non-concurring employee(s) requested that the record be non-public.
  - ☒ The non-concurring employee(s) requested that the record be public. THIS IS SPECIFICALLY REQUESTED FOR THE ENTIRETY OF THE NCP INCLUDING ALL ATTACHMENTS & ENCLOSURES.

- ☐ This record is non-public and for official use only.
- ☐ This record has been reviewed and approved for public dissemination.

A Chmiel
5/31/2018

NRC FORM 757
NRC MD 10.158
(11-2016)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER

SECTION A - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
Clarification of Regulatory Approaches for Lead Test Assemblies," from Holian, NRC, to Cowan	ML18100A045

DOCUMENT SIGNER	SIGNER TELEPHONE NO.
Brian Holian	415-1270

TITLE	ORGANIZATION
Acting Director	Office of NRR

NAME OF NON-CONCURRING EMPLOYEE(S)	TELEPHONE NUMBER
Harold Chernoff	415-2330

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☐ DOCUMENT AUTHOR ☐ DOCUMENT CONTRIBUTOR ☑ DOCUMENT REVIEWER ☐ ON CONCURRENCE

NON-CONCURRING EMPLOYEE'S SUPERVISOR
Chris Miller

TITLE	ORGANIZATION
Director	DIRS

☑ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED AND WOULD LIKE A WRITTEN EVALUATION IN SECTION B AND C.

☐ I WOULD LIKE MY NON-CONCURRENCE CONSIDERED, BUT A WRITTEN EVALUATION IN SECTIONS B AND C IS NOT NECESSARY.

WHEN THE PROCESS IS COMPLETE, I WOULD LIKE THE NCP FORM: ☑ PUBLIC ☐ NON-PUBLIC

REASONS FOR THE NON-CONCURRENCE, POTENTIAL IMPACT ON MISSION, AND THE PROPOSED ALTERNATIVES
(use continuation pages or attach Word document)

See attached file "LTA non-concurrence master.pdf"

Please note that I respectfully request that this non-concurrence be made publicly available in conjunction with the publishing of the subject document in the Federal Register for comment. Additionally, I respectfully request that this non-concurrence be referenced (including its accession number) in the aforementioned Federal Register notice.

SIGNATURE

DATE
APPROVED
By HKC at 2:01 pm, May 04, 2018

Use ADAMS Template NRC-006 (ML063120159)

Non-concurrence Related to Federal Register Notice of Availability (ML18122A036) for Comment of Letter Titled "Clarification of Regulatory Approaches for Lead Test Assemblies," from Brian Holian, NRC, to Pamela Cowan, NEI (ML18100A045)

Background

The following issues form part of the basis for this non-concurrence with the draft letter to NEI and its associated Federal Register Notice referenced above. These issues should be considered in combination with the issues/concerns and positions raised in the memorandum from , DORL, and Harold Chernoff, DIRS, to Margaret M. Doane, General Counsel, dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011), which has been incorporated into this non-concurrence as Appendix A, and comments on the draft letter to NEI from Harold Chernoff which were provided to the Director and Deputy Director DIRS on April 16, 2018 which have been incorporated into this non-concurrence as Appendix B.

Issue 1

The draft letter to NEI provides the following wholly new interpretation, not a clarification, of the requirements of Section 4.2.1 of the technical specifications (TS).

> The first two sentences provide a high-level description of the reactor core (i.e., many features of methods and shown by tests or analyses to comply with all fuel safety design bases." The third sentence includes a provision to allow loading of reconstituted fuel assemblies. The fourth sentence requires the use of "fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases." This requirement applies to the unrestricted use of fuel assemblies for batch loading. The final sentence includes a provision to allow loading of LTAs on a restricted basis. By restricting the quantity and placement and separately identifying "lead test assemblies," as opposed to the unrestricted, batch loaded "fuel assemblies," this provision may be considered separate from the previous four sentences.

> **Model TS 4.2.1 Published in Generic Letter 92-01, Supplement 1, "Alternative Requirements For Fuel Assemblies In The Design Features Section of Technical Specifications"**

> The reactor shall contain [###] fuel assemblies. Each assembly shall consist of a matrix of [Zircaloy or ZIRLO] fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core regions.

No underlying basis or explanation of the derivation of this wholly new interpretation is provided or referenced in the draft letter to NEI. Absolutely no agency records have been identified that support the interpretation of the fourth and final sentences in the manner stated in the draft letter to NEI. The draft letter to NEI also fails to include any mention of Generic Letter 90-02 or Generic Letter 90-02, Supplement 1, which published the revised model Technical Specification 4.2.1.

Regulations Require TS Stipulation of Fuel Cladding

The new interpretation proffered in the draft NEI letter is contrary to the regulatory construct for the design features for fuel assemblies to be included in TSs in accordance with 10 CFR 50.36(c)(4). As noted in Generic Letter 90-02, "The requirements included in Section 5 of the TS or "Design Features" address [in accordance with 10 CFR 50.36] those features of the facility such as materials of construction and geometric arrangements which, if altered or modified, would have a significant effect on safety and are not covered under other sections of the TS on "Safety Limits," "Limiting Conditions for Operation, or "Surveillance Requirements."" In conformance with this regulation the technical specification "Design Features" section includes the number of fuel assemblies, the type of cladding of all fuel assemblies, and the fuel type.

It is of note that operational safety issues have resulted from the implementation of new fuel cladding including its use in LTAs. Two examples of this are the twisting of LTAs at Three Mile Island, Unit 1, resulting in impaired ability to fully insert and move some control rods and the inability to fully insert control rods at South Texas Nuclear Power Plant. This operating experience underscores the importance of having materials of construction for fission product barriers explicitly delineated in the "Design Features" section of the technical specifications in accordance with 10 CFR 50.36.

Model TS to Facilitate Fuel Reconstitution

The model technical specification published for adoption by Generic Letter 90-02 added changes that allow the substitution of Zircaloy-4 or stainless steel filler rods or open water channels for fuel rods in fuel assemblies if justified by cycle-specific reload analyses using an NRC-approved methodology. The requirement to use an NRC-approved methodology was used to confirm conformance to existing design limits and the safety analysis criteria. Thus ensuring that the allowed changes to fuel assemblies would not have a significant effect on safety. These changes were offered solely for the purpose of providing flexibility in the repair of fuel assemblies containing damaged and leaking fuel rods by reconstituting the assemblies. Simply stated, the technical specification changes were designed to facilitate fuel reconstitution and did not state or infer any broader applicability.

Model TS Revision to Ensure Correct Use of NRC-Approved Methodologies for Fuel Reconstitution

The Generic Letter 90-02 model technical specification was revised and published for adoption by Generic Letter 90-02, Supplement 1. The Generic Letter supplement was issued to clarify the limitations on application of NRC-approved analytical methods and to withdraw and replace the model technical specifications which were recommended by GL 90-02, to be consistent with realistic reconstitution configurations. The supplement noted that, "... the model TS [published in conjunction with Generic Letter 90-02] were in error, since a broad range of fuel configurations were identified that extend well beyond the scope of applications that have been

justified by the tests and analyses for the fuel design and the design methods currently approved by the NRC."

The remedy for this situation was to more explicitly describe the importance of ensuring that NRC-approved codes and methodologies directly addressed intended fuel reconstitution configurations and that the configurations had been shown by testing or analyses to comply with all fuel design safety analyses. These concepts were explicitly incorporated into the model technical specification published by the Generic Letter supplement along with an additional sentence that clearly permitted placing a limited number of lead test assemblies that have not completed representative testing into non-limiting core regions. Thus giving a pathway to accomplish the testing of previously untested reconstituted fuel configurations. As with the original Generic Letter 90-02, these changes were offered solely for the purpose of providing flexibility in the repair of fuel assemblies containing damaged and leaking fuel rods by reconstituting the assemblies. Simply stated, the technical specification changes were designed to facilitate fuel reconstitution and did not state or infer any broader applicability.

Changes to the Design Features Section of TS Require a License Amendment

It is significant to note that Generic Letter 90-02, Supplement 1 stated that:

> The reconstitution of a fuel assembly to replace damaged and leaking fuel rods is not considered to be an unreviewed safety question if the repaired fuel assembly constitutes a previously approved design. The licensee may perform such a reconstitution under the provisions of 10 CFR 50.59 without prior approval of the NRC staff if (1) an unreviewed safety question does not exist, and (2) ***the reconstituted fuel does not require a change to the "Design Features" section of the TS. [emphasis added]***

As previously discussed the "Design Features" section of the technical specification included, then and now, explicit restrictions on the number of fuel assemblies, the type of cladding of all fuel assemblies, and the fuel type. Thus, this admonition clearly identified that a change to fuel cladding and/or fuel type could not be implemented under the provisions of 10 CFR 50.59 and that licensees would need to use the amendment process for changes to fuel assembly cladding and/or fuel type.

License Amendments Adopt Model TS for Individual Licensees

The model TS published in conjunction with Generic Letter 90-02, Supplement 1 were adopted by licensees using the license amendment process of 10 CFR 50.90. As such, the agency published notice (Sholly Notice) of the amendment requests in the Federal Register included proposed No Significant Hazards Consideration Determinations, as well as descriptions of the purpose of the proposed change and the effect of the proposed changes. These notices were consistent in referencing the Generic Letter 90-02, Supplement 1, stated purpose of facilitating flexibility in fuel reconstitution. No agency records have shown a Federal Register Notice that stated or inferred that these proposed TS changes would either allow the use of fuel cladding material or fuel of a different type than that stated in the TS Design Features section. Nor have any Federal Register Notices been identified that described the effect of the proposed changes in a manner similar to that described in the draft NEI letter.

Draft Letter to NEI TS 4.2.1 Interpretation Constitutes a *de facto* License Amendment

The Atomic Energy Act section 189a. requires the Commission to afford interested persons an opportunity for a hearing on "the granting, suspending, revoking or amending of any license." A licensee cannot amend the terms of its license unilaterally. Agency approval or authorization is a necessary component of Commission action that affords a hearing opportunity under section 189a., but not all agency approvals granted constitute de facto license amendments. To determine whether an approval constitutes a de facto license amendment, there are two key factors to consider: Whether the approval (1) granted the licensee any greater operating authority or (2) otherwise altered the original terms of a license.

The draft letter to NEI interpretation of TS 4.2.1 can be considered an agency approval or authorization. Thus it is appropriate to examine the key factors that must be considered to determine if a *de facto* license amendment may be involved. The interpretation attempts to grant greater operating authority by permitting the use of fuel assemblies (LTAs) with cladding material and/or fuel that differs from that described in the Design Features section of TS. This also constitutes an alteration from the original terms which in accordance with the requirements of 10 CFR 50.36 incorporated specific restrictions on fuel assembly cladding and fuel type. Thus the interpretation could only be implemented by use of a process that affords interested persons an opportunity for a hearing, such as the license amendment process.

Specifically and inexplicably, the draft letter to NEI indicates that licensees do not need license amendments for use of LTAs with cladding or pellet materials different than those currently specified in the TSs for all fuel assemblies. In addition, the draft letter to NEI indicates licensees do not need to use NRC staff approved codes and methods for analyzing LTAs (this is discussed in more detail in Issue 5 below).

Based on the analysis in Section 2.0, "Interpretation of TS Language Related to LTAs and Need for License Amendments," of Enclosure 2, to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011) it is concluded that, if a licensee desires to use an LTA of a different cladding or pellet material than currently specified in the design features TS for fuel assemblies, a license amendment request must be submitted. In addition, prior to use, LTAs must be analyzed with applicable NRC staff approved codes and methods.

Instability Springs from Rewriting Regulatory History

As illuminated in the discussion points of Issue 1, the draft letter to NEI is attempting to reinterpret and/or revise the regulatory history of model TS 4.2.1. Clearly an interpretation, much less a clarification, cannot be used to substantively alter the requirements and meaning of a plant's technical specification. The requirements and meaning of a plant's license, including technical specifications, must be determined by the plain language of the requirement in combination with the documented regulatory history.

This regulatory history includes documents such as applicable Generic Communications, license amendment requests, Federal Register notices including "Sholly" notices and safety evaluations associated with the approval of license amendments and/or exemptions. Attempts to create alternative interpretations that conflict with, or are not fully informed by, the plain language of the requirement and agency records of the regulatory history create unnecessary regulatory instability and uncertainty for agency staff, licensees and other stakeholders and erode public confidence in the agency.

Objectives and Alternatives

There have been and will be both economic and safety benefits from the continued evolution of fuel assembly cladding material and fuel types. The objective is reap the potential benefits while at least maintaining and hopefully improving safety. These types of changes have historically been accomplished using the license amendment and/or exemption processes. These processes have been successfully used for decades and embody the high quality and openness that foster a stable, reliable regulatory environment that also serves to bolster public confidence.

Issue 2

The draft letter to NEI provides a faulty analysis of the requirements in 10 CFR 50.59, for use of LTAs. The comments in Enclosure 1 to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011) address some of the flawed arguments in the NRR memorandum regarding 10 CFR 50.59. In addition an analysis on use of 10 CFR 50.59 by licensees to implement LTA programs is included in Section 6.0 of Enclosure 2 to the above mentioned memorandum.

The draft letter to NEI states:

> If a licensee's TS contain a provision allowing for use of LTAs, and if the LTA campaign satisfies the TS, then a change to the TS is not required (item (i) above).

As described in Issue 1, this interpretation is wholly unsupported. Further the TS contains no discussion of an LTA campaign. Nor does the regulatory basis for the language state or infer the acceptability of LTAs for any purpose other than fuel reconstitution. As described in Issue 1, use of any fuel assembly or LTA with a different fuel cladding or fuel type would require submittal of a license amendment request and agency approval prior to use. Further as described in Issue 5, the TS COLR requires the use of the specific delineated NRC-approved codes and methods for the analysis of all fuel assemblies severally and collectively. On the basis of these two points it has clearly been shown that the use of fuel assemblies, including LTAs, that use a different type of cladding and/or fuel type than that specified in TS 4.2.1 involve a change to the TS and cannot be implemented without prior agency approval through the license amendment process. Therefore, there is no valid reason to include discussion of application of the criteria of 10 CFR 50.59.

The draft letter to NEI states:

> For 10 CFR 50.59(c)(2)(ii), "Result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety," the NRC-endorsed guidance in Section 4.3.2 of the Nuclear Energy Institute's (NEI) report NEI 96-07, Revision 1, "Guidelines for 10 CFR 50.59 Implementation," dated November 2000 (ADAMS Accession No. ML003771157) states, in part, that "[q]ualitative engineering judgment and/or an industry precedent is typically used to determine if there is more than a minimal increase in the likelihood of occurrence of a malfunction." Section 4.3.2 of NEI 96-07, Revision 1, also states, in part, the following:
>
> > Although this criterion allows minimal increases, licensees must still meet applicable regulatory requirements and other acceptance criteria to which they are committed (such as contained in regulatory guides and nationally

> recognized industry consensus standards, e.g., the [American Society of Mechanical Engineers Boiler and Pressure Vessel Code] and [Institute for Electrical and Electronics Engineers] standards). Further, departures from the design, fabrication, construction, testing and performance standards as outlined in the General Design Criteria (Appendix A to Part 50) are not compatible with a 'no more than minimal increase' standard
>
> The NRC staff anticipates that LTAs that meet the STS LTA provision would be similar to Example 2 in Section 4.3.2 of NEI 96-07, Revision 1, in that the LTAs would continue to meet all applicable design and functional requirements, and any new failure modes would be bounded by the existing analysis. Accordingly, for LTA campaigns where the design and functional requirements and new failure modes are bounded, the licensee could answer this question with a "No." Conversely, if a licensee had information or reason to believe that particular features used in an LTA campaign would undermine applicable design basis requirements and assumptions, then the licensee could answer this question with a "Yes."

The draft letter to NEI provides no basis for why LTAs that meet the STS LTA provision (i.e., (i.e., "A limited number of lead test assemblies," "placed in non-limiting core regions") is in any way related or is otherwise sufficient to support a 10 CFR 50.59 statement that "the LTAs would continue to meet all applicable design and functional requirements, and any new failure modes would be bounded by the existing analysis." For instance, Example 5 of Section 4.3.2 of NEI 96 07, Revision 1, is an example that requires prior NRC approval stating, "The change would cause design stresses to exceed their code allowables or other applicable stress or deformation limit (if any), including vendor-specified stress limits for pump casings that ensure pump functionality." Meeting the STS LTA provision is unrelated to whether, for instance, fuel stress limits are met. Therefore, the proposed NRC letter provides no basis the LTAs can satisfy this criterion.

10 CFR 50.59(d) requires an accompanying explanation providing an adequate basis for the conclusion. NEI 96-07, Revision 1, Section 5, states, "Consistent with the intent of 10 CFR 50.59, these explanations should be complete in the sense that another knowledgeable reviewer could draw the same conclusion. Restatement of the criteria in a negative sense or making simple statements of conclusion is not sufficient."

10 CFR 50.59(c)(2)(vii)

The draft letter to NEI states:

> For 10 CFR 50.59(c)(2)(vii), "Result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered," NEI 96-07, Revision 1, Section 4.3.7 states, in part, that "[i]f an engineering evaluation demonstrates that the analysis presented in the UFSAR remains bounding, then no further 10 CFR 50.59(c)(2)(vii) evaluation is required." If the LTA campaign demonstrates, via the selection of limited quantity and restricted location, that the UFSAR AOR remain bounding, the licensee could answer this question with a "No."

The draft letter to NEI describes the STS LTA provision as follows [emphasis added]:

> The TS provision of non-limiting core regions is dependent upon plant operating parameters (e.g., power density) and the UFSAR AOR. A non-limiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat generation rate, peak clad temperature, minimum departure from nucleate boiling). Non-limiting core regions should be selected such that the new design features of the LTA are conservative for the respective design, performance, and safety limits relative to the co-resident fuel assemblies during normal operation, anticipated operational occurrences, and postulated accidents. As such, if the LTAs are more conservative with respect to the design, performance, and safety limits, then the performance of safety-related structures, systems, and components (SSCs) (i.e., ability to perform intended safety functions) will not be dictated by the performance of the LTAs and reasonable assurance of adequate protection continues to be maintained with respect to the loading and irradiation of LTAs under the STS LTA provision.

The draft letter to NEI is not consistent with NEI 96-07, Revision 1, Section 4.3.7, which states [with emphasis added]:

> A specific proposed activity requires a license amendment if the design basis limit for a fission product barrier is "exceeded or altered." The term "exceeded" means that as a result of the proposed activity, the facility's predicted response would be less conservative than the numerical design basis limit identified above. The term "altered" means the design basis limit itself is changed.
>
> Altering a design basis limit for a fission product barrier is not a routine activity, but it can occur. An example of this would be changing the DNBR value from the value corresponding to the 95/95 criterion for a given DNB correlation, perhaps as a result of a new fuel design being implemented. (A new correlation or a new value for the "95/95 DNB criterion" with the same fuel type would be evaluated under criterion (c)(2)(viii) of the rule.)

The draft letter to NEI provides no basis for the statement "If the LTA campaign demonstrates, via the selection of limited quantity and restricted location, that the UFSAR AOR remain bounding, the licensee could answer this question with a "No." There is no requirement or definition of what is meant by the STS LTA phrase "non-limiting core regions." The draft letter to NEI states, "A non-limiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat generation rate, peak clad temperature, minimum departure from nucleate boiling)." However, past LTA programs for example have limited peak linear heat generation rate (LHGR) to 90-95% of the peak core value to justify a non-limiting location. NEI 96-07, Revision 1, Section 4.3.7, provides a table of examples of typical fission product barrier design basis limits. For "Fuel Cladding" the table specifies the parameters with design basis limits are DNBR/MCPR, Fuel temperature, Linear heat rate, Fuel enthalpy, Clad strain, Fuel burnup, Clad temperature, and Clad oxidation. The draft letter to NEI provides no basis for why "the selection of limited quantity and restricted location" is in any way related to or otherwise addresses each of these fuel cladding design basis limit parameters which is necessary to support a 10 CFR 50.59(c)(2)(vii) determination that the LTAs do not result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered.

Further, the draft letter to NEI fails to recognize that the regulation requires prior agency review through a license amendment request when a design basis limit for a fission product barrier is altered. This is irrespective of whether the change to the limit is conservative or non-conservative. As stated in the Statements of Consideration for 10 CFR 50.59, 64 FR 53582 dated October 4, 1999, "The rule language that provides that a design basis limit may not be altered provides important and needed assurance. Changes that involve alteration of the design basis limit for a fission product barrier involve such a fundamental alteration of the facility design that a change, even in the conservative direction should receive NRC review."

It is equally important to understand that the change is the different fuel assembly cladding and/or fuel type. This regulations requires that the design basis limits for the changed fission product barrier be assessed against the limits that are included in the UFSAR. For example if the DNBR listed in the UFSAR for the existing fuel design is 1.25 and the calculated DNBR for a rod or fuel assembly with a different cladding and/or fuel type is 1.35, in accordance with 10 CFR 50.59(c)(2)(vii) the design basis limit for a fission product barrier has been altered and prior agency review through a license amendment is required. It should be noted that this is also the case if the calculated value was 1.15.

10 CFR 50.59(c)(2)(viii)

The draft letter to NEI states:

> With respect to 10 CFR 50.59(c)(2)(viii), "Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses," NEI 96-07, Revision 1, Section 4.3.8.1 states, in part, the following:
>
> > The definition of "departure..." provides licensees with the flexibility to make changes under 10 CFR 50.59 to methods of evaluation whose results are "conservative" or that are not important with respect to the demonstrations of performance that the analyses provide. Changes to elements of analysis methods that yield conservative results, or results that are essentially the same, would not be departures from approved methods.
>
> Section 4.3.8.2 of NEI 96-07, Revision 1, provides guidance for changing from one method of evaluation to another. As stated above, LTA campaigns that meet the STS LTA provision (i.e., the UFSAR AOR remain applicable and bounding) will not affect the performance of safety-related SSCs and, therefore, the method of evaluation used in establishing the design bases will remain the same. Additionally, the incorporation of TS Section 4.2.1 into a plant's licensing basis represents the NRC's approval for use of new or different methods of evaluation for LTA's under the constraints of the TS provision. If the LTA campaign demonstrates, via the selection of limited quantity and restricted location, that the UFSAR AOR remain bounding, the licensee could answer this question with a "No."

The draft letter to NEI describes the methods of evaluation as follows:

> In order to batch-load fuel into a commercial nuclear power plant, it is necessary for the licensee to perform reload safety analyses using NRC-approved analytical codes and

methods as described in the licensees technical specifications (TS). When new fuel material or design features necessitate a change to these approved analytical codes and methods in order to complete the reload safety analyses, a license amendment is required to allow the new or changed analytical code or method to be used. Knowledge of, and experience with, irradiated material properties and performance is critical for qualifying these analytical codes and methods and developing the safety design bases to license new fuel designs or features for batch loading.

The draft letter to NEI provides no basis for why LTAs that meet the STS LTA provision (i.e., (i.e., "A limited number of lead test assemblies," "placed in non-limiting core regions"), which makes no mention of a method of evaluation, is in any way related or is otherwise sufficient to support a 10 CFR 50.59(c)(2)(viii) determination that the LTAs would not "Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses,"

The draft letter to NEI statement, "As stated above, LTA campaigns that meet the STS LTA provision (i.e., the UFSAR AOR remain applicable and bounding) will not affect the performance of safety-related SSCs and, therefore, the method of evaluation used in establishing the design bases will remain the same," incorrectly states that STS LTA provision mentions a method evaluation. In addition, the draft letter to NEI statement, "Additionally, the incorporation of TS Section 4.2.1 into a plant's licensing basis represents the NRC's approval for use of new or different methods of evaluation for LTA's under the constraints of the TS provision," is incorrect in that, given that the STS LTA provision does not mention or imply a method of evaluation and, as such, cannot represent the NRC's approval for use of new or different methods of evaluation for LTA's under the constraints of the TS provision.

As discussed in Issue 5, the TS COLR requires the use of the specific delineated NRC-approved codes and methods for the analysis of all fuel assemblies, including LTAs, severally and collectively. If any fuel assemblies, or for that matter individual fuel pins/rods, are not analyzed using the COLR specified codes and methods prior agency review through a license amendment modifying the COLR would be required and application of 10 CFR 50.59 would conclude that a license amendment would be required since a TS change is needed. Notwithstanding the TS COLR requirements, the use of a non-COLR code or methodology would represent a new or different method of evaluation.

It is also notable that the fuel vendor methodologies stipulated in TS COLRs incorporate direct reference to the September 23, 1981, letter from the NRC (T.A. Ippolito) to General Electric (R. Engel), "Lead Test Assembly Licensing" (ADAMS Legacy Library Accession No. 8110090006). This letter, which pre-dates the requirements later incorporated into the TSs, stated that one of the "key elements" for licensee use of LTAs was "analysis of the LTAs using approved methods."

Issue 3

The draft letter to NEI provides an interpretation of the need for exemptions from 10 CFR 50.46 that is different than a long history of exemptions issued for use of LTAs. This new interpretation is also contrary to the requirements in 10 CFR 50.57 regarding the licensee operating the facility in conformance with the rules and regulations of the Commission. Based on the analysis in Section 3.0, "Exemption Requirements Associated With 10 CFR 50.46" of Enclosure 2, to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework

Regarding Use of LTAs" (ML18078A011) it is concluded that until the final rule for 10 CFR 50.46c is issued (reference ML112620346), licensees will need exemption requests for cladding materials other than zircaloy or ZIRLO™ and for pellet materials other than uranium oxide.

Furthermore, based on the analysis in Section 4.0, "License Authority," of Enclosure 2 to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011) regardless of your interpretation of the design features TS for fuel assemblies, the licensee still would not have the authority to load LTAs, with different cladding or pellet material than specified in 10 CFR 50.46, and its current TSs, without an approved exemption.

In summary, 10 CFR 50.46 applies to all light water reactors that use zircaloy or ZIRLO clad fuel assemblies. All current commercial operating reactors in the United States incorporate one of these fuel types or other cladding types accepted by an exemption form 10 CFR 50.46, and thus 10 CFR 50.46 applies. In the absence of an exemption from 10 CFR 50.46 to allow different fuel cladding, the ECCS acceptance criteria remains completely undefined and it is unknown how conformance with the requirements of 10 CFR 50.46 can be shown.

Issue 4

Since the draft letter to NEI provides wholly new interpretations of regulatory requirements that have a substantial effect on licensee activities, as well as on public stakeholders, the guidance should be considered a rule. As such, the draft NEI letter should be processed in accordance with the NRC's procedures established to meet the requirements of the Congressional Review Act. Additionally, the draft NEI letter should be subject to public notice, including and comment, prior to implementation, consistent with the Administrative Procedure Act and the Atomic Energy Act. An analysis of these issues is contained in Section 5.0, "Considerations for Guidance that Provide New Interpretations of NRC Requirements," as described in Enclosure 2 to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011)

Issue 5

The draft letter to NEI states that, "In order to batch-load fuel into a commercial nuclear power plant, licensees are required to perform reload safety analyses using NRC-approved analytical codes and methods described in the licensee's technical specifications (TS)." This infers that the use of NRC-approved analytical codes and methods is not required for other situations.

Prior to implementation of Core Operating Limits Report (COLR), licensees submitted license amendment requests to address limits associated with reactor physics parameters that typically change for each fuel cycle and result in the requirement to alter technical specification limits. These amendment requests included analysis with NRC-approved methodologies for each type of fuel assembly severally and collectively.

The COLR and associated technical specifications were implemented in accordance with Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits from Technical Specifications." This Generic Letter stated that it is essential to safety that the plant is operated within the bounds of cycle specific parameter limits and that a requirement to maintain the plant within the appropriate bounds must be retained in the TS. Thus assuring conformance to 10 CFR 50.36 by specifying the specific value(s) determined to be within specified acceptance criteria (usually the limits of the safety analyses) using an approved calculation methodology.

However, the specific values of these limits may be modified by licensees, without affecting nuclear safety, provided that these changes are determined using an NRC-approved methodology and consistent with all applicable limits of the plant safety analysis that are addressed in the Updated Final Safety Analysis Report (UFSAR).

This TS (TS 5.6.3 in the Standard TSs) states that "The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC." This TS also lists the specific NRC-approved topical reports which provide the methods for analyzing the core operating limits. For example, for a boiling water reactor (BWR), plant TSs would typically list NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (referred to as the GESTAR II) among many NRC-approved codes and methodologies. Analysis with NRC-approved methodologies is required to be conducted for each type of fuel assembly severally and collectively, regardless of the specific composition (e.g., new design features like bottom nozzles, replacement of individual fuel pins/rods, and/or LTAs) of the fuel assembly. There is no documented or inferred exception to this license requirement for LTAs.

Issue 6

The draft letter to NEI provides guidance that is inconsistent with the NRC's Principles of Good Regulation. With respect to "Openness," the guidance would establish a new regulatory framework that would exclude the public from any meaningful participation in licensee use of LTAs (i.e., since license amendments would generally not be needed). It is also notable that there has been no effort by managers involved in development of the draft letter to NEI to engage in discussion with the authors of either the March 22, 2018 or April 16, 2018 comments on the draft correspondence to disposition the comments. It also does not appear that there will be any effort to disposition this non-concurrence prior to publication of the draft letter to NEI in the Federal Register. With respect to "Clarity," the guidance would establish positions that are not coherent, not logical, and not readily understood based on past practice and numerous safety evaluations expressing positions diametrically opposed to the guidance, along with the absence of any records of regulatory actions that support the positions of the guidance. With respect to "Reliability," the guidance leads to uncertainty and a lack of regulatory stability. In addition, the guidance is not fully consistent with the NRC's regulations and applicable laws.

Some NRC staff have characterized these LTA regulatory framework issues as of low safety significance and that staff members opposed to the path forward, as described in Enclosure 1 to memorandum dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of LTAs" (ML18078A011), are "too hung up on the process." However, with respect to safety significance, as discussed in Enclosure 2 of this memorandum, maintaining the integrity of the fuel cladding is one of the fundamental concepts with respect to the plant safety margin and defense-in-depth. Furthermore, a nuclear core reload utilizing fuel assemblies with the following attributes could potentially represent a significant hazard due to a significant reduction in safety margin: (1) fuel assemblies different than those previously found acceptable to the NRC; and (2) fuel assemblies whose analytical methods have not been previously approved by the NRC.

With respect to process, the NRC establishes processes via procedures such as Management Directives and Office Instructions, in part, with the intent of ensuring that applicable laws and regulations are met. There are clearly some administrative aspects to agency processes that can be easily changed without being in conflict with the applicable laws and regulations. However, the issues discussed in Enclosure 2 to the aforementioned memorandum, relate to processes rooted in law and regulations and should be adhered to, unless changed legally through the rulemaking process.

Appendix A

March 22, 2018

MEMORANDUM TO: Margaret M. Doane, General Counsel
Office of the General Counsel

FROM: , Senior Project Manager **/RA/**
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Harold K. Chernoff, Chief **/RA/**
ROP Support and Generic Communications Branch
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

SUBJECT: USE OF OPEN DOOR POLICY – REGULATORY FRAMEWORK REGARDING USE OF LEAD TEST ASSEMBLIES

Purpose

The purpose of this memorandum is to express concerns with the regulatory and legal positions stated in a draft memorandum regarding the regulatory framework related to use of lead test assemblies (LTAs) in operating reactors. The draft memorandum in question is included as Enclosure 1.

Background

By memo dated November 22, 2017 (ML17325A157), the Office of Nuclear Reactor Regulation (NRR) established a senior management steering committee and a working group to "oversee resolution of the regulatory challenges associated with the use of lead test assemblies (LTAs)." As stated in the charter (ML17325A336) enclosed with the memo, the industry's current interest in the development of accident tolerant fuel (ATF) designs has led to an increased focus on the use of LTAs. Based on recent interactions with stakeholders and licensees, the staff has recognized a need to develop and communicate clear expectations and guidance on the licensing requirements of LTAs. The purpose of the steering committee is to clearly document the agency's position on the regulatory requirements for inserting LTAs in reactors. As further stated in the charter, the steering committee will specifically seek to provide clarity on the following topics as they relate to LTAs:

- Expectations related to license amendment requests;
- Technical Specification (TS) language;
- Exemption requirements associated with 10 CFR 50.46; and
- Use of 10 CFR 50.59 by licensees to implement LTA programs.

As a result of the above activities, the LTA steering committee has produced a draft memorandum, from the NRR Office Director to the NRC Regional Administrators and several of the NRR Division Directors, to provide the NRC staff positions on the regulatory requirements for inserting LTAs in reactors (hereinafter referred to as the "NRR memorandum"). Based on past communication from the steering committee, it is our understanding that the NRR memorandum would be made public in order to provide guidance to licensees.

In the course of the LTA working group and steering committee discussions, it is clear that there are alternate views on the licensing requirements for LTAs. Enclosure 1 provides a draft copy of the NRR memorandum with comments to delineate some of the areas where there is disagreement. In addition, Enclosure 2, "Regulatory Framework Regarding Use of Lead Test Assemblies (LTAs)" provides an in-depth analysis to support the positions in the concerns stated below. The positions in Enclosure 2 have been discussed in detail and over a long time period with the members of the LTA steering committee and working group. However, the draft NRR memorandum has summarily dismissed those positions and presents a regulatory framework for LTAs that is not in accordance with applicable laws and regulations and should not be supported.

Concerns

1) The draft NRR memorandum (i.e., Enclosure 1) provides an interpretation of the TS requirements for LTAs that is different than a long history of license amendments issued for use of LTAs. This new interpretation is also contrary to the regulatory construct for the design features for fuel assemblies to be included in TSs in accordance with 10 CFR 50.36(c)(4). Specifically, the NRR memorandum indicates that licensees do not need license amendments for use of LTAs with cladding or pellet materials different than those currently specified in the TSs for other fuel assemblies. In addition, the NRR memorandum indicates licensees do not need to use NRC staff approved codes and methods for analyzing LTAs. Based on the analysis in Section 2.0, "Interpretation of TS Language Related to LTAs and Need for License Amendments," of Enclosure 2, it is concluded that, if a licensee desires to use an LTA of a different cladding or pellet material than currently specified in the design features TS for fuel assemblies, a license amendment request must be submitted. In addition, prior to use, LTAs must be analyzed with applicable NRC staff approved codes and methods.

2) The draft NRR memorandum provides a faulty analysis of the requirements in 10 CFR 50.59, for prior NRC approval on use of LTAs. The comments in Enclosure 1 address some of the flawed arguments in the NRR memorandum regarding 10 CFR 50.59. In addition an analysis on use of 10 CFR 50.59 by licensees to implement LTA programs is included in Section 6.0 of Enclosure 2.

3) The draft NRR memorandum provides an interpretation of the need for exemptions from 10 CFR 50.46 that is different than a long history of exemptions issued for use of LTAs. This new interpretation is also contrary to the requirements in 10 CFR 50.57 regarding the licensee operating the facility in conformance with the rules and regulations of the Commission. Based on the analysis in Section 3.0, "Exemption Requirements Associated With 10 CFR 50.46" of Enclosure 2, it is concluded that until the final rule for 10 CFR 50.46c is issued (reference ML112620346), licensees will need exemption requests for cladding materials other than zircaloy or ZIRLO™ and for pellet materials other than uranium oxide. Furthermore, based on the analysis in Section 4.0, "License Authority," regardless of your interpretation of the design features TS for fuel assemblies, the licensee still would not have the authority to load LTAs, with different cladding or pellet material than specified in 10 CFR 50.46, and its current TSs, without an approved exemption.

4) Since the draft NRR memorandum provides new interpretations of regulatory requirements that have a substantial effect on licensee activities, as well as on public stakeholders, the guidance should be considered a rule. As such, the NRR memorandum should be processed in accordance with the NRC's procedures established to meet the requirements of the Congressional Review Act. Additionally, the NRR memorandum should be subject to public notice and comment, prior to implementation, consistent with the Administrative Procedure Act and the Atomic Energy Act. An analysis of these issues is contained in Section 5.0, "Considerations for Guidance that Provide New Interpretations of NRC Requirements," of Enclosure 2.

Conclusion/Recommendations

The draft NRR memorandum provides guidance that is inconsistent with the NRC's Principles of Good Regulation. With respect to "Openness," the guidance would establish a new regulatory framework that would exclude the public from any meaningful participation in licensee use of LTAs (i.e., since license amendments would generally not be needed). With respect to "Clarity," the guidance would establish positions that are not coherent, not logical, and not readily understood based on past practice and numerous safety evaluations expressing different positions. With respect to "Reliability," the guidance leads to uncertainty and a lack of regulatory stability. In addition, the guidance is not fully consistent with the NRC's regulations and applicable laws.

It is noted that some NRC staff have characterized these LTA regulatory framework issues as of low safety significance and that staff members opposed to the path forward, as described in Enclosure 1, are "too hung up on the process." However, with respect to safety significance, as discussed in Enclosure 2, maintaining the integrity of the fuel cladding is one of the fundamental concepts with respect to the plant safety margin. Furthermore, a nuclear core reload utilizing fuel assemblies with the following attributes could potentially represent a significant hazard due to a significant reduction in safety margin:

(1) fuel assemblies different than those previously found acceptable to the NRC; and

(2) fuel assemblies whose analytical methods have not been previously approved by the NRC.

With respect to process, the NRC establishes processes via procedures such as Management Directives and Office Instructions, in part, with the intent of ensuring that applicable laws and regulations are met. There are clearly some administrative aspects to our processes that can be easily changed without being in conflict with the applicable laws and regulations. However, the issues discussed in Enclosure 2 relate to processes rooted in law and regulations.

Based on the above considerations, it is recommended that the current regulatory framework be maintained as is, unless changed legally through the rulemaking process.

Thank you in advance for your time and consideration of the concerns identified herein.

Enclosures:
1) Draft NRR memorandum (with comments)
2) Regulatory Framework Regarding Use of Lead Test Assemblies, Revision 1

SUBJECT: USE OF OPEN DOOR POLICY – REGULATORY FRAMEWORK REGARDING USE OF LEAD TEST ASSEMBLIES DATED: MARCH 22, 2018

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Enclosure 2: ML18078A013

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Regulatory Framework Regarding Use of Lead Test Assemblies (LTAs)

Revision 1[1]

Prepared by
Senior Project Manager, NRR/DORL, Subject Matter Expert for License Amendment Process

1.0 Background

By memo dated November 22, 2017 (ML17325A157), the Office of Nuclear Reactor Regulation (NRR) established a senior management steering committee and a working group to "oversee resolution of the regulatory challenges associated with the use of lead test assemblies (LTAs)." As stated in the charter (ML17325A336) enclosed with the memo, the industry's current interest in the development of accident tolerant fuel (ATF) designs has led to an increased focus on the use of LTAs. Based on recent interactions with stakeholders and licensees, the staff has recognized a need to develop and communicate clear expectations and guidance on the licensing requirements of LTAs. The purpose of the steering committee is to clearly document the agency's position on the regulatory requirements for inserting LTAs in reactors. As further stated in the charter, the steering committee will specifically seek to provide clarity on the following topics as they relate to LTAs:

- Expectations related to license amendment requests;
- Technical Specification (TS) language;
- Exemption requirements associated with 10 CFR 50.46; and
- Use of 10 CFR 50.59 by licensees to implement LTA programs.

As a result of the above activities, the LTA steering committee has produced a draft memorandum, from the NRR Office Director to the NRC Regional Administrators and several of the NRR Division Directors, to provide the NRC staff positions on the regulatory requirements for inserting LTAs in reactors. It is my understanding that the subject memorandum would be made public in order to provide guidance to licensees.

In the course of the LTA working group and steering committee discussions, it is clear that there are alternate views on the licensing requirements for LTAs. This paper documents one viewpoint in order to help inform the path forward on this effort.

2.0 Interpretation of TS Language Related to LTAs and Need for License Amendments

2.1 Safety Margin

The NRC issued a final rule on March 6, 1986 (51 FR 7744), "Final Procedures and Standards on No Significant Hazards Considerations," also known as the "Sholly" rule. This rule, in part, established standards in 10 CFR 50.92, "Issuance of amendment," for determining whether an amendment to an operating license involves no significant hazards consideration (NSHC). The rule revised 10 CFR 50.92 to state that the NRC may make a final determination, under the

[1] This revision supersedes the previous revision of this document (ML18036A009) issued on February 8, 2018.

procedures in 10 CFR 50.91, that a license amendment involves NSHC, if operation of the facility, in accordance with the amendment, would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

As discussed in the statement of consideration (SOC) for a final rule dated October 4, 1999 (64 FR 53582) which modified 10 CFR 50.59:

> As part of the licensing review for a facility, the NRC established a level of required performance (which will be referred to in this discussion as acceptance criteria) for certain physical parameters, such as those that define the integrity of the fission product barriers (e.g., fuel cladding, reactor coolant system boundary, and containment). Satisfying these acceptance criteria produces a margin of safety to loss of barrier integrity.

Consistent with above, the margin of safety (i.e., the third standard in 10 CFR 50.92) is associated with the confidence in the ability of the fission product barriers (i.e., fuel cladding, reactor coolant pressure boundary, and containment structure) to limit the level of radiation dose to the public.

The SOC for the Sholly rule stated, in part, that:

> The Commission explained that it is possible, for example that there may-be a class of license amendments sought by a licensee which, while designed to improve or increase safety may, on balance, involves a significant hazards consideration because it results in operation of a reactor with a reduced safety margin due to other factors or problems.

The SOC provided a list of examples of amendments that are not likely to involve a significant hazards concern. One of these examples included the following:

> For a nuclear power reactor, a change resulting from a nuclear reactor core reloading, if no fuel assemblies from those found previously acceptable to the NRC for a previous core at the facility in question are involved. This assumes that no significant changes are made to the acceptance criteria for the technical specifications, that the analytical methods used to demonstrate conformance with the technical specifications and regulations are not significantly changed, and that NRC has previously found such methods acceptable.

Based on the above, it is concluded that maintaining the integrity of the fuel cladding is one of the fundamental concepts with respect to the plant safety margin. Furthermore, a nuclear core reload utilizing fuel assemblies with the following attributes could potentially represent a significant hazard due to a significant reduction in safety margin:

(1) fuel assemblies different than those previously found acceptable to the NRC; and

(2) fuel assemblies whose analytical methods have not been previously approved by the NRC.

2.2 Technical Specification Requirements for Design Features

In 10 CFR 50.36, the NRC established its regulatory requirements related to the content of TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following categories: (1) safety limits, limiting safety system settings, and limiting control settings; (2) limiting conditions for operation (LCOs); (3) surveillance requirements (SRs); (4) design features; and (5) administrative controls.

As stated in 10 CFR 50.36(c)(4), design features to be included in the TSs are those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered by TSs related to safety limits, limiting safety system settings, and limiting control settings; LCOs; and SRs.

As referenced in the SOC for a final rule dated December 17, 1968 (33 FR 18610), "Technical Specifications for Facility Licenses; Safety Analysis Reports," **the NRC expects "those items that are directly related to maintaining the integrity of the physical barriers designed to contain radioactivity" to be included in the TSs**. The SOC referenced a "Guide to Content of Technical Specifications for Nuclear Reactors," as being available to help provide a sound basis for each technical specification. **With respect to the design features covered by the TSs, this guide, dated November 1968, stated in Section IV.4, "Design Features," that:**

> **These technical specifications are intended to cover design characteristics of special importance to each of the physical barriers, and to the maintenance of safety margins in the design.** The principal objectives of this category is to control changes in design of vital equipment.
>
> Selection of specifications in this category should be predicated upon an examination of all equipment and materials associated with each barrier, including the barrier, with respect to:
>
> (a) whether a change in design would affect any technical specification,
>
> (b) whether any margin of safety associated with any technical specification would be affected, and
>
> (c) whether the equipment or its performance is covered in any other technical specification.

Most plant TSs currently contain requirements regarding fuel assemblies in the design features section of the TSs related to the reactor core. These design features TSs typically contain wording similar to the following based on TS 4.2.1, "Fuel Assemblies," in the Standard Technical Specifications (i.e., NUREG-1430 through NUREG-1434):

> 4.2.1 Fuel Assemblies
>
> The reactor shall contain [ ] fuel assemblies. Each assembly shall consist of a matrix of [Zircaloy or ZIRLO] fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those

> fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. **A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.** [emphasis added]

Some NRC staff have the position that LTAs just need to meet the requirements stated in the last sentence of TS 4.2.1 and that the preceding sentences in the paragraph do not apply. In other words, these staff members assert that the LTAs would not be required to meet the cladding or pellet material requirements and would not need to have been analyzed with "applicable NRC staff approved codes and methods." However, this position is not supported by a plain language reading of TS 4.2.1. It is also inconsistent with the origin of this language in Generic Letter 90-02, Supplement 1, "Alternative Requirements for Fuel Assemblies in Design Features Section of Technical Specifications." This document, clearly states that the proposed language is intended to support fuel reconstitution and that it can only be used without an amendment when the reconstituted fuel does not involve a change to the TS Design Features section (e.g. cladding material). This would preclude any change in cladding material. Further, the whole intent of Supplement 1 to Generic Letter 90-02 was to clarify that fuel reconstitution configurations must be evaluated with NRC approved methods and codes, "The staff considers an NRC-approved methodology to be any methodology that the NRC staff has explicitly approved in a written safety evaluation, or a plant-specific technical specification basis. That NRC-approved methodology must be used only for the purpose and the scope of application specified in the reviewed document as approved or modified in the NRC approval documentation. In general, the scope of application for generic methods is limited to fuel configurations that are represented by fuel assembly test configurations used to validate an approved methodology." It is from this concept and language that the sentence regarding lead test assemblies arises logically since use of a generic approved methodology would require testing for validation and that testing cannot be conducted without an allowance to insert assemblies for representative testing.

In addition, **based on the regulatory framework discussed above, it can be concluded that:**

(1) The design features TSs need to specify materials of construction of the cladding of all fuel assemblies (i.e., including LTAs) since cladding is a fission product barrier and is directly related to maintaining the safety margin; and

(2) LTAs need to be analyzed with NRC staff approved codes and methods.

The position that LTAs need to analyzed with approved codes and methods is further supported by TS requirements regarding the Core Operating Limits Report (COLR). This TS (TS 5.6.3 in the Standard TSs) states that "The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC." This TS also lists the specific NRC-approved topical reports which provide the methods for analyzing the core operating limits. For example, for a boiling water reactor (BWR), plant TSs would typically list NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (referred to as the GESTAR II). There is nothing in TS 4.2.1 that would exclude LTAs from being analyzed with the approved methods listed in TS 5.6.3 (i.e., licensees are required to comply will all provisions of their TSs).

Further evidence in provided on the September 23, 1981, letter from the NRC (T.A. Ippolito) to General Electric (R. Engel), "Lead Test Assembly Licensing" (ADAMS Legacy Library Accession No. 8110090006). This letter, which pre-dates the requirements later incorporated into the TSs, stated that one of the "key elements" for licensee use of LTAs was "analysis of the LTAs using approved methods." It is also noted that the January 10, 2018, report from Southern Nuclear (ADAMS Package ML18012A047) concerning the accident tolerant fuel (ATF) LTAs that were

recently loaded into Hatch Unit 1, stated that the report contains information to comply with the 1981 Ippolito letter. Accordingly, the licensee submittal further states that "the ATF LTAs have been, or will be, analyzed using the NRC approved methods" described in Reference 3." Reference 3 is GESTAR II. Section 1.2, "Basis for Fuel Licensing Criteria," in Revision 23 to GESTAR II (ML16250A043) dated September 2, 2016, specifically states that NRC-approved analytical models and analysis procedures will be used to evaluate new fuel designs and that the method for licensing LTAs (called "lead use assemblies" in GESTAR II) will be in accordance with the September 23, 1981, Ippolito letter, which requires analysis of LTAs with approved methods. **Any assertion that LTAs do not need to be analyzed with NRC staff approved codes and methods is contrary to plant TSs and the long-standing policy as stated in the 1981 Ippolito letter and as further stated in NRC-approved GESTAR II.**

2.3 License Amendment Precedence for Use of LTAs

The NRC staff searched through ADAMS to review a number of license amendments pertaining to use of LTAs. Many of these amendments relate to licensees requesting approval to use LTAs containing cladding material different than previously specified in the design features TS for fuel assemblies.

A compelling example is found in a Braidwood license amendment request and exemption request dated September 26, 2006 (ML062700248). In this application, Exelon proposed the use of up to 8 LTAs with AREVA NP Advanced Mark-BW(A) fuel which use an advanced zirconium-based M5 alloy cladding and fuel pellets containing gadolinia homogeneously mixed with uranium dioxide.

With respect to the need for an amendment, Exelon stated that:

> The AREVA Advanced Mark-BW(A) fuel assemblies use an advanced zirconium-based M5 alloy for the fuel assembly structural tubing, fuel rod cladding, and grids. The NRC has previously approved the use of the M5 alloy in References 3 and 5. **Existing TS 4.2.1 does allow a limited number of lead test assemblies that have not completed representative testing to be placed in nonlimiting core regions (i.e., locations), however, the current TS 4.2.1 restricts fuel rod cladding materials to Zircaloy or ZIRLO™.** Representative testing of Advanced Mark-BW lead test assemblies has been completed, as described in Reference 1. **Changes to TS 4.2.1 are therefore required to allow the use of fuel assemblies containing M5 alloy as a cladding and structural material.** [emphasis added]

The proposed changes to TS 4.2.1 in Exelon's application were as follows (with proposed changes shown in bold text):

> The reactor shall contain 193 fuel assemblies. Each assembly**, with exceptions as noted below,** shall consist of a matrix of Zircaloy or ZIRLO clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (U02) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods or vacancies for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design

bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

Up to 8 AREVA NP Advanced Mark-BW(A) fuel assemblies containing M5 alloy may be placed in nonlimiting Unit 1 core regions for evaluation during Cycles 14, 15, and 16 .

The fact that Exelon included the phrase "with exceptions as noted below" indicates that the text preceding the sentence regarding LTAs (i.e., "A limited number of lead test assemblies..."), are also applicable to the LTAs. This means that LTAs need to be consistent with the cladding and pellet materials stated in TS 4.2.1 and must also be comprised of fuel designs that have been analyzed with applicable NRC staff approved codes and methods.

The NRC staff's SE for the associated amendment issued on October 4, 2007 (ML072620367), echoed the licensee's wording regarding the need for an amendment based on the cladding material other than Zircaloy or ZIRLO.

There are numerous other examples of amendments issued for LTAs to explicitly add cladding materials or allowances to address material restrictions, consistent with the second sentence of TS 4.2.1. These amendments show that the entire paragraph was viewed, by licensees as well as the NRC staff, as requirements that must be met for LTAs. Some of these examples are shown in Table 1 below.

2.4 Conclusion Regarding Need for License Amendments for Use of LTAs

Based on review of the amendments listed in Table 1 below, and the information in Sections 2.1 through 2.3 above, the NRC staff has interpreted the design features TS paragraph, for fuel assemblies (e.g., TS 4.2.1 in the STS), to be taken in its entirety. In other words, the requirements for LTAs in the last sentence in TS 4.2.1 cannot stand on its own. If a licensee desires to use an LTA of a different cladding or pellet material than currently specified in TS 4.2.1, a license amendment request must be submitted. In addition, prior to use, LTAs must be analyzed with applicable NRC staff approved codes and methods.

Table 1
Examples of Amendments Issued for Use of LTAs

Plant	Amend Date	Accession No.	Comments
Cooper	04/01/88	ML021360455	Amendment approves installation of LTAs and control blades. Amendment changes designs features TS which is different than later TS 4.2.1 adopted in STS. Adds the following new paragraph: "Lead Test Assembly (LTA) control blades and fuel assemblies of different design than described above may be installed under the provisions of 10 CFR 50.59 in conjunction with vendor test programs. The LTAs shall have been analysed using methods previously approved by the NRC. The licensee will provide the NRC with a report describing the LTAs and analyses not less than 30 days prior to startup." Although, the above cites 10 CFR 50.59, it also indicates the LTAs need to have been analyzed using NRC-approved methods as stated in the 9/23/81 Ippolito letter. The SE also states that "This change simply reflects the NRC's regulations governing the procedure for modifying design features not specified in the Technical Specifications."
Vogtle 1 & 2	10/04/91	ML012280295	Amendment modifies the TS 5.3.1 to allow the use of two Westinghouse VANTAGE-5 fuel assemblies in which up to 12 fuel rods may be clad with ZIRLO. Amendment changes first sentence in TS 5.3.1 to read as follows (with changes shown in bold): "The core shall contain 193 fuel assemblies with each fuel assembly containing 264 fuel rods clad with Zircaloy-4 **except for two fuel assemblies which may each contain up to twelve (12) fuel rods clad with ZIRLO™**."

Plant	Amend Date	Accession No.	Comments
ANO 1	09/07/93	ML021260296	Allows fuel assemblies to be reconstituted by use of stainless steel filler rods to replace damaged fuel rods per suggested line-item improvement in Supplement 1 to GL 90. Revised TS 5.3.1.1 includes the following last sentence "A limited number of lead test assemblies that have not completed representative testing may be placed in non-limiting core regions." The NRC staff SE states "The amended TS 5.3.1.1 provides also that a limited number of lead test assemblies (LTAs) that have not completed representative testing may be placed in non-limiting core regions. This provision is suggested in Supplement 1 of GL 90-02 in order to explicitly acknowledge the use of LTAs in the core, appropriately placed, to test new fuel designs. The use of NRC-approved methodology is also sufficient to ensure that placement of LTAs in the core will satisfy all existing design bases and safety criteria."
TMI-1	07/24/95	ML003765855	Revised second sentence of TS 5.3.1.1 to add M4 and M5 cladding in addition to zircaloy and ZIRLO.

Plant	Amend Date	Accession No.	Comments
DC Cook 1 & 2	08/22/95	ML021070500	Makes line item improvement to TS 5.3.1, "Fuel Assemblies," in accordance with GL 90-02, Supplement 1, to allow fuel reconstitution when analyzed in accordance with NRC approved methodologies. With respect to LTAs, the staff's SE states: "While the licensee may place lead test assemblies that have not completed representative testing in non-limiting core regions, the proposed change allows this only in non-limiting core regions (i.e., where the lead test assembly does not become the assembly with least thermal margin to either the Departure from Nucleate Boiling or Linear Heat Generation Rate design limits at any time during its cycle life) and where analyses, using NRC approved methodologies, show that these assemblies comply with all fuel safety design bases."
North Anna 1 & 2	05/09/97	ML013510495	Approves LTAs with advanced zirconium cladding and other design features. Adds new sentence to TS consistent with STS as follows: "A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core locations." Also adds new license condition which reads: "Virginia Electric and Power Company may use up to four (4) fuel assemblies containing advanced zirconium based alloys as described in the licensee's submittal dated September 4, 1996, as supplemented February 3, 1997."
Watts Bar 1	09/15/97	ML020780128	Adds the following at the end of TS 4.2.1, "For Unit 1. Cycle 2, Watts Bar is authorized to place a limited number of Tritium Producing Burnable Absorber Rod lead test assemblies into the reactor in accordance with TVA's application dated April 30, as supplemented June 18, July 21 (3 letters), and August 7 and 21, 1997."

Plant	Amend Date	Accession No.	Comments
Sequoyah 2	04/12/99	ML013320556	Amendment added a sentence at the end of TS Section 5.3.1 authorizing installation of LTAs containing downblended uranium.
Calvert Cliffs 2	04/05/01	ML011000289	Added new sentence to end of TS paragraph to allow LTA with advanced cladding material.
Kewaunee	08/13/01	ML012270457	SE indicates that current TS only names zircaloy as an acceptable cladding material. Licensee plans to use LTAs with ZIRLO cladding. Amendment adds new sentence to end of TS paragraph which states "Lead test assemblies shall be of designs approved by the NRC for use in pressurized water reactors and their clad materials shall be the materials approved as part of those designs." SE states that that this change will reduce the licensee's regulatory burden if another advanced design fuel assembly becomes available.
Comanche Peak 1 & 2	03/26/02	ML020910198	Second sentence of TS only allows zircaloy cladding. Amendment revises last sentence to allow ZIRLO LTAs. Revised sentence (per bold text) to read as follows: "A limited number of lead test assemblies that have not completed representative testing **or that contain Westinghouse ZIRLO™ fuel rod cladding** may be placed in non-limiting core regions."
North Anna 2	09/04/02	ML022420065	Adds license condition to allow higher burnup limit to existing LTAs. No TS changes needed, based on 5/9/97 amendment (listed above).

Plant	Amend Date	Accession No.	Comments
Calvert Cliffs 2	04/14/03	ML031050369	Adds the following text at the end of TS 4.2.1: "For Unit 2 Cycle 14 only, advanced cladding material may be used in one lead test assembly as described in an approved temporary exemption dated March 6, 2001. For Unit 2 Cycles 15 and 16 only, advanced cladding material from Framatome-ANP may be used in up to four lead test assemblies as described in approved temporary exemption dated April 11, 2003. For Unit 2 Cycles 15 and 16 only, advanced cladding material from Westinghouse may be used in up to four lead test assemblies as described in approved temporary exemption dated April 11, 2003."
Catawba 1 & 2	03/03/05	ML050600029	Amendment allows use of MOX LTAs. Change to TS 4.2.1 added asterisk to end of this sentence: "Each assembly shall consist of a matrix of either ZIRLO™ or Zircalloy fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO2) as fuel material.*" The asterisk refers to the following new sentence added to the end of TS 4.2.1: "A maximum of four lead assemblies containing mixed oxide fuel and M5™ cladding may be inserted into the Unit 1 or Unit 2 reactor core."
Byron 1 & 2	06/16/04	ML041380429	Adds license condition to allow higher burnup limit to existing LTAs. No TS changes needed. SE states that: "While the licensees may make some changes to their facilities without staff approval under 10 CFR 50.59, there are limitations. One limitation is identified in 10 CFR 50.59(c)(2)(vii), in which a proposed change would "result in a design basis limit for a fission product barrier as described in the Final Safety Analysis Report (as undated) being exceeded or altered." Because the fuel cladding is a fission product barrier and burnup is a design basis limit as described in the Byron UFSAR, a license amendment is required to increase the fuel burnup."

Plant	Amend Date	Accession No.	Comments
Waterford	05/09/05	ML051290381	Revises TS 5.3.1 to allow for the use of ZIRLO™ material for the fuel cladding and allow the use of LTAs in non-limiting core regions. With respect to the new sentence regarding LTAs (i.e., STS wording), the SE states: "The revised TS 5.3.1 allows the use of a limited number of LTAs, which have not completed representative testing, in non-limiting core regions. The licensee, in the List of Regulatory Commitments in Section 4 of this report, provides a commitment that prior to the use of LTAs, fuel designs will be analyzed with applicable NRC-approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases and to assure no new or different kind of accident from any accident previously evaluated will be created. Therefore, the revised TS to allow for use of LTAs is acceptable."
Millstone 3	12/30/05	ML053200224	Allows higher burnup limit to existing LTA. No TS changes needed.
Calvert Cliffs 1 & 2	11/16/06	ML063240209	Amendment approves use of LTAs with advanced cladding material. Revised TS 4.2.1 to add the following: "For Unit 1 Cycle 19 or Unit 2 Cycle 17 only, advanced cladding material from Framatome-ANP may be used in up to 2 lead test assemblies as described in approved temporary exemption dated November 9, 2006. For Unit 1 Cycle 19 or Unit 2 Cycle 17 only, advanced cladding material from Westinghouse may be used in up to 2 lead test assemblies as described in approved temporary exemption dated November 9, 2006."
Braidwood 1 & 2	10/04/07	ML072620367	Amendment revises TS 4.2.1 to allow use of up to 8 LTAs with AREVA NP Advanced Mark-BW(A) fuel which use an advanced zirconium-based M5 alloy cladding and fuel pellets containing gadolinia homogeneously mixed with uranium dioxide. See detailed write up above.

Plant	Amend Date	Accession No.	Comments
Calvert Cliffs 1	12/20/07	ML073200414	Amendment approves use of LTAs with advanced cladding material. Revised TS 4.2.1 to add the following: "For Unit 1 Cycle 19 only, advanced cladding material from AREVA may be used in up to two lead test assemblies as described in approved temporary exemption dated December 17, 2007. For Unit 1 Cycle 19 only, advanced cladding material from Westinghouse may be used in up to two lead test assemblies as described in approved temporary exemption dated December 17, 2007."

3.0 Exemption Requirements Associated With 10 CFR 50.46

As discussed above in Section 1.0, in addition to investigating the need for license amendments for use of LTAs, the steering committee is also tasked with providing clarity on the need for exemption requests, related to 10 CFR 50.46, for use of LTAs.

The staff has searched through ADAMS and reviewed a number of exemptions issued related to use of LTAs. In a number of cases, the exemptions were submitted by licensees with associated amendments (some of those listed in Table 1 above). In other cases, exemptions were submitted without amendments. Sometimes amendments were not needed due to the existing wording in the TSs. In other cases, it appears an amendment should have been submitted but wasn't. These discrepancies highlight the need for guidance on for both internal and external stakeholders.

Similar to the Braidwood license amendment request (LAR) example discussed above in Section 2.3, one of the most telling examples, regarding the need for exemptions, is found in same application dated September 26, 2006 (ML062700248) which requested an exemption for Braidwood. In this application, Exelon proposed the use of up to 8 LTAs with AREVA NP Advanced Mark-BW(A) fuel which use an advanced zirconium-based M5 alloy cladding and fuel pellets containing gadolinia homogeneously mixed with uranium dioxide. With respect to the need for an exemption, Exelon stated in its application that:

> 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," requires nuclear power reactors fueled with uranium oxide pellets within cylindrical Zircaloy or ZIRLO™ cladding to be provided with an emergency core cooling system with certain performance requirements. Although the AREVA Advanced Mark-BW(A) fuel assemblies incorporate cladding material other than those defined in 10 CFR 50.46 (i .e., Zircaloy and ZIRLO™), the criteria of this section will continue to be satisfied for the Braidwood Station Unit 1 core . Since 10 CFR 50.46 does not specifically address M5 alloy, an exemption to 10 CFR 50.46 has been requested.

> 10 CFR Part 50, Appendix K, "ECCS Evaluation Models," ensures that cladding oxidation and hydrogen generation are appropriately limited during a LOCA and conservatively accounted for in the ECCS model. This regulation sets forth requirements for plants that use either Zircaloy or ZIRLO™ fuel cladding. Specifically, Paragraph I.A .5 of 10 CFR Part 50, Appendix K, requires that the Baker-Just equation be used in the ECCS evaluation model to determine the rate of energy release, hydrogen generation, and cladding oxidation. When M5 alloy is used as fuel rod cladding and structural material, the Baker-Just correlation bounds post-LOCA scenarios, and ECCS evaluation model criteria will be met. Because the Baker-Just equation does not explicitly address M5 alloy, an exemption to 10 CFR Part 50, Appendix K has been requested.

Typical wording in the NRC issued exemptions have explained the need for prior NRC approval as follows:

> **As written, these regulations presume only the use of zircaloy or ZIRLO™ fuel rod cladding and do not contain provisions for use of fuel rods with other cladding materials. Therefore, an exemption from the requirements of 10 CFR 50.46 and 10 CFR part 50, appendix K, is needed to support the use of a different fuel rod cladding material.** [Reference: Surry exemption dated July 27, 2016, for use of M5 cladding in 8 LTAs (ML16195A525)]

Almost identical wording to the above paragraph is contained in an exemption dated August 4, 2016, for batch use of Optimized ZIRLO™ in future core reloads for Farley and Vogtle (ML16179A410). That exemption has an associated amendment (ML16179A386) to modify TS 4.2.1, "Fuel Assemblies," and TS 5.6.5.b, "Core Operating Limits" to allow the use of Optimized ZIRLO™ fuel cladding material. The staff's safety evaluation (SE) for the amendment discussed the limitations and conditions in NRC-approved Westinghouse topical report WCAP-12610-P-A for Optimized ZIRLO™. Condition and Limitation 1 in the staff's SE for the topical report states that until rulemaking to 10 CFR Part 50 addressing Optimized ZIRLO™ has been completed, implementation of Optimized ZIRLO™ fuel clad requires an exemption from 10 CFR 50.46 and 10 CFR Part 50, Appendix K.

Further evidence of the need for exemptions, solely because different cladding material is used is discussed in a South Texas Project exemption dated October 19, 2004, for use of Optimized ZIRLO™ in LTAs (ML042940519). The staff's exemption discussed a rule change to 10 CFR 50.44 to remove reference to cladding material. As such, an exemption was not needed from 10 CFR 50.44. The exemption read, in part:

> Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Section 50.44, specifies requirements for the control of hydrogen gas generated after a postulated loss-of-coolant accident (LOCA). Section 50.46 of 10 CFR contains acceptance criteria for the emergency core cooling system (ECCS) for reactors with zircaloy or ZIRLO™ clad fuel. Appendix K to 10 CFR Part 50 requires, among other things, that the Baker-Just equation be used to predict the rates of energy release, hydrogen concentration, and cladding oxidation from the metal-water reaction. Of these three regulations (10 CFR 50.44, 50.46, and Appendix K to 10 CFR Part 50), 10 CFR 50.44 is the only one that has undergone considerable changes relative to its previous version, changes that became effective on January 1, 2004. Prior to that date, 10 CFR 50.44 specified requirements for the control of hydrogen gas generated after a postulated LOCA

> for reactors with zircaloy or ZIRLO™ clad fuel. The new regulation in 10 CFR 50.44 no longer identifies zircaloy or ZIRLO™ as requisite fuel cladding, nor does it identify the LOCA or 10 CFR 50.46 as bases. **Because the intent of this exemption request relates solely to the specific types of cladding material specified in these regulations**, no exemption is needed from the requirements of 10 CFR 50.44. As written, zircaloy or ZIRLO™ cladding continues to be the requisite fuel cladding that is explicitly identified in 10 CFR 50.46 and Appendix K to 10 CFR Part 50. Therefore, an exemption from the requirements of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is needed in order to irradiate up to eight lead test assemblies (LTAs) comprised of low tin (Optimized) ZIRLO™ at the STP, Units 1 and/or 2. [emphasis added]

The exemption also cites precedence for several other exemptions for LTAs using Optimized ZIRLO™.

Based on the above, it is concluded that until the final rule for 10 CFR 50.46c is issued (reference ML112620346), licensees will need exemption requests for cladding materials other than zircaloy or ZIRLO™ and for pellet materials other than uranium oxide. Table 2 below lists examples of exemptions issued to support use of LTAs.

Table 2
Examples of Exemptions Issued for Use of LTAs

Plant	Exemption Date	Accession No.	Comments
McGuire 1	09/27/91	ML013200053	Approves exemption from 10 CFR 50.46, 10 CFR 50.44 and Appendix K to place two demonstration assemblies containing fuel rods with advanced zirconium based claddings in the core. Note, this exemption was before a revision to 10 CFR 50.44 to remove references to specific cladding materials.
Vogtle 1 & 2	10/03/91	ML012320043	Approves exemption from 10 CFR 50.46, 10 CFR 50 Appendix K, 10 CFR 50.44, and 10 CFR 51.52 for two fuel assemblies with 12 fuel rods clad with ZIRLO instead of Zircaloy. Note, this exemption (and several others listed below) was before ZIRLO was added as an approved cladding to the regulations and before a revision to 10 CFR 50.44 to remove references to specific cladding materials.

Plant	Exemption Date	Accession No.	Comments
TMI-1	10/12/95	ML003765677	Approves exemption from 10 CFR 50.46, 10 CFR 50.44 and Appendix K to place two demonstration assemblies containing fuel rods with advanced zirconium based claddings in the core. The NRC's cover letter states "Our letter transmitting License Amendment No. 194, dated July 24, 1995, stated that an exemption was not required for use of these materials. Upon review of that decision, we have determined that, consistent with our past practice, an exemption is appropriate."
Calvert Cliffs 1	11/28/95	ML010510243	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of four LTAs with advanced zirconium based cladding materials.
North Anna 1&2	05/09/97	ML013510410	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of four LTAs with advanced zirconium based cladding materials.
Calvert Cliffs 2	03/06/01	ML010320336	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of an LTA with advanced zirconium based cladding material.
Palo Verde 3	10/16/01	ML012830302	Approves exemption to allow continued testing of an LTA with advanced zirconium based cladding material
North Anna 2	09/04/02	ML022420065	Approves exemption from 10 CFR 50.44, 50.46, and Appendix K to allow the use an LTA with M4 and M5 cladding.
Calvert Cliffs 2	04/11/03	ML030640137	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs with advanced zirconium based cladding material.

Plant	Exemption Date	Accession No.	Comments
Catawba 1&2	08/04/03	ML032060473	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs containing fuel rods, guide thimble tubes, and instrumentation tubes fabricated with a cladding material that contains a nominally lower tin content than the already approved ZIRLO material.
Byron 1&2	09/22/03	ML031910765	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of one LTA with a limited number of "lower tin" ZIRLO clad replacement fuel rods.
Millstone 3	02/11/04	ML040070238	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs with Optimized ZIRLO cladding.
Waterford 3	07/28/04	ML042110407	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the use of four LTAs with Optimized ZIRLO cladding.
South Texas Project 1&2	10/19/04	ML042940519	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs with Optimized ZIRLO cladding.
Byron 1&2	06/30/06	ML061380518	Approves exemption from 10 CFR 50.44, 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of four LTAs with AXIOM cladding.
Calvert Cliffs 1&2	11/09/06	ML062260123	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the re-insertion of up to four LTAs in either Unit 1 or Unit 2 core. Two of the LTAs have fuel rods clad with advanced zirconium-based alloys. The other two LTAs have fuel rods with M5 cladding.
Calvert Cliffs 1	12/17/07	ML073200694	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the re-insertion of up to four LTAs in either Unit 1 or Unit 2 core. Two of the LTAs have fuel rods clad with advanced zirconium-based alloys. The other two LTAs have fuel rods with M5 cladding.

Plant	Exemption Date	Accession No.	Comments
Palo Verde 1	10/14/08	ML082730006	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs with M5 cladding.
Hatch 2	11/07/08	ML082950158	Approves exemption from 10 CFR 50.46 and Appendix K to 10 CFR Part 50 to allow the use of two standard GE14 fuel assemblies with a limited number of GNF-Ziron clad fuel rods.
Byron 2	04/30/09	ML090490645	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of one LTA with AXIOM cladding.
San Onofre 2&3	12/17/09	ML090860415	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow up to 16 LTAs with M5 alloy cladding into the SONGS 2 reactor core or the SONGS 3 reactor core.
Palo Verde 3	08/26/10	ML101900254	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of eight LTAs with Optimized ZIRLO cladding.
Hatch 2	12/03/10	ML103340437	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of four LTAs with GNF-Ziron cladding.
Hatch 1&2	02/04/14	ML13354B755	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow further irradiation of 2 LTAs with GNF-Ziron cladding.
Surry 1&2	07/27/16	ML16195A516	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of up to eight LTAs with M5 cladding.
Millstone 3	05/10/17	ML17087A308	Approves exemption from 10 CFR 50.46, and Appendix K to 10 CFR Part 50 to allow the use of up to eight LTAs with AXIOM cladding.

4.0 License Authority

As described below, a recent license amendment and exemption for Beaver Valley, related to fuel assembly cladding material, reveals important information on the regulatory framework associated with LTAs.

On March 1, 2018, the NRC issued an exemption for Beaver Valley, Units 1 and 2 (ML17313A554). The exemption was published in the *Federal Register* on March 6, 2018 (83 FR 9550). The exemption allows the batch loading of fuel assemblies that use Optimized ZIRLO™ fuel rod cladding material. Similar to the exemptions for LTAs, this exemption stated, in part, that:

> Pursuant to title 10 of the *Code of Federal Regulations* (10 CFR) section 50.12, "Specific exemptions," the licensee requested, by letter dated April 9, 2017 (ADAMS Accession No. ML17100A269), an exemption from § 50.46, "Acceptance criteria for emergency core cooling systems [ECCS] for light-water nuclear power reactors," and 10 CFR part 50, appendix K, "ECCS Evaluation Models," to allow the use of Optimized ZIRLO™ fuel rod cladding for future core reload applications. The regulations in § 50.46 contain acceptance criteria for the ECCS for reactors fueled with zircaloy or ZIRLO® fuel rod cladding material. In addition, 10 CFR part 50, appendix K, requires that the Baker-Just equation be used to predict the rates of energy release, hydrogen concentration, and cladding oxidation from the metal/water reaction. The Baker-Just equation assumes the use of a zirconium alloy different from Optimized ZIRLO™ material. Therefore, an exemption to § 50.46 and 10 CFR part 50, appendix K, is required to support the use of Optimized ZIRLO™ fuel rod cladding at Beaver Valley.
>
> **The exemption request relates solely to the specific types of cladding material specified in these regulations for use in light-water reactors (i.e., fuel rods with zircaloy or ZIRLO® cladding).** [emphasis added]

The exemption also stated:

> This exemption would allow the use of Optimized ZIRLO™ fuel rod cladding material at Beaver Valley. As stated above, § 50.12 allows the NRC to grant exemptions from the requirements of 10 CFR part 50. **The fuel that will be irradiated at Beaver Valley contains cladding material that does not conform to the cladding material that is explicitly defined in 10 CFR 50.46 and implicitly defined in 10 CFR part 50, appendix K.** However, the criteria of these regulations will continue to be satisfied for the operation of the Beaver Valley cores containing Optimized ZIRLO™ fuel cladding. [emphasis added]

In addition to the exemption request discussed above, the licensee's application dated April 9, 2017 (ML17100A269) included a related license amendment request to revise the Beaver Valley Technical Specifications (TS) to allow the use of Optimized ZIRLO™ fuel rod cladding material. Specifically, the licensee proposed to revise TS 4.2.1, Fuel Assemblies," to add Optimized ZIRLO™ to the approved fuel rod cladding materials and to revise TS 5.6.3, Core Operating Limits Report," to add a Westinghouse approved topical report to the list of approved analytical methods used to determine the reactor core operating limits. On March 1, 2018, the

NRC approved the amendments for Beaver Valley, Units 1 and 2. The staff's safety evaluation (ML18022B116) stated, in part, that:

> The regulations in 10 CFR 50.46 and 10 CFR Part 50, Appendix K, make no provisions for use of fuel rod cladding material other than Zircaloy or ZIRLO®. **Since the material specifications of Optimized ZIRLO™ differ from the specification for Zircaloy or ZIRLO®, a plant-specific exemption is needed to permit an amendment, which this SE supports, to be effective.** The exemption is issued separately from but with support from this SE and amendments. [emphasis added]

Although the exemption and amendments discussed above relate to batch loading of fuel assemblies, with cladding material different than currently specified in 10 CFR 50.46, there are some important aspects of these licensing decisions that also relate to LTAs. As noted in the NRC staff safety evaluation for the Beaver Valley amendments, the exemption needed to be issued in order for the amendment to be effective. **In other words, the licensee had no authority to install the subject fuel assemblies unless an exemption was approved allowing cladding materials different than those specified in 10 CFR 50.46.**

The reason why the exemption was needed, to make the amendment effective is because, for each amendment issued, the NRC staff needs to find that:

> The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission.

The above words, shown in each NRR license amendment, are based on the requirements in 10 CFR 50.57, "Issuance of operating license."

As discussed in Section 2.2 above, most plant TSs currently contain requirements regarding fuel assemblies similar to the following:

> 4.2.1 Fuel Assemblies
>
> The reactor shall contain [ ] fuel assemblies. Each assembly shall consist of a matrix of [Zircaloy or ZIRLO] fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. **A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.** [emphasis added]

As also discussed above, some NRC staff have the position that LTAs just need to meet the requirements stated in the last sentence of TS 4.2.1 and that the preceding sentences in the paragraph do not apply. In other words, these staff members assert that the LTAs would not be required to meet the cladding or pellet material requirements and would not need to have been analyzed with "applicable NRC staff approved codes and methods."

Regardless of your interpretation of TS 4.2.1, consistent with the Beaver Valley precedent, the licensee still would not have the authority to load LTAs, with different cladding material than specified in 10 CFR 50.46, and its current TSs, without an approved exemption. Specifically, the last sentence in the above TS does not contain any provision for the licensee to not be in conformance with other regulations (e.g., 10 CFR 50.46).

Without an exemption, the licensee would not be able to operate the facility in conformance with the rules and regulations of the Commission, as required by 10 CFR 50.57. **As such, licensee's desiring to insert LTAs in the reactor core with cladding materials other than zircaloy or ZIRLO would need exemptions regardless of one's interpretation of whether an amendment is also needed. The same would apply to pellet material other than the material specified in 10 CFR 50.46 (i.e., uranium oxide).**

5.0 Considerations for Guidance that Provide New Interpretations of NRC Requirements

There are a number of decisions of the Commission, the Atomic Safety and Licensing Appeal Board Panel, and the Atomic Safety and Licensing Board Panel that weigh in on the issue of how the specific language in a rule and agency practice should be considered in interpretation of the NRC regulations. Specifically, Section 6.21.5, "Agency's Interpretation of its Own Regulations," in NUREG-0386, Digest 16, "United States Nuclear Regulatory Commission Staff Practice and Procedure Digest, Commission, Appeal Board and Licensing Board Decisions, July 1972 – September 2010," cites the following decisions pertinent to this issue:

> Agency practice, of course, is one indicator of how an agency interprets its regulations. See Power Reactor Development Co. v. International Union, 367 U.S. 396, 408 (1961).Yankee Atomic Electric Co. (Yankee Nuclear Power Station), CLI-96-6, 43 NRC 123, 129 (1996); Sequoyah Fuels Corp. (Gore, OK, Site Decommissioning), CLI-01 -2, 53 NRC 2, 13 (2001); Private Fuel Storaqe, L.L.C. (Independent Spent Fuel Storage Installation), CLI-99-10, 49 NRC 318, 324 (1999); Sequoyah Fuels Corp. (Gore, OK, Site Decommissioning), CLI-01-2, 53 NRC 2, 14 (2001).
>
> Where NRC interprets its own regulations and where those regulations have long been construed in a given way, the doctrine of stare decisis will govern absent compelling reasons for a different interpretation; the regulations may be modified, if appropriate, through rulemaking procedures. New England Power Co. (NEP Units 1 & 2), Public Service Co. of New Hampshire (Seabrook Station, Units 1 & 2) ALAB-390, 5 NRC 733, 741-42 (1977).

In addition to the above legal precedent, in the *Perry* decision (CLI-96-13, 44 NRC 315, 1996), the Commission (44 NRC 315 at 325) stated that:

> The Staff is certainty free to change rule interpretations if appropriate. **But the staff may not adopt an interpretation unsupported by the language and history of the rule.** [emphasis added]

In a memo dated December 13, 2010 (ML103470301), the NRC's General Counsel, Stephen G. Burns, provided guidance on agency documents requiring Congressional review under the Congressional Review Act (CRA). As discussed in the memo:

Enclosure 1 to the memo provided a list of examples of Agency statements that are rules under the CRA. In part, the list included the following:

Further guidance on the NRC's CRA process is provided in Yellow Announcement YA-17-0103 dated October 26, 2017 (ML17072A404).

In a memo dated July 16, 2010 (ML102020549), an OGC attorney provided an in-depth analysis regarding guidance that sets forth new Agency interpretations of NRC requirements. This memo concluded, in part, that:

It is clear from the precedent in Tables 1 and 2 and the discussion above that the NRC staff has interpreted the regulations to require exemptions and license amendments for use of LTAs with cladding and pellet material different than specified in 10 CFR 50.46 and the plant-specific TSs. The current guidance being developed by the LTA Steering Committee, is contrary to past precedent regarding exemptions and license amendments for LTAs. **Based on the legal considerations discussed above, it is concluded that:**

1) **The new guidance provides new interpretations of regulatory requirements that has a substantial effect on licensee activities (i.e., would eliminate the need for licensees to submit certain license amendment requests and exemption requests). In addition the guidance would also have a substantial effect on public stakeholders (i.e., would eliminate the public's ability to request hearings or provide comments on licensee use of LTAs if amendment requests were no longer required). Based on these considerations, the guidance should be considered a rule.**

2) **Since the guidance should be considered a rule, the guidance should be processed in accordance with the NRC's procedures established to meet the requirements of the Congressional Review Act (described in Yellow Announcement YA-17-0103 dated October 26, 2017 (ML17072A404)).**

3) **The guidance should be subject to public notice and comment, prior to implementation, consistent with the Administrative Procedure Act and the Atomic Energy Act.**

6.0 Use of 10 CFR 50.59 by Licensees to Implement LTA Programs

As noted above in Section 1.0, one of the items in the steering committee charter included developing documentation to provide clarity on use of 10 CFR 50.59 by licensees with respect to implementing LTA programs. Throughout the course of the steering committee and working group discussions there has been extensive dialog on this issue. The positions stated by some of the working group members are flawed and inconsistent with the requirements in 10 CFR 50.59. The following provides an analysis on use of 10 CFR 50.59 with respect LTA programs.

In a final rule dated October 4, 1999 (64 FR 53582), the NRC revised 10 CFR 50.59, "Changes, tests, and experiments," to "identify possible changes that might affect the basis for licensing the facility so that any changes that might pose a safety concern are reviewed by the NRC to confirm their safety before implementation." Following publication of the final rule, the Nuclear Energy Institute (NEI) submitted a guidance document for the implementation of 10 CFR 50.59 and requested NRC endorsement through a regulatory guide. In November 2000, the NRC issued Regulatory Guide 1.197, "Guidance for Implementation of 10 CFR 50.59, Changes, Tests and Experiments," (ML003759710) which endorsed Revision 1 of NEI 96-07, "Guidelines for 10 CFR 50.59 Implementation" dated November 2000 (ML003771157) as providing methods that acceptable to the NRC staff for complying with the provisions in 10 CFR 50.59.

The final rule included eight new criteria (in 10 CFR 50.59(c)(2)) which require the licensee to obtain prior NRC approval for the proposed change, in the form of a license amendment, if one or more of the criteria are met. In accordance with 10 CFR 50.59(c)(1), a licensee may make changes in the facility described in its Updated Final Safety Analysis Report (UFSAR), make changes in the procedures as described in the UFSAR, and conduct tests or experiments not described in its UFSAR without obtaining a license amendment, pursuant to 10 CFR 50.90, only

if: (1) a change to the technical specifications (TSs) is not required; and (2) if the change, test, or experiment does not meet any of the eight criteria listed in 10 CFR 50.59(c)(2).

As discussed in Section 2.0 above, based on review of the amendments listed in Table 1 above, and the information in Sections 2.1 through 2.3, the NRC staff has interpreted the design features TS paragraph, for fuel assemblies (e.g., TS 4.2.1 in the STS), to be taken in its entirety. In other words, the requirements for LTAs in the last sentence in TS 4.2.1 cannot stand on its own. If a licensee desires to use an LTA of a different cladding or pellet material than currently specified in TS 4.2.1, a license amendment request must be submitted. In addition, prior to use, LTAs must be analyzed with applicable NRC staff approved codes and methods. **However, even if one were to assume a TS change was not needed to implement use LTAs, it is likely an amendment would still be needed based on the criteria in 10 CFR 50.59(c)(2).** The following discussion provides an analysis of 10 CFR 50.59 and the associated NEI guidance with respect to use of LTAs.

Figure 1 on page 5 of NEI 96-07 provides a flowchart of the 10 CFR 50.59 process. As shown on the flowchart, if the proposed activity does not require a TS change and is not controlled by another regulation or change process, the licensee performs a "screening" to determine if a 10 CFR 50.59 evaluation is needed. The flowchart references Section 4.2 of NEI 96-07 with respect to the screening process. Section 4.2.2 of the NEI guidance lists examples of "tests" that would "screen in" thus requiring a full 10 CFR 50.59 evaluation. One of these examples includes "Operation with fuel demonstration assemblies" (i.e., LTAs). **Consistent with the NEI guidance a 10 CFR 50.59 evaluation would need to be performed by the licensee for use of an LTA.**

Section 4.3 of NEI 96-07 describes the 10 CFR 50.59 evaluation process. Once it has been determined by the licensee that a given activity requires a 10 CFR 50.59 evaluation, the written evaluation must address the applicable criteria of 10 CFR 50.59(c)(2). These criteria are as follows:

> (i) Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the final safety analysis report (as updated);
>
> (ii) Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety previously evaluated in the final safety analysis report (as updated);
>
> (iii) Result in more than a minimal increase in the consequences of an accident previously evaluated in the final safety analysis report (as updated);
>
> (iv) Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the final safety analysis report (as updated);
>
> (v) Create a possibility for an accident of a different type than any previously evaluated in the final safety analysis report (as updated);
>
> (vi) Create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated in the final safety analysis report (as updated);

(vii) Result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered; or

(viii) Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses

Of the eight criteria in 10 CFR 50.59(c)(2), criteria (ii), (vii) and (viii) are most likely to result in a "Yes" answer for use of LTAs and thus require NRC prior approval via a license amendment. These criteria are discussed below.

LTA Assessment for 10 CFR 50.59(c)(2)(ii) Criterion

Section 4.3.2 of NEI 96-07 addresses the evaluation under criterion 10 CFR 50.59(c)(2)(ii) to determine whether the activity results in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety. The NEI guidance states that "Although this criterion allows minimal increases, licensees must still meet applicable regulatory requirements and other acceptance criteria to which they are committed (such as contained in Regulatory Guides and nationally recognized industry consensus standards, e.g., the ASME B&PV Code and IEEE standards). Further, departures from the design, fabrication, construction, testing, and performance standards as outlined in the General Design Criteria (Appendix A to Part 50) are not compatible with a "no more than minimal increase" standard. While the specific design details for proposed LTAs will vary, it is likely that those using new materials for cladding and/or fuel would fail to meet this standard, and thus it is likely that this criteria (i.e., 10 CFR 50.59(c)(2)(ii)) would be met for LTAs, thus requiring a license amendment request.

LTA Assessment for 10 CFR 50.59(c)(2)(vii) Criterion

Section 4.3.7 of NEI 96-07 addresses the evaluation under criterion 10 CFR 50.59(c)(2)(vii) to determine whether the activity results in a design basis limit for a fission product barrier, as described in the UFSAR, being exceeded or altered. The NEI guidance states that "Design basis limits for a fission product barrier are the controlling numerical values established during the licensing review as presented in the UFSAR for any parameter(s) used to determine the integrity of the fission product barrier." This section indicates that "A specific proposed activity requires a license amendment if the design basis limit for a fission product barrier is "exceeded or altered." This section states further: "no distinction has been made between a conservative and non-conservative change in these limits." Section 4.3.7 includes a table (on page 58) that lists specific design basis limits for fuel cladding (e.g., fuel centerline melting temperature, linear heat rate, clad strain, fuel burnup, etc.)[2]. The LTA program focus recently has been on accident tolerant fuel (ATF) LTAs. The material composition and design for the ATF LTAs are likely to result in design basis limits related to the fuel cladding fission product barrier being altered. For example, in an article titled "Accident-tolerant fuel: Enhancing safety," published in the November 2017 issue of Nuclear News, the author, in discussing ATF LTAs planned for use in an operating reactor, stated:

[2] As shown in the table on page 58 of NEI 96-07, two of the fuel cladding design basis parameters (clad temperature and clad oxidation) are controlled by 10 CFR 50.46 and, consistent with 10 CFR 50.59(c)(4), are not subject to the change process in 10 CFR 50.59. However the other fuel cladding design basis parameters listed in the table do not have other regulations with more specific change criteria. As such, 10 CFR 50.59 applies to the other fuel cladding design basis parameters.

Uranium silicide pellets also have higher thermal conductively – four times more than uranium dioxide pellets – and therefore store less energy, providing a safety improvement due to much higher linear heat rate that would have to be reached before the pellets would melt.

Based on the above, it is likely that this criteria (i.e., 10 CFR 50.59(c)(2)(vii)) would be met for LTAs, thus requiring a license amendment request.

LTA Assessment for 10 CFR 50.59(c)(2)(viii) Criterion

Some members of the LTA steering committee and working group have indicated that licensees do not need license amendments for use of LTAs with cladding or pellet materials different than those currently specified in the TSs for other fuel assemblies. In addition, these staff members state that licensees do not need to use NRC staff approved codes and methods for analyzing LTAs.

With respect to the issue of use on licensee use of unapproved methods, Section 4.3.8 of NEI 96-07 addresses the evaluation under criterion 10 CFR 50.59(c)(2)(viii) to determine whether the activity results in a departure from a method of evaluation, described in the UFSAR, used in establishing the design bases or in the safety analyses. For purposes of evaluation under this criterion, NEI 96-07 states that the following changes are considered a departure from a method of evaluation:

- Changes to any element of analysis methodology that yield results that are non-conservative or not essentially the same as the results from the analyses of record.

- Use of new or different methods of evaluation that are not approved by NRC for the intended application.

Section 4.3.8.1 of the NEI guidance states that gaining margin by changing one or more elements of a method of evaluation is considered to be a non-conservative change and thus a departure from a method of evaluation for purposes of 10 CFR 50.59. Such departures require prior NRC approval of the revised method. Section 4.3.8.1 of the NEI guidance also states that results are "essentially the same" if they are within the margin of error for the type of analysis being performed. The determination of whether a new analysis result would be considered "essentially the same" can be made through benchmarking the revised method to the existing one.

Section 4.3.8.2 of the NEI guidance states that a new method is approved by the NRC for the intended application if it is approved for the type of analysis being conducted, and application terms, conditions, and limitations for its use are satisfied.

Due to changes in design and materials associated with ATF LTAs (compared to NRC approved fuel designs) it is likely that the currently NRC approved fuel design and reload analysis methods will not fully be able to be used. As such, fuel vendors will likely need to use methods that result in a departure from a method of evaluation currently evaluated in the UFSAR.

Based on the above, it is likely that this criteria (i.e., 10 CFR 50.59(c)(2)(viii)) would be met for LTAs, thus requiring a license amendment request.

Conclusion Regarding Use of 10 CFR 50.59 by Licensees to Implement LTA Programs

Regardless of whether a TS change was needed, it is likely that a licensee evaluation under 10 CFR 50.59 for use of an LTA would result in a determination that prior NRC approval was needed via a license amendment.

Appendix B

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

Mr. Joseph Pollock
Vice President, Nuclear Operations
Nuclear Energy Institute
1201 F Street N.W., Suite 1100
Washington, DC 20004

SUBJECT: CLARIFICATION OF REGULATORY APPROACHES FOR LEAD TEST ASSEMBLIES

The purpose of this letter is to clarify and update regulatory approaches provided in the U.S. Nuclear Regulatory Commission's letter from Ms. Mirela Gavrilas, entitled "Response to Nuclear Energy Institute Letter Concerning the Regulatory Path for Lead Test Assemblies," to Mr. Andrew Mauer dated June 29, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17150A443). This letter provides additional clarification for issues discussed in the June 29th letter, including Sec ion 4.2.1, "Fuel Assemblies," of the Standard Technical Specifications (STS),[1] Section 50.59, "Changes, tests, and experiments," of Title 10 of the *Code of Federal Regulations* (10 CFR), and 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." As more experience with hese regulatory approaches is gained, the NRC staff will continue to engage with stakeholders to determine whether formal guidance is necessary.

Lead test assemblies (LTAs) are fuel assemblies that contain a feature or features that may require additional data to support inclusion in the analyses of record (AOR) for batch loading. The LTAs have been loaded in opera ing reactor cores safely over the past several decades with no adverse effect on public health and safety. The LTAs are a necessary and important step in the fuel development process and have led to safety improvements in the design of nuclear fuel. Some examples include improved resistance to corrosion, improved thermal-hydraulic performance, increased heat transfer properties, and major reductions in the number of fuel rod leakers. The new features of LTAs include design and or material changes to the fuel, cladding, or other parts of the fuel assembly. For example, an LTA may be nearly identical to the co-resident fuel except for a new fuel filter design or may be an assembly with a completely different design and materials.

Commented [CH1]: Unclear what this means the COLR incorporated into the license controls the analysis of core parameters. AOR is not defined and it is unclear what is meant by inclusion.

Commented [CH2]: This is materially incorrect LTAs have resulted in stuck control rods and failure of control rods to fully insert to name a couple of safety impacts.

Commented [CH3]: May include many things

The purposes of LTA irradiation campaigns are to:

- collect data to characterize irradiated material properties and performance,
- provide irradiated material for subsequent hot-cell examination, characterization, and research, and
- demonstrate in-reactor performance.

[1] Revision 4 of NUREG-1430, "Standard Technical Specifications – Babcock and Wilcox Plants" (ADAMS Accession No. ML12100A177); NUREG-1431, "Standard Technical Specifications – Westinghouse Plants" (ADAMS Accession No. ML12100A222); NUREG-1432, "Standard Technical Specifications – Combustion Engineering Plants" (ADAMS Accession No. ML12102A165); NUREG-1433, "Standard Technical Specifications – General Electric Plants (BWR/4)" (ADAMS Accession No. ML12104A192); and NUREG-1434, "Standard Technical Specifications – General Electric Plants (BWR/6)" ADAMS Accession No. ML12104A195).

licensees are required to perform reload safety analyses using NRC-approved analytical codes and methods as described in the licensee's technical specifications (TS). When new fuel material or design features necessitate a change to these approved analytical codes and methods in order to complete the reload safety analyses, a license amendment is required to allow the new or changed analytical code or method to be used. Knowledge of, and experience with, irradiated material properties and performance is critical for qualifying these analytical codes and methods and developing the design bases to license new fuel designs or features.

Each licensee must comply with its license and the NRC's regulations. The NRC staff has identified three regulatory approaches related to LTA campaigns. The first and second approaches apply to licensees that have the STS LTA provision described below or a similar LTA TS. The third approach applies to licensees that do not have a TS LTA provision. The remainder of this letter provides background on the STS LTA provision, a description of the three different regulatory approaches to LTA campaigns, LTA specific guidance for 10 CFR 50.59, and the staff's assessment of exemptions to 10 CFR 50.46. This letter does not address all regulatory requirements that should be considered when planning an LTA campaign, such as other TS, aspects of 10 CFR Part 50, Appendix K, "ECCS [Emergency Core Cooling System] Evaluation Models," hat may apply to non-Zircaloy or ZIRLO fuel, 10 CFR 50.68, "Criticality accident requirements," and transportation and storage requirements in 10 CFR Parts 71 and 72. These issues are beyond the scope of this letter.

STS LTA Provision

Many licensees have adopted the Standard Technical Specification (STS) 4.2.1 language (e.g., NUREG-1431, Revision 4) or other similar language into plant-specific TS.

> The reactor shall contain [157] fuel assemblies. Each assembly shall consist of a matrix of [Zircaloy or ZIRLO] fuel rods with an ini ial composi ion of natural or slightly enriched uranium dioxide (UO_2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applica ions of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply wi h all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.

The first two sentences provide a general description of the reactor core (i.e., many features of the reactor core and fuel assemblies important to safety are not described). The third sentence provides a provision to allow loading of reconstituted fuel assemblies. The fourth sentence requires the use of *fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases.* This requirement applies to the unrestricted use of fuel assemblies for batch loading. The final sentence provides a provision to allow loading of LTAs on a restricted basis. By restricting their quantity and placement and separately identifying "lead test assemblies," as opposed to the unrestricted, batch loaded "fuel assemblies," this provision may be considered separate from the previous four sentences. As such, LTAs may be comprised of features, wi h different mechanical or material design specifications han the approved co-resident fuel assemblies defined earlier in TS Section 4.2.1. For the remainder of his letter, the STS LTA provision refers to this last sentence of STS 4.2.1 and similar plant-specific TS LTA sentences.

Deleted: In order to batch-load fuel into a commercial nuclear power plant, it is necessary for the

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Deleted: safety

Deleted: for batch loading

Deleted: .

Deleted: Safety remains the primary focus of the NRC, and the NRC expects licensees to maintain safety as a primary focus, including during the use of LTAs.

Deleted: is responsible for assessing its ability to irradiate LTAs under the provisions of its license and

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Commented [CH5]: There does not seem to be any actual regulatory difference in these approaches. These are just describing steps to be taken not different regulatory approaches.

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Commented [CH6]: The genesis of the language is completely omitted. It was generated by Generic Letter 90-02 Supplement 1 which contains the discussion of why the language was added and the strictures on its use. The generic letter specifically states that its measures, which includes the LTA sentence, are for reconstitution of fuel and cannot be conducted without prior approval if there are any changes to the design features section of TS. The design features section of TS included and still includes specific limitations on cladding and the type of fuel.

Commented : This sentence removes all doubt that LTAs are "fuel assemblies" because they are part of the [157] fuel assemblies. It also removes all doubt that any design provision in the first sentence for "fuel assemblies" must apply to LTAs to be true and thus it follows that any design provision in any subsequent sentence that mentions "fuel assemblies" must be considered to apply to LTAs unless explicitly stated otherwise (which there are no instances).

Commented [CH8]: This sentence makes no sense as written. The first two sentences which existed prior to Generic letter 90-02 are derived from the requirements of 10 CFR 50.36. It is not a general description it is a specific statement of the fission product barrier material of the cladding and the type of fuel as well as the number of fuel assemblies, which would include any type of demonstration assemblies (e.g., LTAs).

Commented [CH9]: This is explicitly in conflict with GL 90-02 Supp 1. The GL explicitly states that this sentence is to be applied for reconstituted fuel which is obviously not a batch load of fuel.

Commented [CH10]: This is a new staff position that is not supported by precedence or a plain language reading of the TS. Numerous safety evaluations indicate that **the NRC staff** interpreted the last sentence in this TS as to be integral to the whole TS (i.e., LTAs need to be of same materials as listed in the rest of the TS and be analyzed with approved codes and methods). It is also inconsistent with the origin of this language in Generic Letter 90-02, Supplement 1. Among other statements in this document, it clearly states that the proposed language is intended to support fuel reconstitution and that it can only be used without an amendment when the reconstituted fuel does not involve a change to the TS Design Features section. This would preclude any change in cladding material.

Commented [CH11]: All of the remaining sentences were added to address fuel reconstitution as explicitly described in the Generic Letter and SECY-92-217.

Commented [CH12]: This assertion is completely unsupported and contrary to official records.

Commented [CH13]: Please provide some validation for this statement that would support that cladding material or fuel does not need to conform to the Design Features section.

Compliance with the STS LTA provision that LTAs are of limited number and in non-limiting core regions may be demonstrated by a licensee's evaluation that the quantity and placement of LTAs will not invalidate the final safety analysis report (as updated) (UFSAR) AOR (i.e., transient and accident analyses). The NRC staff expects that licensees will use good engineering judgment and analytical codes and methods that reflect good engineering practices and consideration of risk. Consequently, the staff believes that reasonable assurance of adequate protection con inues to be maintained with respect to the loading and irradiation of LTAs under the STS LTA provision. To the extent practical, the licensee's evaluation of limited number and non-limiting core region should utilize the current state of knowledge, including all available data, to ensure he most complete analyses.

To meet the TS provision of a limited number of LTAs, he analysis should be informed by the degree of characterization of irradiated material properties and performance for a given material or design change. Degree of characterization refers to the amount and quality of the data that supports the expected material or design performance. As irradiated material characterization matures, the quantity of LTAs may increase as further tes ing is performed. Historically, LTA campaigns have ranged from a few rods to 2 percent of the core, depending on the novelty of the design and the degree of characterization of he material performance.

The TS provision of non-limiting core regions is dependent upon plant opera ing parameters (e.g., power density) and the UFSAR AOR. A non-limiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat genera ion rate, peak clad temperature, minimum departure from nucleate boiling). Non-limiting core regions should be selected such that the new design features of the LTA are conservative for the respective design, performance, and safety limits rela ive to the co-resident fuel assemblies during normal operation, anticipated operational occurrences, and postulated accidents. As such, if the LTAs are more conservative with respect to he design, performance, and safety limits, then the performance of safety-related structures, systems, and components (SSCs) (i.e., ability to perform intended safety functions) will not be dictated by the performance of the LTAs and reasonable assurance of adequate protection continues to be maintained with respect to the loading and irradiation of LTAs under the STS LTA provision.

Regulatory Path 1

Regulatory Pa h 1 applies if he licensee's TS contain the STS LTA or similar TS provision and there is no conflicting documentation elsewhere in the plant's licensing basis. In these circumstances, a licensee may be able to embark on LTA campaigns that meet the STS LTA provision (i.e., he UFSAR AOR remain applicable and bounding[2]) under 10 CFR 50.59 without prior NRC approval.

As described above, licensees complete core reload analyses prior to refueling the reactor. Path 1 is for situations where a licensee considers an LTA campaign as part of the core reload and evaluates it using the 10 CFR 50.59 screening and/or evaluation hat is done for he core reload. If TS changes are required an amendment must be submitted in accordance with 10 CFR 50.92. Lead test assembly specific guidance related to 10 CFR 50.59 is provided below.

[2] More limiting.

Commented : This is a new requirement/position. It is required by the COLR that all fuel be analyzed iaw the codes/methodologies in the COLR they must also comply with the UFSAR descriptions until changed via the amendment process.

Commented [CH15]: It is unclear what this means or is intended to mean. Invalidating???

Commented [CH16]: Inappropriate to talk about staff expectations – what are the requirements. Expectations are not part of the regulatory process or approach.

Commented [CH17]: Staff cannot make a reasonable assurance determination on an expectation of licensee action.

Commented [CH18]:
This position (i.e., that unapproved methods may be used for LTAs) is contrary to:
(1) The regulatory history of license amendments issued for LTAs and the previous NRC staff interpretations of TS 4.2.1 as described in the safety evaluations for these amendments. Part of the basis for approval of these amendments is that NRC-staff approved methods were used.
(2) The technical specification for the Core Operating Limits Report (COLR). This TS (TS 5.6.3 in the Standard TSs) states that "The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC." This TS also lists the specific NRC-approved topical reports which provide the methods for analyzing the core operating limits. For example, for a BWR, plant TSs would typically list NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (referred to as the GESTAR II). There is nothing in TS 4.2.1 that would exclude LTAs from being analyzed with the approved methods listed in TS 5.6.3 (i.e., licensees are required to comply will all provisions of their TSs).
(3) The 9/23/81 letter from the NRC (T.A. Ippolito) to General Electric (R. Engel), "Lead Test Assembly Licensing" (ADAMS Legacy Library Accession No. 8110090006). This letter, which pre-dates the requirements for LTAs later incorporated into the TSs, stated that one of the "key elements" for licensee use of LTAs was "analysis of the LTAs using approved methods."
As further evidence of the need for LTAs to be analyzed with NRC-approved methods, the 1/10/18 report from Southern Nuclear concerning the accident tolerant fuel (ATF) LTAs that were just loaded into Hatch Unit 1 (ADAMS Package ML18012A047), stated that the report contains information to comply with the 9/23/81 Ippolito letter. Accordingly, the licensee submittal further states that "the ATF LTAs have been, or will be, analyzed using the NRC approved methods" described in Reference 3." Reference 3 is GESTAR II.
It is also inconsistent with the origin of this language in Generic Letter 90-02, Supplement 1. The whole intent of which was to clarify that fuel reconstitution configurations must be evaluated with NRC approved methods and codes, "The staff considers an NRC-approved methodology to be any methodology that the NRC staff has explicitly approved in a written safety evaluation, or a plant-specific technical specification basis. That NRC-approved methodology must be used only for the purpose and the scope of application specified in the reviewed document as approved or modified in the NRC approval documentation. In general, the scope of application for generic methods is limited to fuel configurations that are represented by fuel assembly test configurations used to validate an approved methodology.

Commented [CH19]: No requirement referenced here just Staff hope that a complete analyses is performed – what are the requirements that must be met???

Commented [CH20]: Unclear what this means – plain language needed.

Commented [CH21]: What does novelty mean???

Commented [CH22]: This type of terminology should be replaced with a direct reference to the COLR which is a TS requirement.

Commented [CH23]: Need to describe how a core misload AOO is accounted for in the selection of non-limiting locations.

Commented [CH24]: The argument that LTAs are more conservative is not validated if licensees are using new fuel designs not reviewed by the NRC and if they analyze the LTAs with codes and methods not reviewed and approved by the NRC staff. In fact, this situation could be considered a significant hazard as supported by the statement of considerations for the Sholly rule (see 51 FR 7751).

Commented : The comments below regarding 10 CFR 50.59 do not address all the flaws in the analysis. The proper treatment of LTAs with respect to 50.59 is provided in Section 6.0 the memo to the General Counsel (ML18078A013). Broadly, the use of LTAs that differ from the TS Design Features se ... [1]

Commented [CH26]: There is only one Path it is to assess the change to the facility pursuant to plant 10 CFR 50.59 procedures. The first step is to determine if the change has been previously approved by amendment. If the change conflicts with anything in the Design Features section as stated in GL 90-02 supplement 1 or any other TS requirement like the COLR (e.g., not analyzing an assembly using the C ... [2]

Commented [CH27]: The COLR which is part of the licensing and design basis conflicts with

Commented [CH28]: The requirement for reload analyses should be described.

Regulatory Path 2

Regulatory Path 3

Regulatory Pa h 3 applies to licensees that do not have the STS LTA provision or a similar LTA TS. A licensee would need to determine if its LTA campaign required a change to the TS and if not, whether the activity constituted a change, test, or experiment that requires a 10 CFR 50.59 evaluation. Due to the overwhelming number of different combinations of licensing bases considerations, TS language, and LTA campaigns, the staff has not attempted to provide more specific guidance for this regulatory path.

LTA Specific Guidance for 10 CFR 50.59

Depending on the content of the final safety analysis report (FSAR), a licensee could potentially determine hat its LTA campaign is a test or experiment previously described in the FSAR and screen out of 10 CFR 50.59 evaluation. If a licensee determines hat its LTA campaign is a change, test, or experiment requiring a 10 CFR 50.59 evaluation, the licensee would be required to conduct a complete 10 CFR 50.59 evaluation. Several of the 10 CFR 50.59 criteria most applicable to LTAs are discussed below.

The regulation under 10 CFR 50.59(c)(1) states that:

> A licensee may make changes in the facility as described in the final safety analysis report (as updated), make changes in the procedures as described in the final safety analysis report (as updated), and conduct tests or experiments not described in he final safety analysis report (as updated) without obtaining a license amendment pursuant to § 50.90 only if:
>
> (i) A change to the technical specifications incorporated in the license is not required, and
> (ii) The change, test, or experiment does not meet any of the criteria in paragraph (c)(2) of this sec ion.

If a licensee's TS contains a provision allowing for use of LTAs, and if the LTA irradiation campaign satisfies the TS, then a change to the TS is not required (item (i) above).

Although all criteria must be address(c)(2)(i), (ii), (vii) and (viii) are of note.

For paragraph (c)(2)(ii) of 10 CFR 50.59, *Result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety,* the NRC-endorsed guidance in the Nuclear Energy Institute's (NEI) report NEI 96-07, Revision 1, "Guidelines for 10 CFR 50.59 Implementation," Section 4.3.2 states, in part, that "[q]ualitative engineering judgment and/or an industry precedent is typically used to determine if there is more than a minimal increase in he likelihood of occurrence of a malfunction." Section 4.3.2 of NEI 96-07, Revision 1, also states, in part, that:

> Although this criterion allows minimal increases, licensees must s ill meet applicable regulatory requirements and other acceptance criteria to which they are committed (such as contained in regulatory guides and nationally recognized industry consensus standards, e.g., the [American Society of Mechanical Engineers Boiler and Pressure Vessel Code] and [Institute for Electrical and

Commented [CH29]: Whether Path 1 or Path 2 the same activities occur 50.59, whether core or reload with LTAs or just LTAs there is no difference in the criteria used.

Deleted: Regulatory Path 2 is for situations where a licensee conducts an LTA campaign 10 CFR 50.59 screening and/or evaluation separately from the one conducted for the core reload. Similar to Path 1 above, this path applies if the licensee's TS contain the STS LTA or similar TS provision and there is no conflicting documentation elsewhere in the plant's licensing basis. In these circumstances, a licensee may be able to embark on LTA campaigns that meet the STS LTA provision (i.e., the UFSAR AOR remain applicable and bounding) under 10 CFR 50.59 without prior NRC approval. Lead test assembly specific guidance for 10 CFR 50.59 is provided below.¶
¶

Commented [CH30]: There is only one Path it is to assess the change to the facility pursuant to plant 10 CFR 50.59 procedures. The first step is to determine if the change has been previously approved by amendment. If the change conflicts with anything in the Design Features section as stated in GL 90-02 supplement 1 or any other TS requirement like the COLR (e.g., not analyzing an assembly using the COLR appr0oved codes) an amendment will be required, even if you label the changed equipment an LTA this does not infer special status that other requirements do not need to be met. If an amendment is not required because the cladding material statements and fuel material statements remain true for each and every fuel assembly being inserted into the reactor, then you can proceed to the 10 CFR 50.59 screening. NEI 96-07 says that demonstration fuel assemblies must be subject to a 10 CFR 50.59 evaluation. This means that all LTAs will require an evaluation not just a screen. Each of the evaluation criterion are then treated and documented.

Commented [CH31]: No they cannot. It would not be an LTA if it did not include some new feature or design as described above.

Commented [CH32]: screening process includes a determination of averse affect. However as discussed in the previous comments NEI 6-07 stipulates that operation with demonstration fuel assemblies "screens in" meaning an evaluation is required.

Commented [CH33]: This statement is completely unsupported in any way. The generic letter directly states that an amendment is required if other portions of the design features section are altered. If LTAs have different cladding or fuel than specified in the design features an amendment is required

Commented [CH35]: A fairly recent GESAR amendment RAI asked about core misload which was an AOO – The answer to this RAI reclassified misload as an Incident of Moderate Frequency for LTAs. This would meet criteria (i) since transitioning to a different ANSI classification for an event requires a conclusion of more than minimal increase in frequency..

Deleted: With respect to item (ii), it may be possible to satisfy all of the criteria in paragraph (c)(2) of 10 CFR 50.59 and not trigger the need for a license amendment.

Deleted: Of particular interest to LTA campaigns

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> Electronics Engineers] standards). Further, departures from the design, fabrication, construction, testing and performance standards as outlined in the General Design Criteria (Appendix A to Part 50) are not compatible with a 'no more than minimal increase' standard.

It is anticipated that LTAs that meet the STS LTA provision would be similar to Example 2 in Section 4.3.2 of NEI 96-07, Revision 1, in that the LTAs would continue to meet all applicable design and functional requirements and any new failure modes are bounded by the existing analysis. Accordingly, for LTA campaigns where the design and functional requirements and new failure modes are bounded, he licensee could answer this question with a "no." Conversely, if a licensee had information or reason to believe that particular features used in an LTA campaign would undermine applicable design basis requirements and assumptions, then the licensee could answer his question with a "yes."

Commented [CH36]: This statement is unsupported since the previous discussion does not propose any strictures on the LTAs other than good judgement. Thus it is possible if not likely that cladding changes and fuel design changes are unlikely to meet current guidance and standards stated in the UFSAR. In fact the purpose is to evaluate new ways of meeting existing design functions.

Commented [CH37]: This is misstated.

For paragraph (c)(2)(vii), *Result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered*; NEI 96-07, Revision 1, Section 4.3.7 states, in part, that "[i]f an engineering evaluation demonstrates that the analysis presented in the UFSAR remains bounding, then no further 10 CFR 50.59(c)(2)(vii) evalua ion is required." If the LTA campaign demonstrates, via the selec ion of limited quantity and restricted location, that the UFSAR AOR remain bounding, the licensee could answer this question with a "no."

Deleted: NRC endorsed guidance in

Deleted: "Guidelines for 10 CFR 50.59 Evaluations."

Commented [CH38]: Taken out of context. Altering DBLFFPBs sated in the UFSAR requires an amendment. Bounding discussion is only relevant to simplifying reviews to determine if parameters are effected not the actual limits. For example if a cladding oxidation limit is altered (increased or decreased) an amendment is required. The agency is both interested in encroachment on fission product barrier limits and the creation of margin from the limits.

With respect to paragraph (c)(2)(viii) of 10 CFR 50.59, *Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses*, NEI 96-07, Revision 1, Section 4 3.8.1 states, in part, that:

> The definition of "departure ..." provides licensees wi h the flexibility to make changes under 10 CFR 50.59 to methods of evaluation whose results are "conserva ive" or that are not important with respect to the demonstrations of performance that the analyses provide. Changes to elements of analysis methods that yield conserva ive results, or results that are essentially he same, would not be departures from approved methods.

Section 4.3.8.2 of NEI 96-07, Revision 1 provides guidance for changing from one method of evaluation to another. As stated above, LTA campaigns hat meet the STS LTA provision will not affect the performance of safety-related SSCs and therefore the method of evaluation used in establishing the design bases will remain the same. Additionally, the incorporation of TS Section 4.2.1 into a plant's licensing basis represents the NRC's approval for use of new or different methods of evaluation for LTA's under the constraints of the TS provision. If the LTA campaign demonstrates, via he selection of limited quantity and restricted location, that the UFSAR AOR remain bounding, he licensee could answer this question wi h a "no."

Commented [CH39]: This is completely incorrect. The requirement is that the COLR methods be used to analyze the core including all fuel assemblies. This includes any and all demonstration fuel such as LTAs or reconstituted fuel. There is no exception to show that a bounding condition with respect to UFSAR methods. Simply put LTAs must be analyzed by the methods of the COLR and UFSAR. If these methods are not employed a new or different methodology is being used and requires an amendment. In fact merely replacing a correlation with another valid correlation to reflect material differences is a change in methodology, the correlation is an element of the methodology, that requires an amendment.

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Commented [CH40]: (a)(1)(i) Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant accidents are calculated. Except as provided in paragraph (a)(1)(ii) of this section, the evaluation model must include sufficient supporting justification to show that the analytical technique realistically describes the behavior of the reactor system during a loss-of-coolant accident. Comparisons to applicable experimental data must be made and uncertainties in the analysis method and inputs must be identified and assessed so that the uncertainty in the calculated results can be estimated. This uncertainty must be accounted for, so that, when the calculated ECCS cooling performance is compared to the criteria set forth in paragraph (b) of this section, there is a high level of probability that the criteria would not be exceeded. Appendix K, Part II Required Documentation, sets forth the documentation requirements for each evaluation model. This section does not apply to a nuclear power reactor facility for which the certifications required under § 50.82(a)(1) have been submitted.

The above is the first paragraph of the regulation. The regulation specifically states that each light=water reactor that is fueled with uranium oxide within zircaloy or zirlo cladding **must meet the criteria in paragraph (b).** This is not optional because a licensee may be inserting a fuel assembly that does not have zircaloy or zirlo cladding, as long as any part of the core is fueled with zircaloy or zirlo cladding. This is best illustrated by the example of the proposed use of an assembly that contains only stainless steel filler rods and no active fuel. This regulation is still in force since the core contains zicraloy or zirlo or other cladding shown to meet the underlying purpose of the regulation by exemption.

Exemptions to 10 CFR 50.46 for LTA Campaigns

The regulation under 10 CFR 50.46 provides a means (via analytical requirements and prescriptive analytical limits) to satisfy 10 CFR Part 50, Appendix A, General Design Criterion 35, "Emergency core cooling." Criterion 35 and 10 CFR 50.46 apply, with he exception of the provisions in paragraph (a)(3) on changes or errors, only to the design of the ECCS. They do not establish requirements governing the operation of a nuclear power plant including the use of LTAs. Additionally, 10 CFR 50.46 does not set for h an express prohibition on the use of fuel systems which do not use either cylindrical uranium oxide fuel and/or

zirconium-based cladding. Therefore, an exemp ion to 10 CFR 50.46 solely for insertion of LTAs is not required.

Additionally, the prescrip ive fuel performance analytical limits in 10 CFR 50.46 were based on testing conducted on zirconium alloy cladding and cylindrical uranium oxide fuel. For non-zirconium cladding material and fuel other than cylindrical uranium oxide, here is no expectation that the prescriptive fuel performance analytical limits apply nor would they ensure acceptable performance under loss-of-coolant accident conditions. For example, for non-zirconium-based cladding, neither the 2200 degree Fahrenheit peak clad temperature nor the maximum local oxidation limit are applicable, as he reaction rate that drives these limits is material specific.

Conclusions

Lead test assemblies are a necessary and important step in the fuel development process and have led to safety improvements in he design of nuclear fuel. They provide the material and data necessary to license new design features and provide in-reactor performance demonstra ion prior to broader commercial implementation. Throughout LTA campaigns, safety remains the primary focus of NRC and its licensees. In clarifying the June 29, 2017, letter, the NRC staff has iden ified three regulatory approaches for the use of LTA campaigns. As described in this letter, Regulatory Pa hs 1 and 2 may not require prior NRC approval for an LTA campaign, while Regulatory Path 3 may require prior NRC approval depending upon the specific circumstances. The staff also clarified that exemptions to 10 CFR 50.46 are not required for LTA campaigns. The staff did not attempt to address all regulatory requirements that should be considered when planning an LTA campaign, such as o her TS, aspects of 10 CFR Part 50, Appendix K that may apply to non-Zircaloy or ZIRLO fuel, 10 CFR 50.68 requirements, and transportation and storage requirements in Parts 71 and 72. These issues are beyond the scope of this letter.

As next steps, the NRC staff will continue to engage wi h licensees that are planning to embark on LTA campaigns, as well as external stakeholders, to collect lessons learned and feedback on these approaches. As part of this outreach, the staff will determine whether additional formal guidance is necessary.

Questions on this letter can be directed to Mirela Gavrilas at 301-415-3283 or Mirela.Gavrilas@nrc.gov or Kathryn Brock at 301-415-1454 or Kathryn.Brock@nrc.gov.

Sincerely,

Brian E. Holian, Acting Director
Office of Nuclear Reactor Regulation

Commented [CH41]: This is a new staff position that is contrary to precedent. Exemptions have consistently stated they were necessary solely based on materials being different than those explicitly cited in 10 CFR 50.46.

Commented [CH42]: This is a distinction that represents a new staff position. Exemptions issued for LTAs have indicated that the exemption was needed solely based on the cladding material being different than those specified in 10 CFR 50.46 (i.e., anything other than zircaloy or ZIRLO). Consistent with past exemptions for LTAs with advanced zirconium based cladding, and the requirements in 10 CFR 50.12, the applicant must demonstrate that the underlying purpose of the rule is met. The underlying purpose of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is to establish acceptance criteria for emergency core cooling system performance.

Commented [CH43]: In general this letter and its antecedents creates regulatory uncertainty where no previously existed. Prior to these recent events there is a long history of easily executed, low cost amendments and exemptions. These well-established processes provide for the required public engagement when expansions of operating authority are being considered.

Field Code Changed

Field Code Changed

SUBJECT: CLARIFICATION OF REGULATORY APPROACHES FOR LEAD TEST ASSEMBLIES DATED

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Page - 3 -: [1] Commented **04/12/2018 4:17:00 PM**

The comments below regarding 10 CFR 50.59 do not address all the flaws in the analysis. The proper treatment of LTAs with respect to 50.59 is provided in Section 6.0 the memo to the General Counsel (ML18078A013). Broadly, the use of LTAs that differ from the TS Design Features section complete description, require a change to the TSs. As such, an amendment is needed as required by 10 CFR 50.59(c)(1)(i).

Page - 3 -: [2] Commented [CH26] **Chernoff, Harold** **04/16/2018 2:26:00 PM**

There is only one Path it is to assess the change to the facility pursuant to plant 10 CFR 50.59 procedures. The first step is to determine if the change has been previously approved by amendment. If the change conflicts with anything in the Design Features section as stated in GL 90-02 supplement 1 or any other TS requirement like the COLR (e.g., not analyzing an assembly using the COLR appr0oved codes) an amendment will be required, even if you label the changed equipment an LTA this does not infer special status that other requirements do not need to be met. If an amendment is not required because the cladding material statements and fuel material statements remain true for each and every fuel assembly being inserted into the reactor, then you can proceed to the 10 CFR 50.59 screening. NEI 96-07 says that demonstration fuel assemblies must be subject to a 10 CFR 50.59 evaluation. This means that all LTAs will require an evaluation not just a screen. Each of the evaluation criterion are then treated and documented.

Main document changes and comments

Page - 1 -: Commented [CH1] **Chernoff, Harold** **04/13/2018 11:50:00 AM**

Unclear what this means the COLR incorporated into the license controls the analysis of core parameters. AOR is not defined and it is unclear what is meant by inclusion.

Page - 1 -: Commented [CH2] **Chernoff, Harold** **04/13/2018 11:52:00 AM**

This is materially incorrect LTAs have resulted in stuck control rods and failure of control rods to fully insert to name a couple of safety impacts.

Page - 1 -: Commented [CH3] **Chernoff, Harold** **04/13/2018 11:54:00 AM**

May include many things

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In order to batch-load fuel into a commercial nuclear power plant, it is necessary for the

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s are required

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safety

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for batch loading

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There is no explained regulatory basis for this term

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Safety remains the primary focus of the NRC, and the NRC expects licensees to maintain safety as a primary focus, including during the use of LTAs.

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is responsible for assessing its ability to irradiate LTAs under the provisions of its license and

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There does not seem to be any actual regulatory difference in these approaches. These are just describing steps to be taken not different regulatory approaches.

Page - 2 -: Commented [CH6] **Chernoff, Harold** **04/13/2018 12:00:00 PM**

The genesis of the language is completely omitted. It was generated by Generic Letter 90-02 Supplement 1 which contains the discussion of why the language was added and the strictures on its use. The generic letter specifically states that its measures, which includes the LTA sentence, are for reconstitution of fuel and cannot be conducted without prior approval if there are any changes to the design features section of TS. The design features section of TS included and still includes specific limitations on cladding and the type of fuel.

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This sentence removes all doubt that LTAs are "fuel assemblies" because they are part of the [157] fuel assemblies. It also removes all doubt that any design provision in the first sentence for "fuel assemblies" must apply to LTAs to be true and thus it follows that any design provision in any subsequent sentence that mentions "fuel assemblies" must be considered to apply to LTAs unless explicitly stated otherwise (which there are no instances).

Page - 2 -: Commented [CH8] **Chernoff, Harold** **04/13/2018 12:05:00 PM**

This sentence makes no sense as written. The first two sentences which existed prior to Generic letter 90-02 are derived from the requirements of 10 CFR 50.36. It is not a general description it is a specific statement of the fission product barrier material of the cladding and the type of fuel as well as the number of fuel assemblies, which would include any type of demonstration assemblies (e.g., LTAs).

Page - 2 -: Commented [CH9] **Chernoff, Harold** **04/16/2018 2:15:00 PM**

This is explicitly in conflict with GL 90-02 Supp 1. The GL explicitly states that this sentence is to be applied for reconstituted fuel which is obviously not a batch load of fuel.

Page - 2 -: Commented [CH10] **Chernoff, Harold** **04/13/2018 12:02:00 PM**

This is a new staff position that is not supported by precedence or a plain language reading of the TS. Numerous safety evaluations indicate that **the NRC staff** interpreted the last sentence in this TS as to be integral to the whole TS (i.e., LTAs need to be of same materials as listed in the rest of the TS and be analyzed with approved codes and methods). It is also inconsistent with the origin of this language in Generic Letter 90-02, Supplement 1. Among other statements in this document, it clearly states that the proposed language is intended to support fuel reconstitution and that it can only be used without an amendment when the reconstituted fuel does not involve a change to the TS Design Features section. This would preclude any change in cladding material.

Page - 2 -: Commented [CH11] **Chernoff, Harold** **04/13/2018 12:06:00 PM**

All of the remaining sentences were added to address fuel reconstitution as explicitly described in the Generic Letter and SECY-92-217.

Page - 2 -: Commented [CH12] **Chernoff, Harold** **04/13/2018 12:07:00 PM**

This assertion is completely unsupported and contrary to official records.

Page - 2 -: Commented [CH13] **Chernoff, Harold** **04/16/2018 2:18:00 PM**

Please provide some validation for this statement that would support that cladding material or fuel does not need to conform to the Design Features section.

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This is a new requirement/position. It is required by the COLR that all fuel be analyzed iaw the codes/methodologies in the COLR they must also comply with the UFSAR descriptions until changed via the amendment process.

Page - 3 -: Commented [CH15] **Chernoff, Harold** **04/13/2018 12:19:00 PM**

It is unclear what this means or is intended to mean. Invalidating???

Page - 3 -: Commented [CH16] **Chernoff, Harold** **04/13/2018 12:20:00 PM**

Inappropriate to talk about staff expectations – what are the requirements. Expectations are not part of the regulatory process or approach.

Page - 3 -: Commented [CH17] **Chernoff, Harold** **04/13/2018 12:21:00 PM**

Staff cannot make a reasonable assurance determination on an expectation of licensee action.

Page - 3 -: Commented [CH18]	Chernoff, Harold	04/13/2018 12:18:00 PM

This position (i.e., that unapproved methods may be used for LTAs) is contrary to:
(1) The regulatory history of license amendments issued for LTAs and the previous NRC staff interpretations of TS 4.2.1 as described in the safety evaluations for these amendments. Part of the basis for approval of these amendments is that NRC-staff approved methods were used.
(2) The technical specification for the Core Operating Limits Report (COLR). This TS (TS 5.6.3 in the Standard TSs) states that "The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC." This TS also lists the specific NRC-approved topical reports which provide the methods for analyzing the core operating limits. For example, for a BWR, plant TSs would typically list NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" (referred to as the GESTAR II). There is nothing in TS 4.2.1 that would exclude LTAs from being analyzed with the approved methods listed in TS 5.6.3 (i.e., licensees are required to comply will all provisions of their TSs).
(3) The 9/23/81 letter from the NRC (T.A. Ippolito) to General Electric (R. Engel), "Lead Test Assembly Licensing" (ADAMS Legacy Library Accession No. 8110090006). This letter, which pre-dates the requirements for LTAs later incorporated into the TSs, stated that one of the "key elements" for licensee use of LTAs was "analysis of the LTAs using approved methods."
As further evidence of the need for LTAs to be analyzed with NRC-approved methods, the 1/10/18 report from Southern Nuclear concerning the accident tolerant fuel (ATF) LTAs that were just loaded into Hatch Unit 1 (ADAMS Package ML18012A047), stated that the report contains information to comply with the 9/23/81 Ippolito letter. Accordingly, the licensee submittal further states that "the ATF LTAs have been, or will be, analyzed using the NRC approved methods" described in Reference 3." Reference 3 is GESTAR II.
It is also inconsistent with the origin of this language in Generic Letter 90-02, Supplement 1. The whole intent of which was to clarify that fuel reconstitution configurations must be evaluated with NRC approved methods and codes, "The staff considers an NRC-approved methodology to be any methodology that the NRC staff has explicitly approved in a written safety evaluation, or a plant-specific technical specification basis. That NRC-approved methodology must be used only for the purpose and the scope of application specified in the reviewed document as approved or modified in the NRC approval documentation. In general, the scope of application for generic methods is limited to fuel configurations that are represented by fuel assembly test configurations used to validate an approved methodology.

Page - 3 -: Commented [CH19]	Chernoff, Harold	04/13/2018 12:21:00 PM

No requirement referenced here just Staff hope that a complete analyses is performed – what are the requirements that must be met???

Page - 3 -: Commented [CH20]	Chernoff, Harold	04/13/2018 12:23:00 PM

Unclear what this means – plain language needed.

Page - 3 -: Commented [CH21]	Chernoff, Harold	04/13/2018 12:24:00 PM

What does novelty mean???

Page - 3 -: Commented [CH22]	Chernoff, Harold	04/16/2018 2:09:00 PM

This type of terminology should be replaced with a direct reference to the COLR which is a TS requirement.

Page - 3 -: Commented [CH23]	Chernoff, Harold	04/16/2018 2:10:00 PM

Need to describe how a core misload AOO is accounted for in the selection of non-limiting locations.

Page - 3 -: Commented [CH24]	Chernoff, Harold	04/16/2018 2:12:00 PM

The argument that LTAs are more conservative is not validated if licensees are using new fuel designs not reviewed by the NRC and if they analyze the LTAs with codes and methods not reviewed and approved by the NRC staff. In fact, this situation could be considered a significant hazard as supported by the statement of considerations for the Sholly rule (see 51 FR 7751).

Page - 3 -: Commented **04/12/2018 4:17:00 PM**

The comments below regarding 10 CFR 50.59 do not address all the flaws in the analysis. The proper treatment of LTAs with respect to 50.59 is provided in Section 6.0 the memo to the General Counsel (ML18078A013). Broadly, the use of LTAs that differ from the TS Design Features section complete description, require a change to the TSs. As such, an amendment is needed as required by 10 CFR 50.59(c)(1)(i).

Page - 3 -: Commented [CH26] **Chernoff, Harold** **04/16/2018 2:26:00 PM**

There is only one Path it is to assess the change to the facility pursuant to plant 10 CFR 50.59 procedures. The first step is to determine if the change has been previously approved by amendment. If the change conflicts with anything in the Design Features section as stated in GL 90-02 supplement 1 or any other TS requirement like the COLR (e.g., not analyzing an assembly using the COLR appr0oved codes) an amendment will be required, even if you label the changed equipment an LTA this does not infer special status that other requirements do not need to be met. If an amendment is not required because the cladding material statements and fuel material statements remain true for each and every fuel assembly being inserted into the reactor, then you can proceed to the 10 CFR 50.59 screening. NEI 96-07 says that demonstration fuel assemblies must be subject to a 10 CFR 50.59 evaluation. This means that all LTAs will require an evaluation not just a screen. Each of the evaluation criterion are then treated and documented.

Page - 3 -: Commented [CH27] **Chernoff, Harold** **04/16/2018 2:13:00 PM**

The COLR which is part of the licensing and design basis conflicts with

Page - 3 -: Commented [CH28] **Chernoff, Harold** **04/16/2018 11:11:00 PM**

The requirement for reload analyses should be described.

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If TS changes are required an amendment must be submitted in accordance with 10 CFR 50.92.

Page - 4 -: Commented [CH29] **Chernoff, Harold** **04/13/2018 12:25:00 PM**

Whether Path 1 or Path 2 the same activities occur 50.59, whether core or reload with LTAs or just LTAs there is no difference in the criteria used.

Page - 4 -: Deleted **Chernoff, Harold** **04/16/2018 2:25:00 PM**

Regulatory Path 2 is for situations where a licensee conducts an LTA campaign 10 CFR 50.59 screening and/or evaluation separately from the one conducted for the core reload. Similar to Path 1 above, this path applies if the licensee's TS contain the STS LTA or similar TS provision and there is no conflicting documentation elsewhere in the plant's licensing basis. In these circumstances, a licensee may be able to embark on LTA campaigns that meet the STS LTA provision (i.e., the UFSAR AOR remain applicable and bounding) under 10 CFR 50.59 without prior NRC approval. Lead test assembly specific guidance for 10 CFR 50.59 is provided below.

Page - 4 -: Commented [CH30] **Chernoff, Harold** **04/16/2018 2:36:00 PM**

There is only one Path it is to assess the change to the facility pursuant to plant 10 CFR 50.59 procedures. The first step is to determine if the change has been previously approved by amendment. If the change conflicts with anything in the Design Features section as stated in GL 90-02 supplement 1 or any other TS requirement like the COLR (e.g., not analyzing an assembly using the COLR appr0oved codes) an amendment will be required, even if you label the changed equipment an LTA this does not infer special status that other requirements do not need to be met. If an amendment is not required because the cladding material statements and fuel material statements remain true for each and every fuel assembly being inserted into the reactor, then you can proceed to the 10 CFR 50.59 screening. NEI 96-07 says that demonstration fuel assemblies must be subject to a 10 CFR 50.59 evaluation. This

means that all LTAs will require an evaluation not just a screen. Each of the evaluation criterion are then treated and documented.

Page - 4 -: Commented [CH31] **Chernoff, Harold** **04/16/2018 2:37:00 PM**

No they cannot. It would not be an LTA if it did not include some new feature or design as described above.

Page - 4 -: Commented [CH32] **Chernoff, Harold** **04/16/2018 2:39:00 PM**

screening process includes a determination of averse affect. However as discussed in the previous comments NEI 6-07 stipulates that operation with demonstration fuel assemblies "screens in" meaning an evaluation is required.

Page - 4 -: Commented [CH33] **Chernoff, Harold** **04/13/2018 12:27:00 PM**

This statement is completely unsupported in any way. The generic letter directly states that an amendment is required if other portions of the design features section are altered. If LTAs have different cladding or fuel than specified in the design features an amendment is required

Page - 4 -: Deleted **Chernoff, Harold** **04/16/2018 2:55:00 PM**

With respect to item (ii), it may be possible to satisfy all of the criteria in paragraph (c)(2) of 10 CFR 50.59 and not trigger the need for a license amendment.

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Although all criteria must be address

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Of particular interest to LTA campaigns

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Undefined "campaign"

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are questions

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(i), (ii),

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A fairly recent GESAR amendment RAI asked about core misload which was an AOO – The answer to this RAI reclassified misload as an Incident of Moderate Frequency for LTAs. This would meet criteria (i) since transitioning to a different ANSI classification for an event requires a conclusion of more than minimal increase in frequency..

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are of note

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topical

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Revision 1,

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This statement is unsupported since the previous discussion does not propose any strictures on the LTAs other than good judgement. Thus it is possible if not likely that cladding changes and fuel design changes are unlikely to meet current guidance and standards stated in the UFSAR. In fact the purpose is to evaluate new ways of meeting existing design functions.

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This is misstated.

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NRC endorsed guidance in

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"Guidelines for 10 CFR 50.59 Evaluations,"

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Taken out of context. Altering DBLFFPBs sated in the UFSAR requires an amendment. Bounding discussion is only relevant to simplifying reviews to determine if parameters are effected not the actual limits. For example if a cladding oxidation limit is altered (increased or decreased) an amendment is required. The agency is both interested in encroachment on fission product barrier limits and the creation of margin from the limits.

Page - 5 -: Commented [CH39] **Chernoff, Harold** **04/16/2018 11:17:00 PM**

This is completely incorrect. The requirement is that the COLR methods be used to analyze the core including all fuel assemblies. This includes any and all demonstration fuel such as LTAs or reconstituted fuel. There is no exception to show that a bounding condition with respect to UFSAR methods. Simply put LTAs must be analyzed by the methods of the COLR and UFSAR. If these methods are not employed a new or different methodology is being used and requires an amendment. In fact merely replacing a correlation with another valid correlation to reflect material differences is a change in methodology, the correlation is an element of the methodology, that requires an amendment.

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, Appendix A,

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(a)(1)(i) Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant accidents are calculated. Except as provided in paragraph (a)(1)(ii) of this section, the evaluation model must include sufficient supporting justification to show that the analytical technique realistically describes the behavior of the reactor system during a loss-of-coolant accident. Comparisons to applicable experimental data must be made and uncertainties in the analysis method and inputs must be identified and assessed so that the uncertainty in the calculated results can be estimated. This uncertainty must be accounted for, so that, when the calculated ECCS cooling performance is compared to the criteria set forth in paragraph (b) of this section, there is a high level of probability that the criteria would not be exceeded. Appendix K, Part II Required Documentation, sets forth the documentation requirements for each evaluation model. This section does not apply to a nuclear power reactor facility for which the certifications required under § 50.82(a)(1) have been submitted.

The above is the first paragraph of the regulation. The regulation specifically states that each light=water reactor that is fueled with uranium oxide within zircaloy or zirlo cladding **must meet the criteria in paragraph (b)** This is not optional because a licensee may be inserting a fuel assembly that does not

have zircaloy or zirlo cladding, as long as any part of the core is fueled with zircaloy or zirlo cladding. This is best illustrated by the example of the proposed use of an assembly that contains only stainless steel filler rods and no active fuel. This regulation is still in force since the core contains zicraloy or zirlo or other cladding shown to meet the underlying purpose of the regulation by exemption.

Page - 6 -: Commented [CH41] **Chernoff, Harold** **04/16/2018 11:25:00 PM**

This is a new staff position that is contrary to precedent. Exemptions have consistently stated they were necessary solely based on materials being different than those explicitly cited in 10 CFR 50.46.

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This is a distinction that represents a new staff position. Exemptions issued for LTAs have indicated that the exemption was needed solely based on the cladding material being different than those specified in 10 CFR 50.46 (i.e., anything other than zircaloy or ZIRLO). Consistent with past exemptions for LTAs with advanced zirconium based cladding, and the requirements in 10 CFR 50.12, the applicant must demonstrate that the underlying purpose of the rule is met. The underlying purpose of 10 CFR 50.46 and Appendix K to 10 CFR Part 50 is to establish acceptance criteria for emergency core cooling system performance.

Page - 6 -: Commented [CH43] **Chernoff, Harold** **04/16/2018 11:38:00 PM**

In general this letter and its antecedents creates regulatory uncertainty where no previously existed. Prior to these recent events there is a long history of easily executed, low cost amendments and exemptions. These well-established processes provide for the required public engagement when expansions of operating authority are being considered.

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Footnote changes

Endnote changes

NRC FORM 757
NRC MD 10.158
(11-2016)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2018-003

SECTION B - TO BE COMPLETED BY NON-CONCURRING EMPLOYEE'S SUPERVISOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
Clarification of Regulatory Approaches for Lead Test Assemblies," from Holian, NRC, to Cowan	ML18100A045

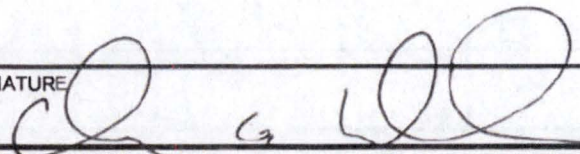
NAME: Christopher Miller

TITLE	TELEPHONE NUMBER
Director, Division of Inspection and Regional Support	(301) 415-1004

ORGANIZATION: NRR

COMMENTS FOR THE NCP REVIEWER TO CONSIDER (use continuation pages or attach Word document)

This non-concurrence provides a well written discussion with viewpoints on the draft letter. While many of the points included herein have been discussed during staff and management review by the agency, this document has a well laid out discussion of the details behind the major points to be considered and documented in Section C.

SIGNATURE: 

DATE: 5-7-18

NRC FORM 757
NRC MD 10.158
(11-2016)

U. S. NUCLEAR REGULATORY COMMISSION

NON-CONCURRENCE PROCESS

NCP TRACKING NUMBER: NCP-2018-003

SECTION C - TO BE COMPLETED BY NCP COORDINATOR

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
"Clarification of Regulatory Approaches for Lead Test Assemblies," from Holian, NRC to Cowan, NEI	ML18100A045

NAME: Brian E. Holian

TITLE	TELEPHONE NUMBER
Acting Director	(301) 415-1270

ORGANIZATION: Office of Nuclear Reactor Regulation

AGREED UPON SUMMARY OF ISSUES (use continuation pages or attach Word document)

Staff summarized the concerns into six major areas, but reviewed and considered the entire submittal

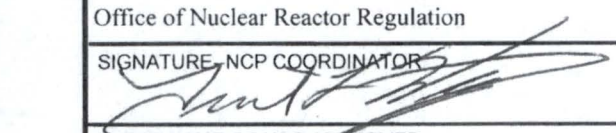
EVALUATION OF NON-CONCURRENCE AND RATIONALE FOR DECISION (use continuation pages or attach Word document)

First, I provide a little background on this subject for the public.

- Lead test assembly programs are a necessary aspect that can provide advances in reactor fuel.
- Licensees have expressed uncertainty with the varied framework for NRC review.
- Over a year ago the NRC was asked for clarification.
- NRC staff discussed the issue during the 2017 RIC, and sent a letter to NEI with clarification on June 29, 2017.
- Some licensees continued to seek clarification.
- NRC commenced drafting additional guidance, and committed to publish this draft letter for comment.
- For information, on February 8, 2018, an NRC staff member submitted a differing professional opinion (DPO) regarding the NRC's initial clarification letter of June 29, 2017. In accordance with our process, staff are responding to the DPO; I expect that will be finalized within a month and made public.

TYPED NAME OF NCP COORDINATOR	TITLE
Trent Wertz	Technical Assistant

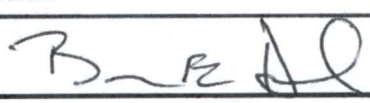
ORGANIZATION: Office of Nuclear Reactor Regulation

SIGNATURE--NCP COORDINATOR: 

DATE: 5/31/18

TYPED NAME OF NCP APPROVER	TITLE
Brian E. Holian	Acting Director

ORGANIZATION: Office of Nuclear Reactor Regulation

SIGNATURE--NCP APPROVER: 

DATE: 31 May 18

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NRC FORM 757 NRC MD 10.158 (11-2016)	U. S. NUCLEAR REGULATORY COMMISSION	NCP TRACKING NUMBER
	NON-CONCURRENCE PROCESS	NCP-2018-003

TITLE OF SUBJECT DOCUMENT	ADAMS ACCESSION NO.
"Clarification of Regulatory Approaches for Lead Test Assemblies," from Holian, NRC to Cowan, NEI	ML18100A045

CONTINUATION OF SECTION ☐ A ☐ B ☑ C

- The non-concurrence was submitted on May 4, 2018, and staff/management from several divisions in NRR assisted in the response (attached).
- The draft letter to industry was improved by submittal of the non-concurrence.

Response for Section C of NCP Form Dated May 4, 2018

As the NCP Approver, I have read and considered the submission from Mr. Chernoff. I would like to thank Mr. Chernoff for participating in the non-concurrence process and raising concerns that have generated additional thought and dialogue on this subject. In addition, by indicating that the nonconcurrence could be made publicly available, members of the public will have the benefit of Mr. Chernoff's views as they develop and submit public comments.

There are six main concerns raised by Mr. Chernoff in his nonconcurrence. His request was that his concerns be considered in combination with the issues/concerns and positions raised in the memorandum from Harold K. Chernoff, NRR/Division of Inspection and Regional Support (DIRS), to Margaret M. Doane, General Counsel, dated March 22, 2018, "Use of Open Door Policy – Regulatory Framework Regarding Use of Lead Test Assemblies," which was provided as Appendix A, and the comments on the draft letter to NEI by Harold Chernoff, which was provide as Appendix B to the non-concurrence form dated May 4, 2018.

Mr. Chernoff raised six main concerns on the draft letter from me to the Nuclear Energy Institute (NEI):

1. The draft letter to NEI provides a wholly new interpretation, not a clarification, of the requirements of Section 4.2.1 of the technical specifications (TS), without an underlying basis or explanation, and is attempting to reinterpret and/or revise the regulatory history of Standard Technical Specification (STS) 4.2.1. This new interpretation constitutes a *de facto* license amendment because it grants greater operating authority and alters the original terms of a license. The new interpretation also introduces new uncertainty in the reading of Technical Specifications.

2. The draft letter to NEI provides a faulty analysis of the requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.59, for use of lead test assemblies (LTAs). In particular, statements by the staff on guidance from NEI 96-07, Revision 1, "Guidelines for 10 CFR 50.59 Evaluations," with respect to 10 CFR 50.59(c)(2)(ii), (vii), and (viii) have no basis.

3. The draft letter to NEI provides an interpretation of the need for exemptions from 10 CFR 50.46 that is different than a long history of exemptions issued for use of LTAs. This new interpretation is also contrary to the requirements in 10 CFR 50.57 regarding the licensee operating the facility in conformance with the rules and regulations of the Commission.

4. Because the draft letter to NEI provides wholly new interpretations of regulatory requirements that have a substantial effect on licensee activities, as well as on public stakeholders, the guidance should be considered a rule, and should be processed in accordance with the NRC's procedures established to meet the requirements of the Congressional Review Act. Additionally, the draft NEI letter should be subject to public notice, including the opportunity for public comment, prior to implementation, consistent with the Administrative Procedure Act and the Atomic Energy Act.

5. Analysis with NRC-approved methodologies is required to be conducted for each type of fuel assembly "severally and collectively," regardless of the specific composition (e.g., new design features like bottom nozzles, replacement of individual fuel pins/rods, and/or

LTAs) of the fuel assembly. There is no documented or inferred exception to this license requirement for LTAs.

6. The draft letter to NEI provides guidance that is inconsistent with the NRC's Principles of Good Regulation, specifically, "Openness," "Clarity," and "Reliability." The guidance is not fully consistent with the NRC's regulations and applicable laws, and changes to processes rooted in law and regulations and should be adhered to, unless changed legally through the rulemaking process. Additionally, cores utilizing fuel assemblies that are different than those previously found acceptable to the NRC or whose analytical methods have not been previously approved by the NRC could potentially represent a significant hazard due to a significant reduction in safety margin.

The following is a response to each of the six main concerns identified by Mr. Chernoff.

Concern 1. The non-concurrence states that the draft letter to NEI provides a wholly new interpretation, not a clarification, of the requirements of STS 4.2.1, without an underlying basis or explanation.

Response: The positions contained in this letter do not necessarily represent a new interpretation of STS 4.2.1, as many licensees have inserted LTAs into their reactors without the need for an amendment. Below is a partial list of plants that inserted LTAs with new clad material without requesting an amendment.

Plant	Cladding Material	Year(s) inserted (ADAMS Accession No.)
Summer 1	Optimized ZIRLO™	2005 (ML042530230)
Hatch-2	Ziron	2008 (ML081230661) 2010 (ML091170253) 2014 (ML13115A480, ML13115A473)
PVNGS-1	M5	2008 (ML080790524)
PVNGS-3	Optimized ZIRLO™	2010 (ML093160596)
Surry-1,2	M5	2016 (ML15282A036)
MPS-3	AXIOM	2017 (ML16189A104)
Hatch-2	ARMOR, IronClad	2018 (ML18012A057) 2018 (ML18012A058) 2018 (ML18012A059)

The draft letter provides an interpretation of STS 4.2.1 that is legally defensible and removes ambiguity about how the NRC staff currently interprets the last sentence of the STS. As is always the case, any licensee can request an amendment to its license under 10 CFR 50.90, and the NRC will continue to review such requests.

The non-concurrence states that the letter is attempting to reinterpret and/or revise the regulatory history of STS 4.2.1, and specifically, it ignores Generic Letter (GL) 90-02, "Alternative Requirements for Fuel Assemblies in Design Features Section of Technical Specifications," and Supplement 1 to GL 90-02.

Response: As discussed below, the STS (draft) preceded GL 90-02. GL 90-02 neither revised the STS nor addressed LTAs. As such, the regulatory history does not compel a result different than that provided in the draft letter to NEI.

The earliest version of what would become STS 4.2.1 is found in Revision 0 of NUREG-0452, "Standard Technical Specifications for Westinghouse Pressurized Water Reactors," which is an earlier version of the STS from 1976. That version contained the following paragraph:

> *5.3 Reactor Core*
>
> *FUEL ASSEMBLIES*
>
> *5.3.1 The reactor core shall contain _____ fuel assemblies with each fuel assembly containing _____ fuel rods clad with (Zircaloy-4). Each fuel rod shall have a nominal active fuel length of _____ inches and contain a maximum total weight of _____ grams uranium. The initial core loading shall have a maximum enrichment of _____ weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of _____ weight percent U-23*

This paragraph remained unchanged through Revision 4 of NUREG-0452, published in 1981. In 1987, the Commission released a policy statement on Technical Specification Improvement for Nuclear power reactors. As a result of that policy statement, the Boiling Water and Pressurized Water Reactor Owners Groups proposed new Standard Technical Specifications. A draft of the new STS Section 4.0, "Design Features," was sent from the NRC to the Nuclear Management and Resources Council (NUMARC) on June 19, 1990 and contained the following paragraph for STS Section 4.2.1 for Pressurized Water Reactors:

> *The reactor shall contain [ ] fuel assemblies. Each assembly shall consist of a matrix of Zircaloy clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2), as fuel material. Limited substitutions of zirconium or stainless steel filler rods for fuel rods may be used. Fuel assemblies shall be limited to those fuel designs which have been analyzed with NRC-approved codes and methods (including DNBR correlations and seismic analysis), and have been shown to comply with all Safety Design Bases in the FSAR.*

For Boiling Water Reactors, the draft contained the following paragraph for STS 4.2.1:

> *The reactor shall contain [ ] fuel assemblies. Each assembly shall consist of a matrix of Zircaloy clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO_2), as fuel material [and water rods]. Fuel assemblies shall be limited to those fuel designs which have been analyzed with NRC-approved codes and methods (including DNBR correlations and seismic analysis) and have undergone representative testing, and have been shown to comply with all Safety Design Bases in the FSAR.*

In January 1991, the first version of NUREG-1431, "Standard Technical Specifications: Westinghouse Plants," was published in draft form for public comment and contained the following paragraph for STS Section 4.2.1:

> *The reactor shall contain [N] fuel assemblies. Each assembly shall consist of a matrix of [Zircalloy or ZIRLO] fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO2) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core regions.*

The same version of NUREG-1431 (including the cited language) remains in use today.

LTAs do not appear in the draft STS Section 4.0 sent to NUMARC in June of 1990, but the sentence allowing restricted use of LTAs does appear in the first draft of NUREG-1431 issued for public comment. Publication of this paragraph occurred after GL 90-02 (February 1, 1990), but before GL 90-02 Supplement 1 (July 31, 1992). Moreover, GL 90-02 Supplement 1 references the draft STS when it discusses this paragraph:

> *The staff has issued the drafts of the new Standard Technical Specifications (STS) for public comment, including the following specification for fuel assemblies under the Design Features Section:*
>
> *The reactor shall contain [ ] fuel assemblies…*

The GL supplement did not introduce any changes to the STS, but instead quoted the STS that the NRC had previously published. While it is likely that the STS were influenced by GL 90-02, neither the GL nor its supplement provided any specific discussion of LTAs. The draft STS sent to NUMARC in 1990 contained allowances for reconstituted fuel, but not for LTAs, indicating that they are in fact two different types of fuel assemblies. In order to become reconstituted fuel, a fuel assembly must be in the reactor and contain rods that are found to be leaking or are determined to be probable sources of future leakage and those rods are then replaced. LTAs are fuel assemblies that contain new design features or materials for which additional data may be needed to support batch loading.

The non-concurrence claims that this draft letter constitutes a *de facto* license amendment because it grants greater operating authority and alters the original terms of a license.

Response: I disagree with this claim. The issuance of the draft letter does not alter the terms of any existing license. Further, the draft letter is not a vehicle for approving or authorizing a particular LTA campaign and, therefore, does not grant any specific licensee any greater operating authority.. Instead, the draft letter provides generic guidance that is not specific to any particular licensee, license, or LTA campaign; rather, it advises that a licensee must comply with its license and the NRC's regulations.

Lastly, the non-concurrence states that the new interpretation introduces new uncertainty in the reading of Technical Specifications.

Response: Licensees have expressed uncertainty within the current framework. While there are a substantial number of amendment and exemption requests that have been submitted in support of LTA campaigns, there are also numerous examples where LTA campaigns have been pursued without either license amendments or exemptions. There are also inconsistent or unclear statements within approved license amendments and exemptions about whether a license amendment or exemption is required. Reviews of past documents are also subject to selection bias because LTA campaigns conducted under the 10 CFR 50.59 screening process do not require reporting to NRC, and evaluation reports may be unclear with respect to the analysis of a given LTA if it was performed as part of another activity. Notably, since 2008, no TS amendments have been requested or issued for LTA campaigns. In light of the varied past approaches and questions on this topic, this draft letter is intended to clarify the agency's position on when prior NRC approval is needed for LTA campaigns.

Concern 2. The non-concurrence states that the draft letter to NEI provides a faulty analysis of the requirements in 10 CFR 50.59, for use of LTAs. In particular, statements by the staff on guidance from NEI 96-07, Revision 1 with respect to 10 CFR 50.59(c)(2)(ii), (vii), and (viii) have no basis.

The non-concurrence states that the draft letter does not provide a basis for why LTAs that meet the STS LTA provision (i.e., "A limited number of lead test assemblies…placed in non-limiting core regions") is sufficient to support a 10 CFR 50.59 statement that "the LTAs would continue to meet all applicable design and functional requirements, and any new failure modes would be bounded by the existing analysis."

Response: I disagree with this claim; however, the draft letter has been revised to be more clearly consistent with 10 CFR 50.59 and NEI 96-07. The draft letter states:

> The TS provision of "nonlimiting core regions" is dependent upon plant operating parameters (e.g., COLR limits like power density), and the UFSAR Chapter 15 transient and accident analyses. A nonlimiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat generation rate, peak clad temperature, minimum departure from nucleate boiling). The licensee must select nonlimiting core regions such that the new design features of the LTA are conservative for the respective design, performance, and safety limits relative to the limiting fuel assemblies during normal operation, anticipated operational occurrences, and postulated accidents.

The draft letter also states:

> The NRC staff expects licensees to evaluate LTAs against applicable design and functional requirements, and to ensure that any new failure modes introduced by LTAs are analyzed against the existing analyses. For LTA campaigns where the design and functional requirements and new failure modes are bounded, the licensee may not meet this criterion (and thereby would not need to request a license amendment due to this criterion). Absent an evaluation showing that the LTAs satisfy the bounding analysis, the licensee would meet this criterion, and thus require a license amendment.

The non-concurrence states that the draft letter to NEI is not consistent with NEI 96-07, Revision 1, Section 4.3.7, "Does the Activity Result in a Design Basis Limit for a Fission

Product Barrier Being Exceeded or Altered?" in that it does not provide a basis for the statement "If the LTA campaign demonstrates, via the selection of limited quantity and restricted location, that the UFSAR AOR remain bounding, the licensee could answer this question with a 'No'," because there is no requirement or definition of what is meant by the STS LTA phrase "non-limiting core regions."

Response: The draft letter does contain a description of the term "non-limiting core region." However, to better clarify considerations that are involved in evaluating a proposed change against 10 CFR 50.59(c)(2)(vii) and Section 4.3.7 of the NEI guidance, the underlined passage below has been added to the draft letter:

> For 10 CFR 50.59(c)(2)(vii), "Result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered," NEI 96 07, Revision 1, Section 4.3.7 states, in part, that "[i]f an engineering evaluation demonstrates that the analysis presented in the UFSAR remains bounding, then no further 10 CFR 50.59(c)(2)(vii) evaluation is required." If the LTA campaign demonstrates, via the selection of a "limited number" of LTAs placed in and "nonlimiting core regions" that the COLR limits and UFSAR Chapter 15 transient and accident analyses continue to be applicable and remain bounding, the licensee may not meet this criterion (and thereby would not need to request a license amendment due to this criterion). <u>For example, if an LTA campaign impacts a design basis parameter (such as linear heat generation rate) but does not challenge the existing design basis limit associated with that parameter, then the limit remains bounding. If, however, the LTA is inserted such that the design basis parameter exceeds the design basis limit associated with that parameter, then the criterion would be met and prior NRC approval would be required to change the limit.</u>

Similarly, the non-concurrence states that the draft letter to NEI provides no basis for why "the selection of limited quantity and restricted location" is in any way related to or otherwise addresses each of these fuel cladding design basis limit parameters which is necessary to support a 10 CFR 50.59(c)(2)(vii) determination that the LTAs do not result in a design basis limit for a fission product barrier as described in the FSAR (as updated) being exceeded or altered.

Response: As described in the draft letter, a non-limiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat generation rate, peak clad temperature, minimum departure from nucleate boiling). The draft letter has been revised to state:

The TS provision of "nonlimiting core regions" is dependent upon plant operating parameters (e.g., COLR limits like power density), and the UFSAR Chapter 15 transient and accident analyses. A nonlimiting core region is a location where the LTA will not be the bounding assembly for any safety analyses (e.g., peak linear heat generation rate, peak clad temperature, minimum departure from nucleate boiling). Licensees must select nonlimiting core regions such that the new design features of the LTA are conservative for the respective design, performance, and safety limits relative to the limiting fuel assemblies during normal operation, anticipated operational occurrences, and postulated accidents. In addition to the information added above (shown as underlined text), if a design basis limit for a fission product barrier is altered by an LTA then the licensee should submit a license amendment request for prior review

and approval to the NRC. However, if LTAs are inserted in such limited quantities and in non-limiting locations such that the limits for the core are unchanged, then the LTA program may not meet this criterion and, therefore, would not necessitate a license amendment due to this criterion.

The non-concurrence states that the draft letter to NEI provides no basis for why LTAs that meet the STS LTA provision, which makes no mention of a method of evaluation is sufficient to support a 10 CFR 50.59(c)(2)(viii) determination that the LTAs would not "Result in a departure from a method of evaluation described in the FSAR (as updated) used in establishing the design bases or in the safety analyses."

Response: The draft letter to NEI letter has been revised to state:

> Section 4.3.8.2 of NEI 96 07, Revision 1, provides guidance for changing from one method of evaluation to another. LTA campaigns that meet the STS LTA provision (i.e., the COLR limits and Chapter 15 UFSAR analyses remain applicable and bounding) will not affect the performance of safety related SSCs and, therefore, the method of evaluation used in establishing the design bases will remain the same, and the licensee may not meet this criterion (and thereby would not need to request a license amendment due to this criterion).

The non-concurrence states that a clause in the draft letter to NEI ("Additionally, the incorporation of TS Section 4.2.1 into a plant's licensing basis represents the NRC's approval for use of new or different methods of evaluation for LTA's under the constraints of the TS provision,") is incorrect in that, given that the STS LTA provision does not mention or imply a method of evaluation and, as such, cannot represent the NRC's approval for use of new or different methods of evaluation for LTAs under the constraints of the TS provision.

Response: I agree with your statement, and therefore, this language has been deleted from the draft letter.

The non-concurrence states that the draft letter contained a statement that LTAs meeting the STS LTA provision would be similar to Example 2 in Section 4.3.2 of NEI 96-07, in that they would continue to meet all applicable design and functional requirements, and any new failure modes would be bounded by the existing analyses.

Response: Example 2 implies substituting one component for another, where the replacement component meets all applicable design and functional requirements of the original. I agree with your comment. This is not how LTAs are described earlier in the letter, and is not an appropriate comparison. The passage has been deleted from the draft letter.

The non-concurrence also questions the draft letter's characterization of how an LTA may not be considered a change, test, or experiment under 10 CFR 50.59.

Response: The sentence was re-worded as noted below:

> LTA campaigns that are not described in the UFSAR meet the definition of a change, test, or experiment under 10 CFR 50.59(a), and the licensee must

perform a 10 CFR 50.59 evaluation to determine if it may proceed with its campaign without prior NRC approval.

Concern 3. The non-concurrence states that the draft letter provides an interpretation of the need for exemptions from 10 CFR 50.46 that is different than a long history of exemptions issued for use of LTAs. The non-concurrence states that this new interpretation is also contrary to the requirements in 10 CFR 50.57 regarding the licensee operating the facility in conformance with the rules and regulations of the Commission.

Response: There have been varied approaches used by licensees who have inserted LTAs. Some licensees have requested an exemption "from 10 CFR 50.46" such that the acceptance criteria in 10 CFR 50.46 and 10 CFR Part 50, Appendix K could be applied to fuel assembly designs that used cladding material other than zircaloy and ZIRLO. The table in the response to Concern 1 provides a partial listing of similar exemption requests.

10 CFR 50.46 states, in relevant part:

> (a)(1)(i) Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section."

The LTA exemptions that have been issued for 10 CFR 50.46 are unusual in that they provide an exemption to the applicability statement in the rule, rather than an exemption from the rule itself. For example, a plant using M5 cladding would typically request an exemption to the 10 CFR 50.46 applicability statement, allowing the application of the acceptance criteria in 10 CFR 50.46(b) to a cladding other than zircaloy or ZIRLO. The exemption request in that circumstance would be expected to document that the clad-specific criteria in 10 CFR 50.46(b) (i.e., peak cladding temperature, maximum cladding oxidation, and maximum hydrogen generation) are applicable or bounding for M5. Meeting these criteria would demonstrate compliance with GDC 35, "Emergency Core Cooling."

In the case where a limited number of LTAs are inserted into a core for which 10 CFR 50.46 applies, either intrinsically or by exemption (true for all currently operating LWRs), the acceptance criteria of 10 CFR 50.46(b) still apply to the core. An exemption is not required to insert the LTAs because a limited number of LTAs inserted in non-limiting core regions will not impact the acceptability of the ECCS for that plant. If a licensee were to determine that the LTAs may impact the ECCS acceptability, then the LTAs would not be considered to fit the limited number and non-limiting core regions provisions of the TS. The draft letter to NEI has been updated to reflect this point.

With regard to your concern that "this new interpretation" is contrary to the requirements in 10 CFR 50.57 regarding the licensee operating the facility in conformance with the rules and regulations of the Commission, the draft letter reiterates that licensees must comply with the regulations. This is mandated by a condition in their licenses. As explained in the draft letter, an exemption to expand the applicability of 10 CFR 50.46 to other zirconium-based claddings is not necessary for LTAs. This position is legally defensible. Therefore, a licensee would be in compliance with its license and the regulations of the Commission without an exemption to 10 CFR 50.46 for non-zirconium based cladding. Nonetheless, any licensee can request an

exemption to apply 10 CFR 50.46 to cladding other than zircaloy and ZIRLO, and the NRC will continue to review such requests.

To the extent you believe that the draft letter constitutes a change in position, the NRC may make such a change and an interpretive rule is an acceptable vehicle to do so, given the generic issues that have been raised.

Concern 4. The non-concurrence states that because the draft letter to NEI provides wholly new interpretations of regulatory requirements that have a substantial effect on licensee activities, as well as on public stakeholders, the guidance should be considered a rule, and should be processed in accordance with the NRC's procedures established to meet the requirements of the Congressional Review Act (CRA).

Response: The CRA does not apply to this draft letter because the CRA only applies to agencies' final rules. I agree that once finalized, this letter will be considered a rule for CRA purposes and will be submitted to the Office of Management and Budget (OMB) to determine whether it constitutes a major rule.

The non-concurrence also states that the draft NEI letter should be subject to public notice, including the opportunity for public comment, prior to implementation, consistent with the Administrative Procedure Act and the Atomic Energy Act.

Response: I agree that the draft letter should be subject to public notice and comment. The draft letter will be published in the *Federal Register* for a 20-day public comment period. Comments will be addressed and appropriate revisions to the letter will be made before final issuance of the letter.

Concern 5. The non-concurrence states that analysis with NRC-approved methodologies is required to be conducted for each type of fuel assembly severally and collectively, regardless of the specific composition (e.g., new design features like bottom nozzles, replacement of individual fuel pins/rods, and/or LTAs) of the fuel assembly. The non-concurrence also states that there is no documented or inferred exception to this license requirement for LTAs.

Response: I agree in part and disagree in part with this comment.

The requirement for analysis of LTAs using approved methods is one that has been stated or implied in many of the documents reviewed by the NRC staff. The requirement was identified in GE's original LTA process as discussed in the letter from the NRC to Mr. Ron Engel, General Electric Company,[1] and it is still cited by licensees who use the GE methodology (NEDE-24011-P-A). This letter is intended to clarify the NRC's position regarding the use of approved methods for LTAs. As an initial matter, the licensee must perform reload analyses to establish core operating limits using NRC-approved analytical codes and methods listed in the licensee's TS (i.e., STS 5.6.3). If a new fuel material or design feature, including an LTA, necessitates a change to these approved analytical codes and methods to determine the COLR limits and UFSAR Chapter 15 analyses, then a license amendment would be required to use the

[1] Letter from Thomas A. Ippolito, NRC, dated September 23, 1981 (ADAMS Legacy Library Accession No. 8110090006)

new or changed analytical code or method. In some instances, an LTA campaign may be covered by an approved method. For example, some plants have methods included in STS 5.6.3 that specify conditions for LTA insertion (for example, NEDE-24011-P-A, also known as GESTAR). These methods have already been approved by the NRC through the topical report approval process and continue to be acceptable for use within the scope of their approval.

There have also been instances where the NRC staff approved use of previously unapproved methods for limited analysis of LTAs. For example, in 1981, the staff approved an amendment that allowed the use of LTAs at Peach Bottom Atomic Power Station, even though some of the analysis was outside the bounds of the approved method (ADAMS Accession No. ML011300274). The staff stated:

> We believe that the licensee's decision to use an uncorrected analysis for these four assemblies is acceptable because, (a) the allowable power rating of these assemblies at high exposures is significantly lower than the rest of the core, (b) only four lead test bundles are involved, and (c) the benefits to be derived from this high-burnup lead test assembly program outweigh the small risk that will be taken by relying on an uncorrected analysis.

While many of the LTA documents use the terms "approved methods" or "acceptable methods," these terms are a simplification that can be misleading. In most instances, it is not possible to use only approved methods to analyze LTAs because approved methods for the LTAs may not exist. For example, in 2015 the NRC was notified of two upcoming LTA programs: one at Browns Ferry to load Atrium 11 LTAs (ADAMS Accession No. ML15306A037), and one at Shearon Harris to load GAIA LTAs (ADAMS Accession No. ML15188A172). While much of the analysis for these LTAs was performed with approved methods, it is not possible to perform the non-LOCA safety analysis using approved methods, as the non-LOCA analysis requires critical heat flux (CHF) and critical power (CP) correlations. Those correlations are fuel-type-specific and there are currently no approved correlations for either ATRIUM 11 or GAIA. Those correlations are currently under review by the NRC staff.

The NRC staff's position is that approved methods should be used wherever possible; however, approved methods for the LTA fuel (e.g., assembly-specific CHF correlations) may not exist. In those instances, the licensee should perform a conservative evaluation of the LTAs using the approved codes and methods for the core. For example, Tennessee Valley Authority inserted Atrium 11 LTAs at Browns Ferry and AREVA stated in the LTA Design and Licensing Report (ADAMS Accession No. ML15306A037):

> For the materials or features outside the current NRC approved codes and methods, the licensing analyses demonstrate that modeling of this small number of test fuel assemblies with NRC approved codes and methods produces either a conservative result or has a negligible impact with respect to cycle specific licensing analyses.

LTA campaigns help to collect the data necessary to approve the codes and methods used for generation of the core operating limits for batch loading. LTAs inserted in nonlimiting locations must, by definition, be within the bounds of the core operating limits. The evaluation of LTA campaigns necessarily requires some engineering judgment due to incomplete representative data availability prior to irradiation of the LTAs, and evaluation may necessitate modifications to approved codes and methods or the use of such codes and methods outside the bounds for

which they were explicitly approved. These modifications, made solely for the evaluation of limited numbers of LTAs, may be acceptable for confirmation of the nonlimiting nature of the LTAs and the continued applicability of the core operating limits, which themselves are calculated using approved codes and methods.

Additionally, if LTAs are inserted in such number or location that they invalidate the COLR limits or UFSAR Chapter 15 transient and accident analyses, they would not meet the requirement for LTAs in TS 4.2.1 that they be limited in number and placed in non-limiting core regions. Approved codes and methods must be used to determine the COLR limits, with or without LTAs.

Concern 6. The non-concurrence states that the draft letter to NEI provides guidance that is inconsistent with the NRC's Principles of Good Regulation, specifically, "Openness," "Clarity," and "Reliability."

Response: The staff strives to adhere to the NRC's Principles of Good Regulation. With respect to "Openness," the NRC's regulations, which reflect the Atomic Energy Act of 1954, as amended, and the Administrative Procedure Act, provide opportunities for members of the public to engage the staff through comments on no significant hazards consideration determinations and opportunities to request hearings. Such opportunities are appropriate if an amendment to a license is required. As stated earlier, a license amendment may not be necessary if it does not meet the criteria in 10 CFR 50.59(c)(2), or the LTAs it intends to insert in its core meet approved codes and methods, such as the GESTAR methodology (NEDE-24011-P-A). Also as indicated in the response to Concern 4, the staff will issue the draft letter for public comment. With respect to "Clarity," the staff recognizes that some past licensing actions followed a different interpretation of STS 4.2.1 than what is presented in the draft letter; however, there are several examples that align with this guidance. As stated in a recent amendment request, "...the NRC has not communicated alignment with this position [that LTA demonstration programs can be conducted by licensees under 10 CFR 50.59], creating regulatory uncertainty regarding the licensing approach for accident tolerant fuel LTAs" (ADAMS Accession No. ML18037A431). The goal of the draft letter is to increase clarity by formally stating the agency's position on a topic with varied approaches. With respect to "Reliability," the staff notes that there has been regulatory uncertainty with respect to LTAs, with questions over the years about the NRC's approach; the draft guidance is intended to promote greater stability and reliability in the regulatory scheme.

While there are a substantial number of amendment and exemption requests that have been submitted in support of LTA campaigns, there are also numerous examples where LTA campaigns have been pursued without either license amendments or exemptions. There are also some inconsistent or unclear statements within approved license amendments and exemptions about whether a license amendment or exemption is required. Reviews of past documents are also subject to selection bias because LTA campaigns conducted under the 10 CFR 50.59 screening process do not require reporting to NRC, and evaluation reports may be unclear with respect to the analysis of an LTA campaign if it was performed as part of another activity. Notably, since 2008, no TS amendments have been requested or issued for LTA campaigns. In light of the varied past approaches and questions on this topic, this letter is intended to clarify the agency's position on when prior NRC approval is needed for LTA campaigns.

The non-concurrence also states that the guidance is not fully consistent with the NRC's regulations and applicable laws, and changes to processes rooted in law and regulations and should be adhered to, unless changed legally through the rulemaking process.

Response: As stated in the response to Concern 3, to the extent the draft letter constitutes a change in position, the NRC may make such a change and an interpretive rule is an acceptable vehicle to do so, given the generic issues that have been raised. The draft letter states that the NRC staff will continue to engage with stakeholders to determine whether further guidance is necessary. The draft will be issued for public comment, and if stakeholders indicated that more "durable" guidance is needed, the staff will consider the development of such guidance and will follow the appropriate processes for issuance of said guidance.

Additionally, the non-concurrence states that cores utilizing fuel assemblies that are different than those previously found acceptable to the NRC or whose analytical methods have not been previously approved by the NRC could potentially represent a significant hazard due to a significant reduction in safety margin.

Response: As noted in the response to Concern 5, approved codes and methods are used to develop the core operating limits. Licensees cannot exceed these limits without prior NRC approval. As explained in the response to Concern 1, some licensees have requested license amendments to insert LTAs, while other licensees have not been required to do so. Licensees that requested amendments to insert LTAs prepared no significant hazards consideration determinations and submitted them as part of their requests. 10 CFR 50.92(c)(3) specifically addresses significant reduction in a margin of safety. As noted in these requests, the licensees did not identify that the insertion of LTAs presented a significant hazard, more specifically, that the LTAs would not result in a significant reduction in a margin of safety. For licensees that inserted LTAs under the provision of 10 CFR 50.59, reports submitted to the NRC indicated that these licensees also used approved methodologies, e.g., NEDE-24011-P-A, to analyze events and accidents whose results could be affected by the LTAs. As stated in the letter, modifications made solely for the evaluation of limited numbers of LTAs may be acceptable for confirmation of the nonlimiting nature of the LTAs and the continued applicability of the core operating limits, which themselves are calculated using approved codes and methods. Therefore, insertion of LTAs would not represent a significant hazard because there would not be a significant reduction in the safety margin.

Finally, it is important to note that after insertion of LTAs, the NRC's regulatory oversight process provides oversight of reactor core performance.