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Mike hope all is well. Quick question.. the FRN noted that…

> *The staff is also seeking input on whether to incorporate guidance on two issues into DG-1321: the continued viability of an existing process for treating changes during construction, i.e., the preliminary amendment request process and the timing and review of license amendment requests submitted after the Commission publishes a Notice of Intended Operations.*

I am aware of meetings with the staff has had with Southern concerning a streamlined LAR process during construction, since emergency/exigent LARs are not applicable under construction. But it is unclear exactly what the staff is considering in the FRN. Is the staff considering whether the current ISG-025 process should still be applicable during the period from the *Notice of Intended Operations* to 103(g)?

Also several other issues. DG-1321 seems to only cover a small subset of what the industry was requesting in it's report that shows that there were a number of changes to Tier 1 and Tier 2* that created challenges. Not sure why Tier 2* isn't addressed in the DG. Also it is not clear why minor clerical corrections to Tier 1 information is excluded from the process. Without the additional relief in those 2 areas it seems as if PAR is still needed.

Please see attached report.

Thanks.

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Assessment of Licensing Impacts on Construction: *Experience with Making Changes during Construction under Part 52*

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Introduction and Purpose

More than 25 years ago, the Nuclear Regulatory Commission added an alternative to the traditional 10 CFR Part 50 "build-and-then-license" approach to new nuclear plants. This alternative (promulgated in 10 CFR Part 52), enables companies to "license-then-build," and reflects an NRC effort to add certainty and efficiency to new nuclear projects. A key difference is that under Part 52, there is a license that must be maintained during construction. This means that unlike the traditional Part 50 process, changes during construction under Part 52 are subject to NRC change control processes, and many changes must be reviewed and approved by the NRC before they can be implemented.

This paper provides an assessment of Part 52 construction experience to date and concludes that adjustments can and should be made to optimize the change process and provide the flexibility licensees need to construct new nuclear plants, including changes that are expected and inevitable in such large and complex projects.

Background on Part 52 Change Process

In its Staff Requirements Memo on SECY-90-377 "Requirements for Design Certification Under 10 CFR Part 52," the Commission recognized that "a certain amount of flexibility will be needed to finalize procurement information and construct the facility." To provide the requisite flexibility, the Commission approved a two-tier approach for design certification and the use of a process similar to 10 CFR 50.59 for making changes to Tier 2. The two-tier approach and the "50.59-like process" are codified in the design certification rules that have been incorporated by reference in combined licenses granted by the NRC under Part 52. Tier 1 presents a top-level description of design features and functions that are most important to safety and is derived from Tier 2. Tier 2 contains the additional design information and analyses needed to support the NRC's safety evaluation of the design.

Part 52 licensees may make changes during construction in accordance with Section VIII of their referenced design certification rule. Section VIII defines the change control processes for Tier 1 and Tier 2 information, as well as a third tier of information known as Tier 2*. Tier 1 and Tier 2 (including Tier 2*) information comprise the design control document (DCD). Similar to Tier 1 information, departures from Tier 2* information require prior NRC approval via license amendment regardless of the safety significance of the change. Tier 1 departures also require an exemption from Tier 1 requirements as part of the license amendment. Tier 1 and Tier 2* change controls are distinctly different from controls for Tier 2 information, which may be changed without prior NRC approval using a process similar to that in 10 CFR 50.59. The 50.59-like process in Part 52 allows licensees to depart from a standard design certification without prior NRC approval provided several safety-focused criteria are met.

Beyond the Part 52 change process requirements themselves, the NRC staff interprets Part 52 to require that construction must be in accordance with the licensing basis at all times. This means that licensees may depart from the approved design, or continue construction that departs from the licensing basis, only after 1) the licensee determines that a License Amendment Request (LAR) is

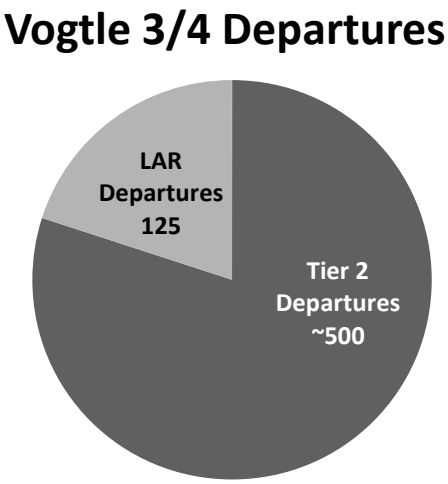
not required; 2) after the LAR is developed, submitted, reviewed and approved by the NRC; or 3) the licensee receives a Preliminary Amendment Request (PAR) "no objection" letter from the NRC. Because it can take weeks or longer to develop an LAR and obtain NRC acceptance of the LAR for review, this NRC interpretation of the Part 52 change process can have a significant impact on construction.

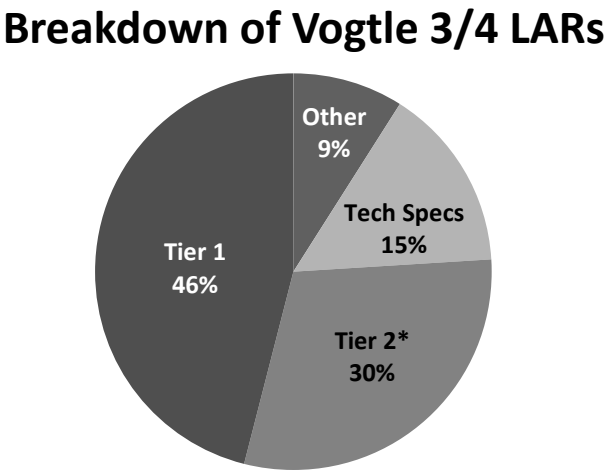
Preliminary Amendment Request Process

The interpretation that construction must be in accordance with the licensing basis at all times required NRC to establish the Preliminary Amendment Request (PAR) process to allow work to proceed – at licensee risk – in advance of LAR approval. Instead of waiting several months to one year for an LAR to be approved before constructing the change, the licensee may submit a PAR along with an LAR. Upon NRC acceptance of the LAR, the NRC sends a "no objection" letter to the licensee, who may then proceed to construct the change in parallel with NRC formal technical review in progress and prior to NRC approval of the LAR. Once an LAR is submitted, the PAR process can be completed in days to weeks depending on the complexity and urgency of the change. Work under a PAR is considered "at-risk" because if the NRC ultimately rejects the associated LAR, the licensee must undo the change and restore the facility to the approved licensing basis. The PAR process is codified via a license condition in each COL.

Changes during Construction – Southern Nuclear Company Experience

As of December 2017, Southern Nuclear Company (SNC) had implemented or proposed approximately 625 departures at Vogtle 3/4 in accordance with the AP1000 design certification change process. This number of changes is not unexpected given the nature of this complex, first-of-kind project and affirms the decision of the Commission to establish the two-tier approach for design certification.

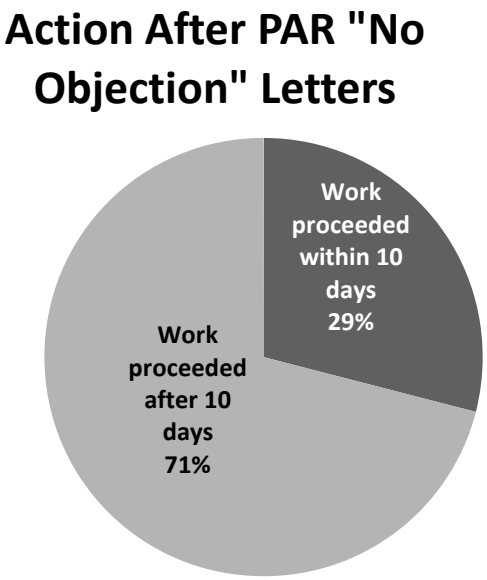




Under the Section VIII design certification change process, LARs are required for departures from Tier 1, Tier 2*, technical specifications, and certain other requirements of the license. At the time this report was developed, SNC had identified the need for roughly 625 Vogtle 3/4 departures and had submitted 125 LARs for departures that were determined to require prior NRC approval; 90 had been approved by the NRC. None were denied.

Approximately 30% of license amendment requests for the Vogtle 3/4 project were required solely because of changes to Tier 2* information. An assessment by SNC determined that of those changes, the vast majority were not safety significant and would not have required an amendment if a "50.59-like" change process could be applied. The remainder would have required a license amendment request under the Tier 2 "50.59-like" process, meaning the Tier 2* designation requiring prior NRC approval was duplicative and unnecessary.

AP1000 experience indicates that Tier 2* designations were applied to design details that were not significant to NRC safety findings. Because of Tier 2* designations, LARs were required even for changes that were not safety significant. In most cases, excessive detail in figures and text designated as Tier 2* information triggered the need for an LAR. In many cases, changes permitted by referenced codes/standards could not be made without a LAR because they were in conflict with specific details that were designated Tier 2*. NEI continues to pursue elimination of Tier 2* for future design certifications, and SNC is seeking relief[1] from Tier 2* in the wake of SECY-17-0075 and NEI's October 11, 2017 follow-up letter to the Commission.



As of December 2017, 31 PARs had been submitted and approved, indicating the need to expedite NRC permission to proceed with construction with those changes. In 29% of these cases, work proceeded within 10 days of receipt of the "no objection" letter from NRC indicating that construction may have been affected, or nearly affected, by the need for permission from NRC. It is SNC's assessment that the PAR process has worked as intended and that NRC has generally turned around PARs in sufficient time to support Vogtle 3/4 construction needs.

Change Process Impacts on Construction

With a few exceptions (discussed below), the Part 52 change process, including PAR/LAR, has not caused frequent or significant delays in construction at Vogtle 3/4 (and likewise did not at SCANA's V.C. Summer 2/3). The causes of the extensive delays at Vogtle 3/4 and Summer 2/3 were largely

[1] On September 20, 2018, the NRC approved SNC LAR 17-037 on changes to the Tier 2* departure evaluation process.

related to other issues, not regulatory/licensing issues. The relatively mild impact on construction can largely be attributed to significant licensee resources dedicated to managing the Vogtle 3/4 licensing basis and the responsiveness of NRC when expedited action on PAR/LARs was necessary.

While direct impacts on construction schedules were limited, the need for unnecessary (e.g., non-safety-significant Tier 2* changes) LARs and the need for PARs has had an adverse cost impact on the project. The process has required additional time and resources on the part of both the SNC and NRC. On average SNC estimates the cost for preparation and NRC review of a typical LAR to be $200-$300K. And beyond the direct cost of the licensing action, the interpretation that construction must be in accordance with the licensing basis at all times creates the ongoing risk and potential for the change process to delay construction and requires the licensee and design authority to maintain licensing and engineering staffs that are larger than would otherwise be necessary to be ready to address emergent conditions and minimize that risk.

In addition to the resource burden on licensees, the current NRC interpretation that construction cannot at any time deviate from the licensing basis creates unnecessary ongoing risk during the entire construction period and the potential for costly construction delays due to emergent conditions that require prior NRC approval of LARs or PARs. That risk is not justifiable from a public health and safety perspective and is exacerbated by unnecessary use of the Tier 2*designation.

Vogtle 3/4 Construction Impacts

The following examples were among the most impactful on Vogtle 3/4 construction, in large part because compliance issues were identified while the NRC was inspecting work underway on site. These examples illustrate the impact of the Part 52 change process on construction and how those impacts are exacerbated by excessive detail in the licensing basis in general, and by Tier 2* in particular. Except for the backfill example (which involved information in the site safety analysis report for the Vogtle ESP – not the DCD), each of the other examples involved Tier 2* information. It is worth noting that in each of these cases, the 50.59-like change process would have assured that potentially safety significant changes were considered by the NRC as part of a license amendment request, without designating certain information as Tier 2*, while allowing the licensee to proceed with others without an LAR.

Engineered Backfill [No LAR # -- ML101120089]

> During the site preparations under the early site permit (ESP) and the limited work authorization (LWA) for Vogtle 3/4, SNC planned to conduct significant excavations to replace the existing soil with “Engineered Backfill.” The ESP contained specific criteria that the Engineered Backfill needed to meet to be suitable for use. However, due to the manner in which the NRC’s Standard Review Plan was written, the NRC staff believed it was necessary for SNC to identify in the ESP the specific locations on the site from which SNC would take the Engineered Backfill. As SNC began the excavations, it was clear that soil would need to be taken from additional locations on the site because the five specified locations did not contain adequate amounts. SNC did not recognize the NRC limitation due to its lack of safety significance and the wording in the SER. SNC began using backfill from these alternate

locations. However, the NRC staff stopped the work at Unit 3 on the basis that according to the ESP, SNC could only use Engineered Backfill from those five specific locations in the ESP.

Instead of relying on the criteria specified in the ESP to ensure the additional soil was appropriate for Engineered Backfill, the NRC staff required that SNC submit a license amendment request to modify the ESP in order to add these additional locations. This NRC action disrupted the planned work at the site; the NRC ultimately approved SNC's proposed changes without modification. Since the PAR process was not in place at that time, SNC made a case for exigency to expedite the NRC review.

Construction Tolerances of Rebar at Vogtle 3

The NRC staff required detailed information pertaining to structural design of critical sections[2] and designated that information as Tier 2*. In one example, instead of referencing a particular code or standard, the NRC staff required that the Westinghouse AP1000 design control document (DCD) include the thickness of the rebar and its spacing in a portion of the basemat (foundation) of the AP1000. The DCD indicated that the rebar be spaced one foot apart with a tolerance of plus or minus ¼ inch. When performing an inspection of the basemat as it was being constructed, the NRC staff noted that the spacing of some rebar sections was not exactly one foot plus or minus ¼ inch. The deviations could have been reconciled in accordance with the applicable code[3], but because the tolerance was specified in the DCD, the NRC staff required SNC to either perform a revised structural analysis or remove the concrete and reposition the rebar. Due to timing and schedule considerations, SNC chose to remove the concrete and reposition the rebar.

Nuclear Island Walls Reinforcement (T-heads) LAR-13-009

Following differing professional opinions between Westinghouse and NRC staff regarding application of relevant code[2] provisions, UFSAR (plant-specific DCD) Section 3.8 and Appendix 3H were revised to provide alternative requirements in the licensing basis from the applicable codes[4] for development of headed reinforcement. This change clarified the design and licensing basis for the headed reinforcement bars in locations including auxiliary building walls and walls within containment. The associated UFSAR (plant-specific DCD) figures for the auxiliary building wall reinforcement were also revised. The UFSAR specification of headed shear reinforcing tie bar size and spacing of the shear reinforcement in these walls was replaced in the DCD with a reference to the applicable ACI Code requirements and the minimum provided square inches of shear reinforcement per length of wall. The use of

[2] Critical sections are those portions of Seismic Category I structures approved in the design certification that are representative of the complete structural design. Such sections may include areas of high stress ratios (e.g., stress concentrations), require unique methods of evaluation, or use novel design techniques.

[3] Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349-01)

[4] ACI 349-01 Appendix B to include the Building Code Requirements for Structural Concrete and Commentary (ACI 318-11), Section 12.6

conventional shear ties (with alternating 90 degree and 135 degree hooks) was also included in the UFSAR as an allowable alternative to headed reinforcement for providing shear reinforcement in exterior walls below grade.

Due to the impact on Tier 2*, a LAR and PAR were submitted to update the licensing basis and the affected scope of work was disrupted pending NRC approval of the PAR. The LAR was ultimately approved by the NRC. No repair or rework was required as a result of this departure.

Basemat rebar design (sheer ties) LAR-13-003

The proposed amendment was necessitated by the need to depart from plant-specific Design Control Document Tier 2* information incorporated into the Updated Final Safety Analysis Report to clarify the requirements for shear reinforcement spacing in the nuclear island basemat below the auxiliary building. The proposed change was to modify the provisions for maximum spacing of the shear reinforcement in the basemat below the auxiliary building.

This LAR was needed in order to revise Tier 2* information in UFSAR (plant-specific DCD) Subsection 3.8.5.5 to remove the direct reference to ACI 349-01 Subsection 11.8.3 and replace it with supplemental provisions based on criteria from ACI 349-01. The proposed changes were in accordance with the NRC-reviewed AP1000 design and mirrored provisions included in the parallel portion of the NRC-certified AP600 design.

A LAR and PAR were submitted to update the licensing basis and the affected scope of work was disrupted pending NRC approval of the PAR. The LAR was ultimately approved by the NRC.

Welded couplers LAR-15-010

The design requirements for welding of mechanical couplers to structural steel needed to be changed to allow the use of American Institute of Steel Construction (AISC) N690-1994 Stress Limit Coefficient (SLC) of 1.6, for rebar sizes #4, #5, and #6 couplers and to demonstrate the required weld capacity through analysis. For rebar sizes #7 through #11 couplers, the requirements were changed to allow physical destructive testing to demonstrate the weld capacity.

This change affected Tier 2* UFSAR material. A LAR and PAR were submitted to update the licensing basis and installation of welded couplers and associated work was disrupted pending NRC approval of the PAR and completion of the required analysis and testing. The LAR was ultimately approved by the NRC.

Location of headed studs for Containment Internal Structures LAR-13-006R

The NRC staff required that the Westinghouse AP1000 design certification document (DCD) include a figure showing the size and spacing of headed studs that were to be attached to

steel face plates. The DCD indicated the design spacing of headed stud, trusses, and channels in the wall modules in locations away from openings and penetrations in the walls.

When performing an inspection of the CIS modules during construction, the NRC staff noted that in some limited areas near obstructions (e.g., near leak chases and embedments), the spacing of some headed studs exceeded the spacing specified in the DCD. Although the deviations were structurally acceptable and could have been reconciled in accordance with applicable codes, the NRC staff required SNC to halt construction and submit an LAR to address in the UFSAR stud spacing adjacent to the obstructions. To address this, SNC submitted an LAR, later approved by the NRC, to further describe the headed stud design.

This change affected Tier 2* UFSAR material. An LAR and PAR were submitted and the affected scope of work was disrupted pending NRC approval of the PAR. The LAR was ultimately approved by the NRC.

The examples above illustrate how the need for regulatory approval of departures from the DCD caused disruptions to construction and higher costs. In each case where a licensing change was made, proposed changes were approved by the NRC. The disruptions to construction took various forms, including work resequencing, shifting of resources, adjustment of priorities and delays to planned work.

Part 52 Licensing Impacts on Construction – Conclusions

Successful completion of commercial nuclear projects demands excellence in technology, construction and regulation. Achieving that excellence means learning from experience and fine-tuning as we go. In the regulatory area, we draw the following conclusions from licensee experience making changes during construction under Part 52, including process improvements that should be considered going forward.

1. The two-tiered Part 52 change process is fundamentally sound and, with some changes in implementation, can provide the flexibility needed by licensees to procure SSCs and construct the facility.

2. The need for prior NRC approval of changes has disrupted work and increased licensing and engineering costs during construction, and created an ongoing risk of delay. Changes to the interpretation and implementation of the change process should be considered going forward.

3. For time-sensitive LAR/PARs, NRC should establish criteria (e.g., use of sensitivity analyses) that would enable the NRC to accept LARs without the need to develop completed calculations and other details that are unnecessary to begin the safety review.

4. Use of Tier 2* is unnecessary, does not add value, and should be eliminated for future design certifications. For Vogtle 3/4, the scope of Tier 2* should be significantly reduced and specified more precisely.[5]

5. Because of the need for LARs for any circumstance that requires departing from Tier 1 information, greater care and discipline is needed in defining the scope and level of detail of Tier 1 information based on improved guidance (e.g., First Principles). Minor clerical corrections to Tier 1 should not require a LAR.

6. The NRC staff interpretation that construction must conform to the licensing basis *at all times* makes construction under Part 52 inflexible and as a result more costly than it has to be – without a corresponding safety benefit. The added complexity and burden on licensees to obtain LAR/PAR approvals before construction of changes may proceed is not justified from a safety benefit perspective. Other interpretations are possible, such as ongoing reconciliation of the licensing basis during construction, that would be more workable and have no adverse impact on safety, quality or the objectives of Part 52.

[5] On September 20, 2018, the NRC approved SNC LAR 17-037 on changes to the Tier 2* departure evaluation process.

