10 CFR 50.46c Final Rule

Industry Guidance: Compliance Planning

Volume I, Revision 0

DRAFT

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NEI 16-XXX

Acknowledgements

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PWR Owners Group
U.S. Nuclear Fleet Utilities
Westinghouse

Executive Summary

This document represents initial industry guidance to help licensees navigate the 10CFR50.46c implementation planning.

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Revision Log

Number	Page	Description
R0	All	This is a new document

List of Acronyms

ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agency-wide Document Access and Management System
ANL	Argonne National Laboratory
AOR	Analysis of Record
BWROG	Boiling Water Reactor Owners Group
CFR	Code of Federal Regulations
ECR	Equivalent Cladding Reacted
EM	Evaluation Model
FRN	Federal Register Notice
GSI	Generic Safety Issue
IN	Information Notice
LAR	License Amendment Request
LBLOCA	Large Break LOCA
LTCC	Long Term Core Cooling
LTR	Licensing Topical Report
LOCA	Loss of Coolant Accident
LOE	Level of Effort
LWR	Light Water Reactor
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
QA	Quality Assurance
RAI	Request for Additional Information
RG	Regulatory Guide
RIS	Regulatory Issue Summary
PQD	Post Quench Ductility
PWROG	Pressurized Water Reactor Owners Group
RS	Review Standard
SBLOCA	Small Break LOCA
SE	Safety Evaluation
SOC	Statements of Consideration
SSC	Structures, Systems, and Components
TS	Technical Specifications
TSTF	Technical Specification Task Force
U.S.NRC	United States Nuclear Regulatory Commission

References

1. FRN Publication, (final rule & SOC).

2. NUREG/CR-6967, ANL-07/04, **Cladding Embrittlement During Postulated Loss-of-Coolant Accidents**, U.S. Nuclear Regulatory Commission, Office of Nuclear Regulatory Research, July 2008.

3. Regulatory Guide 1.222, draft Revision 0, **Measuring Breakaway Oxidation Behavior**, U. S. Nuclear Regulatory Commission, January 19, 2016. [ML16005A135]

4. Regulatory Guide 1.223, draft Revision 0, **Determining Post Quench Ductility**, U.S. Nuclear Regulatory Commission, January 19, 2016. [ML16005A134]

5. Regulatory Guide 1.224, Revision 0, **Establishing Analytical Limits for Zirconium-Alloy Cladding Material**, U.S. Nuclear Regulatory Commission, January 19, 2016. [ML16005A133]

6. Regulatory Guide 1.229, draft Revision 0, **Risk Informed Approach for Addressing the Effects of Debris on Post-Accident Long-Term Core Cooling**, U.S. Nuclear Regulatory Commission, TBD. [ML15335A179]

1 Introduction

1.1 Background

The U. S. NRC published new rule language pertaining to LOCA analyses, per Reference 1. The basic research supporting the new rule language was documented per Reference 2. The NRC has also published regulatory guidance per References 3, 4, 5, & 6.

1.2 Purpose

The purpose of this document is to provide industry guidance to power reactor Licensees relative to actions associated with preparation of implementation plans described in Reference 1.

1.3 Scope Overview

The initial revision of this document will focus on the rule requirement to develop and submit a plan demonstrating final compliance with Reference 1.

2 Compliance Planning

The NRC rulemaking published per Reference 1 contains requirements regarding development and submittal of compliance plans. §50.46c.(p)(2)(i) states:

…must submit an implementation plan and schedule for achieving compliance with the provisions of this regulation with the exception of the consideration of debris effects under paragraph (d)(2)(iii) of this section. The implementation plan must identify the evaluation model(s), fuel design(s) and cladding alloy(s), and analytical limits to be used in the ECCS performance demonstration, along with the relative level of effort needed to complete the performance demonstration. The schedule must identify, for each element of the ECCS performance demonstration required to be submitted to the NRC for review (e.g., evaluation model, hydrogen uptake model, cladding alloy), the earliest possible date for submission and the expected date of submission…

Because the §50.46c rule is a complex backfit, there will need to be a coordinated efforts on the part of Licensees, vendors, and regulators to achieve compliance goals within the available time frame.

Licensees must submit a plan for compliance within 6 months from the Reference 1 effective date. As part of the rule making process, and development of this guidance, NRC Staff has verbally indicated during a public meeting that the first submittal of a Licensee's plan for compliance does not automatically become a commitment. Rather, it is the first step of constructive dialog with all involved parties to optimize resource allocation for the entire fleet. Compliance plans can be revised as the situation develops. At a minimum, the new rule language calls for Licensees to revise their compliance plans at least annually after the initial plan has been submitted.

2.1 Planning Considerations

A variety of considerations are involved with the new rule. This section will provide a brief overview.

2.1.1 Proprietary Information

Development of a Licensees compliance plan could entail the use of proprietary material. Information may be proprietary to the Licensee and/or a Vendor. NRC has stated in public meetings they will accept submittal of Proprietary and Non-Proprietary compliance plans. Standard labeling such as **Proprietary – Commercial**, along with a signed affidavit would be required. **Part I** of the Communication Tool will NOT be considered proprietary.[1]

2.1.2 Timing

The Reference 1 rule identifies/implies three specific time line milestones:

- Initial Implementation Plan
- Compliance LAR submittal
- Full Compliance

[1] Refer to the latest available version of LIC-204, *Handling Requests to Withhold Proprietary Information from Public Disclosure*.

As noted above, the rule language requires an initial compliance plan 6 months from the Rule effective date; with subsequent annual revisions. For purposes of this guidance, it is simply assumed annual plan revisions would no longer be necessary once a Licensees compliance LAR has been docketed, or as requested by NRC staff.

The rule language provides a total time period of 84 months from the Reference 1 effective date for all Licensees to achieve compliance. The NRC staff has indicated they intend to reserve the time period of 60-84 months for LAR reviews, and completion of §50.92 activities. Consequently, it will be necessary for Licensees to develop plans, and docket a final compliance LAR no later than 60 months from the Reference 1 effective date. NRC Staff will be looking to ensure fleet compliance LAR submittals are spread across as wide a time frame as practical[1].

The early part of the compliance time frame will be focused on vendor development of LOCA methods/supplements supporting the new rule. However, Licensees should not look at this early time period as a little to no effort interval. Regulator, Vendor, and Licensee interaction will be important to long term success.

To help visualize the types of activities taking place in the early months of the compliance time frame, a Gantt Chart is provide per Appendix D[2]. The chart illustrates a myriad of activities undertaken by Vendors/Regulators to build the foundations for Licensee LAR construction.

2.1.3 Fuel Types

§50.46c(k) of the new rule identifies fuel may not be loaded into the core unless compliance has been achieved for the specific fuel design. An important consideration flowing from this new requirement is that a Licensee must determine fuel types they plan to defend in their compliance LAR. Fuel types not demonstrating compliance are effectively no longer viable for reuse in a future core design, absent an additional LAR. This type of decision will directly impact the work scope of a Licensees compliance LAR.

2.1.4 Analytical limits

Analytical limits in support of new rule requirements are discussed by a series of Regulatory Guidance, primarily but not exclusively Reference 5. LTCC does not have specified numerical criteria, or an applicable Regulatory Guide at this time. The Reference 1 SOC indicates previously acceptable methods would remain acceptable for the non-debris condition. Further industry guidance is being prepared in this area, but it is outside the scope of this specific guidance document. Plant or analysis changes affecting previous analyses would be considered as impacting compliance submittal scope.

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[1] It will not be acceptable for the entire fleet to docket compliance LAR's 59-½ months post Reference 1 effective date.

[2] Based on Preliminary assumptions from 2015 Public Meeting discussions with NRC, and supplemented with knowledge as it become available. Assumes FRN publication date, along with development and review period estimates, subject to reality checks

2.1.5 Evaluation Models

Fuel vendors will be submitting new methodologies or supplements to existing methodologies to address aspects of §50.46c. It is expected that supplements will address application to current AORs as well as new applications with a supplemented methodology. Relative to an existing AOR, the material would need to address how an AOR meets the new prescriptions and/or any additional evaluations necessary (e.g. post-processing). It is expected that a new supplement, once approved, would become an additional reference for Technical Specification Section 5.6.5.b References supporting the core operating limits report. Coordination with your Vendor and NRC Staff will be needed to verify your specific situation.

2.1.6 Addressing Debris

§50.46c(d)2(iii) requires a licensee to address debris. During rulemaking, numerous public meetings, and in the SOC, the expectation is that licensees will address the debris issue by referring to ongoing industry activities. The NRC staff has developed guidance for the new "Risk-Informed" approach to dealing with debris effects on fuel. As part the compliance LAR, there is no expectation Licensees will address debris issues via the risk-informed option. If you are in a situation where you will take advantage of the risk-informed option as part of your compliance LAR, make sure this is communicated / agreed upon with NRC staff.

When GSI-191, and related activities are completed, licensees will need to discuss with NRC Staff how closure intersects with §50.46c rule language requirements.

2.1.7 License Amendment Request

An important feature of the compliance plan is all backfit requirements to meet the new rule language can be confined solely to the compliance LAR. Other LARs docketed before the commission will not be required to demonstrate compliance with §50.46c during the implementation time period, up until a Licensee's site specific implementation has been achieved.

2.2 Communication Tool

In order to facilitate communication between the parties, a tool has been developed. The proposed format can be found in Appendix A.

2.2.1 Part I

Information needed to fill in **Part I** of the communications tool should be reasonably easy to develop. In general, the intention of the communication tool is to address a single unit license. However, if you have multiple licenses which are going to essentially be "clones" for the purposes of LOCA compliance, **Plant Name / Unit(s)** could represent multiple licenses. In this situation, there could be multiple **Units** and **Docket Numbers** provided.

The NRC Staff wants a single **Contact Point** to be identified. A Name, Position, telephone, and email contacts should be provided.

The LAR **Level of Effort** refers to a topic discussed in the Reference 1 SOC. There are three levels of effort identified by NRC Staff. The purpose of providing this information is to help NRC Staff with planning activities in an attempt to load balance resource demands. The three LOE are paraphrased by the following:

Level 1: No rework of break spectrum analyses. Only post processing of existing AOR results against the new requirements, using §50.46c specific Evaluation Model supplements. Technical Specification references supplementation.

Level 2: Limited confirmatory break analyses. No change of base Technical Specification reference Evaluation Methodology. Post processed results using the §50.46c specific Evaluation Model supplements. Technical Specification reference supplementation.

Level 3: Essentially involves new break spectrum analyses using new methods relative to existing Technical Specification references. Technical Specification reference supplementation.

When attempting to determine your plant specific LOE, there could be multiple factors influencing the decision. For initial planning, utilize the above descriptions as best as possible. *As a slightly complex example, your licensing basis may be divided between two methodologies for large vs. small break scenarios. In this case, you would assess the LOE for each methodology, but select the higher level of effort if they turn out to be different.* Keep in mind the LOE is about how NRC Staff perceives their effort; less about how a licensee perceives their own/vendor efforts.

Time Line estimates must also be provided as part of the compliance plan. Each Licensee must state an Earliest Possible LAR **Submittal** date, as well as a best estimate date for Expected **Submittal,** demonstrating compliance along with an expected **Issuance** (completion of §50.92) from the NRC. It will also be necessary to identify an expected **Site Implementation** date. The reason for this is the compliance LAR may be tied to completion of a specific cycle of operation, or possibly align with other plant licensing activity. For example, at the end of Cycle X, you may be discharging fuel which is not expected to be part of your compliance LAR, such that you don't want site implementation to take effect until the start of Cycle X+1 operation.

Time Line estimates will be used by NRC and NEI[1] to develop a master schedule, looking at the workloads for all parties involved. Your estimated submittal date will not be possible prior to all approvals being in place for methods and programs relied upon in your compliance LAR.[2]

Licensees will need to provide justification of dates along the following lines:

[1] Utilizing non-proprietary information from compliance plan submittals.

[2] Vendors have methodology topical reports, supplements, and breakaway oxidation programs which must be reviewed and approved by NRC staff. Default initial criteria (time-and-temperature) are provided per Reference 3 for initial compliance demonstration should testing programs not yet be approved at the desired submittal time.

- Provide justification for requested LAR submittal date
- Provide justification for implementation date
  - Identify precursors and critical path items
  - Identify unique circumstances or parallel activities (e.g. fuel change, plant modifications)
- Provide earliest possible date for LAR submission

An example of a textual description rationalizing the proposed schedule could be:

50.46c LAR will be aligned with Cycle 27 to allow 3rd batch of AREVA CE14HTP with M5 cladding. Also, awaiting NRC approval of EMF-2103 Rev. X and new LBLOCA analysis. Based upon schedule for new analysis, earliest possible date of submittal is February 2020.

The more thoroughly one describes the bases, it should in theory become easier to manage the fleet workload.

The plan submittal should also include a **Revision Log** to help minimize any potential confusion. The Licensee compliance plan is expected to have at least one revision, and possibly many more, due to the annual update requirement of the rule.

Finally, a **Cross Reference Index** is provided. The purpose of the index is to identify and describe additional documents which you may attach to your plan package. Cross Referenced documents may provide additional background information, bases for choices, and/or other information germane to the planning process. While the **Cross Reference Index** will NOT be considered proprietary, cross referenced documents themselves may be withheld from public release for legitimate proprietary reasons. Documents described in the **Cross Reference Index** should be described in generic terms, (e.g., Potential Licensing Topical Report List).

2.2.2 Part II

Information to fill in Part II is a bit more complicated. §50.46c.(k) has a new requirement which prohibits use of fuels which have not been specifically reviewed and approved in the context of the new rule. Consequently, the Licensee must determine which fuel types will be defended as part of the compliance LAR submittal. In the simplest case, a Licensee will only have one fuel type to consider. However, there are potentially much more complicated situations.

Effectively, if a fuel type is not part of the compliance LAR, it can be thought of as not available for future use (dry storage path only) without further licensing action beyond the initial compliance LAR.

For each fuel type to be defended, the Licensee will need to provide the basic information of the first table: Fuel Vendor, Product Line, and Cladding Alloy utilized. Then for each fuel type to be defended, Analytical Limits and Evaluation Methods tables would be provided.

The analytical limits table response is fairly standard for each fuel type. PQD Limits are anticipated to be those identified in Regulatory Guide 1.224. If you intend to conduct testing

and submit analytical limits for lower temperature testing conditions, NRC needs to know up front in order to properly assign resources[1].

For the breakaway oxidation analytical limit, each vendor will generate a topical report for review and approval by the NRC. Reference to this report will become part of the LOCA analysis of record bases. Fuel manufactured after the vendor break-away oxidation program is approved and implemented will effectively have a virtual certification. However, licensees need to pay close attention to fuel manufactured and received between Reference 1 publication, and the time when the NRC has approved the vendor's breakaway oxidation program.

During development of the rule package, the Reference 5 language was modified to provide for fuel manufactured prior to establishment and approval of breakaway oxidation programs. The modification allows licensees to use the analytical limit established for the current tested version of the cladding as the analytical limit for cladding of the same alloy type, which was not manufactured with the approved testing program in place. Additionally the text provides a default limit of 3,500 seconds for cladding alloys no longer commercial available for testing under the new programs.

The evaluation methods table(s) are potentially the most complicated. New ECR limits are a function of Hydrogen concentration in the cladding material. Default models are available via Regulatory Guidance, but Vendors may be preparing their own proprietary Hydrogen pickup models. Topical reports containing Hydrogen pickup models for LOCA application, could be required by NRC to be added to a licensee's Technical Specification references regarding LOCA based limits.

Some Vendors may not pursue Hydrogen pickup models in the near term. Consequently, acceptable relationships for Hydrogen pickup are available in Regulatory Guidance. However, using the Regulatory Guidance values means future licensing action if the licensee wants/needs to adopt proprietary Vendor models to meet limits in the future.

A similar issue could exist regarding Breakaway Oxidation time. Regulatory Guidance allowed values are available. However, like Hydrogen pickup, future licensing action may be needed if it should become necessary to adopt proprietary Vendor test results to meet requirements.

Large and Small Break LOCA analyses has not always been addressed by a single unified licensing topical report. For Licensees who will utilize unique Large and Small Break Methods, simply identify your appropriate Reference. For those who will utilize a Full Spectrum methodology, one could simply repeat the response for both the Large and Small break sections of the Evaluation Methods Table. Licensees need to verify Vendor §50.46c methodology supplements are acceptable for application to the base evaluation method utilized for your

[1] The need for lower temperature based limits might only come up for plants with very tight ECR margins at higher Hydrogen concentrations.

analysis of record. A description of the intended performance demonstration must be provided by addressing the following information:

- Clearly define analytical models and methods, planned updates (supplements) to these methods, and the scope of reanalysis.
- Identify any partitioning of the compliance demonstration
- Identify any proprietary analytical limits or methods
- Describe treatment of mixed core fuel types and analytical methods
- Describe any supporting LARs (e.g. earlier transition to new methods)

A short example for a PWR could be as follows:

SBLOCA

No new accident simulations will be performed. Existing EM and break spectrum sufficient to identify most limiting breakaway oxidation condition. Vendor approaches described in the methodology supplement will be applied to post-process the existing analysis.

LBLOCA

Complete break spectrum will be performed using new EM.

2.3 Communication Tool Examples

Based on discussion in the previous section, some examples are provided to help Licensees to understand they type of information to provide on the communication planning tool.

2.3.1 Part I

Part I of the communication tool is independent of compliance LOE. An example is provided in Appendix B.

2.3.2 Part II

The first example of a Part II plan assumes a LOE = 1. In this specific example, the Licensee will not deal with any change of fuel vendor or product line. The Licensee will utilize information issued in existing Regulatory Guidance. Compliance will be shown via post processing existing analyses of record temperature histories. The Licensee will depend on their fuel Vendor Break-away oxidation program being approved prior to submittal of the compliance LAR.

The second example of a Part II plan corresponds to a possible LOE = 2. In this example, there are 2 fuel products, with a cladding change, but within one vendor and methodology. It would be expected that only a limited number of break spectrum cases would be needed to confirm the limiting analysis of record conditions. Then post processing of temperature histories.

The third example of a Part II plan corresponds to a possible LOE = 3. In this example, there are multiple legacy fuel types, along with a vendor transition. It is assumed the legacy fuel would be analyzed per existing analysis of record evaluation models. New fuel products would be assessed per the new vendors evaluation models.

2.3.3 Cover Letter

An example cover letter for the initial plan submittal is provided in Appendix C. The purpose of the example is provide all licensees with a common text to clarify the purpose of the initial submittal *(the example is written from the perspective of a Part 50 applicant with an Operating License)*.

2.4 Implementation Related Topics

There are a variety of topics related to compliance implementation which require further clarification in the future. One or more of these topics may be featured in future Volumes of NEI Industry Guidance related to 10CFR50.46c.

2.4.1 Status Monitoring

Finalize process for NEI to track industry schedules and discuss status with NRC Staff. Frequency to be determined.

2.4.2 Pre-Application Meetings

Prior to submitting a LAR, it is customary for a licensee to have a meeting with the NRC Staff to discuss the nature of the request, and potential time lines and resources. In the case of the new rule, all Licensees will be involved in LAR submittals of one form or another. Further discussion with the NRC Staff will be needed to agree upon the best process going forward: Group vs. Individual discussions; or both? (schedule, and content)

2.4.3 Partitioning of LAR

Will NRC allow/expect compliance LAR to come in pieces as available, or will only the traditional full package be allowed? Any change to existing LIC-101 or LIC-109 process?

2.4.4 LAR Work Scope

What's in the Bag. Need a cross reference to a Review Standard, or an industry alternative document for potential endorsement. Some items will be universal, others may be method dependent. Potential TSTF for TS 4.2 regarding fuel. Review Standard? SRP updates?

2.4.5 Technical Specification COLR References

What belongs in 5.6.5.b? Possibly vendor specific response.

2.4.6 TSTF-363 Retraction

Uniform application of NRC position; ramifications.

2.4.7 Long Term Core Cooling Guidance

NRC has stated the LTCC is part of the §50.46c(b) definition of an EM. Historically, LTCC methods have not always been explicitly approved by NRC, but treated as a LOCA component found to be acceptable.

The PWROG, in conjunction with the BWROG, is developing a guidance document for Long Term Core Cooling. The goal is to build a NEI guidance document which can be endorsed via a Regulatory Guide.

3 Summary

This document represents initial industry guidance to help licensees navigate the 10CFR50.46c implementation planning.

Appendix A: *Compliance Planning Communication Tool*

Tables identified in this Appendix are available as Excel spreadsheets

Part I

Licensee Data	
Plant Name / Unit(s)	
Docket #	
Contact Point	
LAR Level of Effort	
Time Line Estimate	
Earliest Submittal	
Expected Submittal	
Issuance	
Site Implementation	

Revision Log

Revision	Description	Date
0	Initial Plan	TBD

Cross Reference Index

Description	Attachment

Part II

	Fuel Types		
	1	2	3
Vendor			
Product Line			
Cladding Alloy			

For each planned fuel type, add the next two tables of information:

Fuel Type 1	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility		
Break-Away Oxidation		

Fuel Type 1	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake		
Small Break LOCA		
Large Break LOCA		

Appendix B: *Communication Tool Examples*

Part I *(example)*

Licensee Data	
Plant Name / Unit(s)	Plant XXXXXX, Unit 1
Docket #	#YYYYYYY
Contact Point	Jane Smith, Corporate Licensing Project Manager, (123) 456-7890, jsmith@companyName.com
LAR Level of Effort	LOE = 1
Time Line Estimate	
Earliest Submittal	Month, Day, Year (FRN + 3 yrs)
Expected Submittal	Month, Day, Year (FRN + 3 yrs, 6months)
Issuance	Month, Day, Year (Submittal + 12 months)
Site Implementation	Month, Day, Year (Support Startup of Cycle X)

Revision Log		
Revision	Description	Date
0	Initial compliance planning submittal	TBD

Cross Reference Index	
Description	Attachment
General Background	Attachment 1, Revision 0
Long Term Core Cooling	Attachment 2, Revision 0
Base Methodology	Attachment 3, Revision 0

Part II *(example: LOE = 1)*

	Fuel Types		
	1	2	3
Vendor	A		
Product Line	X		
Cladding Alloy	Zr-2		

Fuel Type 1	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 1	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Regulatory Guide X	Issued
Small Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications
Large Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications

Part II *(example: LOE = 2)*

	Fuel Types		
	1	2	3
Vendor	A	A	
Product Line	X	Y	
Cladding Alloy	Zirlo	Optimized Zirlo	

Fuel Type 1	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 1	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Vendor A Topical Report Z	TBD
Small Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications
Large Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications

Part II *(example: LOE = 2, continued)*

Fuel Type 2	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 2	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Vendor A Topical Report Z	TBD
Small Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications
Large Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications

Part II *(example: LOE = 3)*

	Fuel Types		
	1	2	3
Vendor	A	A	B
Product Line	X	Y	Z
Cladding Alloy	Zirlo	Optimized Zirlo	M5

Fuel Type 1	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 1	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Regulatory Guide X	Issued
Small Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications
Large Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications

Part II *(example: LOE = 3, continued)*

Fuel Type 2	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 2	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Regulatory Guide X	Issued
Small Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications
Large Break LOCA	Vendor A Topical Report X	Approved on Unit Specific Technical Specifications

Fuel Type 3	Analytical Limits	
Analytical Limit	Reference	Status
Post-Quench Ductility	Regulatory Guide X	Issued
Break-Away Oxidation	Vendor A QA Program, Topical Report	Under Development

Fuel Type 3	Evaluation Methods	
Methods	Reference	Status
Hydrogen-Uptake	Vendor B Topical Report	TBD
Small Break LOCA	Vendor B Topical Report Y	Approved Topical Report, Not On Unit T.S.
Large Break LOCA	Vendor B Topical Report Y	Approved Topical Report, Not On Unit T.S.

Appendix C: *Cover Letter Example*

[DATE]

10CFR50.4

U.S. Nuclear Regulatory Commission
Washington, DC 20555-001
ATTN: Document Control Desk

Plant Name, Unit X
Facility Operating License Nos. NPF-XX
NRC Docket Nos. 50-XXX

Subject: [Utility/Plant] –Submittal of Implementation Plan and Schedule for Achieving Compliance with 10CFR50.46c

The purpose of this letter is to provide [Utility/Plant] implementation plan and schedule for achieving compliance with the provisions of 10CFR50.46c.

On [Date TBD], the Nuclear Regulatory Commission (NRC) approved 10CFR50.46c. 10CFR50.46c, § (p)(2)(i) requires each holder of an operating license issued under this part as of [**INSERT DATE THAT IS 30 DAYS AFTER THE DATE OF PUBLICATION IN THE FEDERAL REGISTER**], and each holder of an operating license issued under this part which is based upon a construction permit in effect as of [**INSERT DATE THAT IS 30 DAYS AFTER THE DATE OF PUBLICATION IN THE FEDERAL REGISTER**] (including deferred and reinstated construction permits), must submit an implementation plan and schedule for achieving compliance with the provisions of this regulation with the exception of the consideration of debris effects under paragraph (d)(2)(iii) of this section. The implementation plan must identify the evaluation model(s), fuel design(s) and cladding alloy(s), and analytical limits to be used in the ECCS performance demonstration, along with the relative level of effort needed to complete the performance demonstration. The schedule must identify, for each element of the ECCS performance demonstration required to be submitted to the NRC for review (e.g., evaluation model, hydrogen uptake model, cladding alloy), the earliest possible date for submission and the expected date of submission. The implementation plan and schedule must be submitted within 6 months of [**INSERT DATE THAT IS 30 DAYS AFTER THE DATE OF PUBLICATION IN THE FEDERAL REGISTER**], and updated by the licensee every 12 months until the license amendment request has been submitted and docketed by the NRC for review.

[**Note: If proprietary information is to be included in the enclosure, please note the 10CFR2.390 process here and include any necessary legal documentation.**]

To facilitate the uniform transmission of this information to NRC, the industry developed NEI-16-XXX, "**10CFR50.46c Final Rule – Industry Guidance: Compliance Planning**," Volume I, Revision 0, TBD 2016. The NRC subsequently endorsed this guidance for submittal of the

required 10CFR50.46c implementation plan [NRC to NEI, dated XXXX, xx, 2016, "TITLE" (ML15XXX)].

Accordingly, please find the enclosed required implementation plan and associated schedule. Note that the attached information is subject to change and will be updated, at a minimum of every 12 months. The attached information fulfills the obligation of 10CFR50.46c(p)(2)(i). There are no regulatory commitments in this letter.

If there are any questions, or if additional information is required, please contact [CONTACT NAME] at [CONTACT INFORMATION].

Sincerely,
[Utility Executive]

Enclosure:

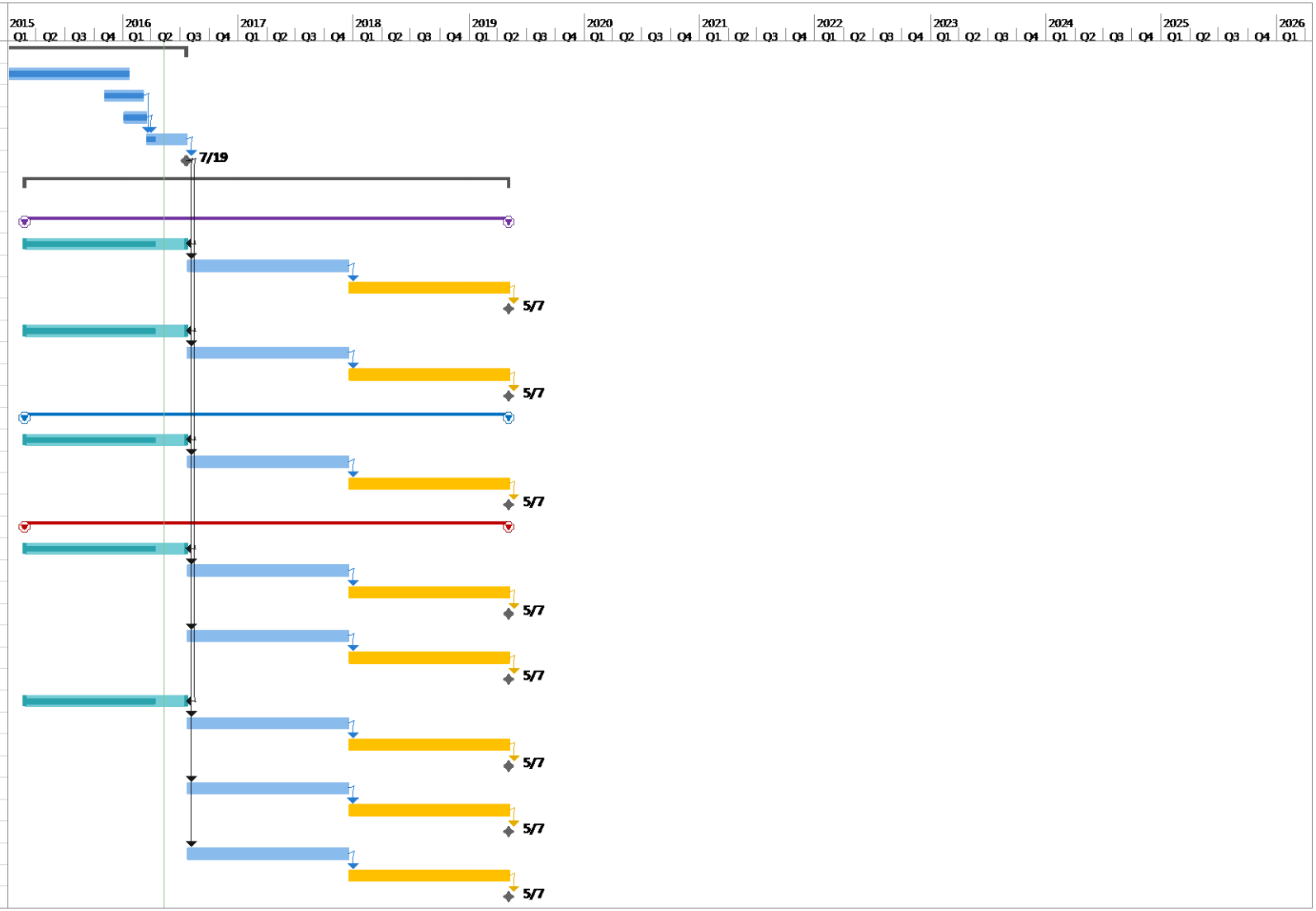
[Utility/Plant name] Implementation Plan and Proposed Schedule pursuant to 10CFR50.46c

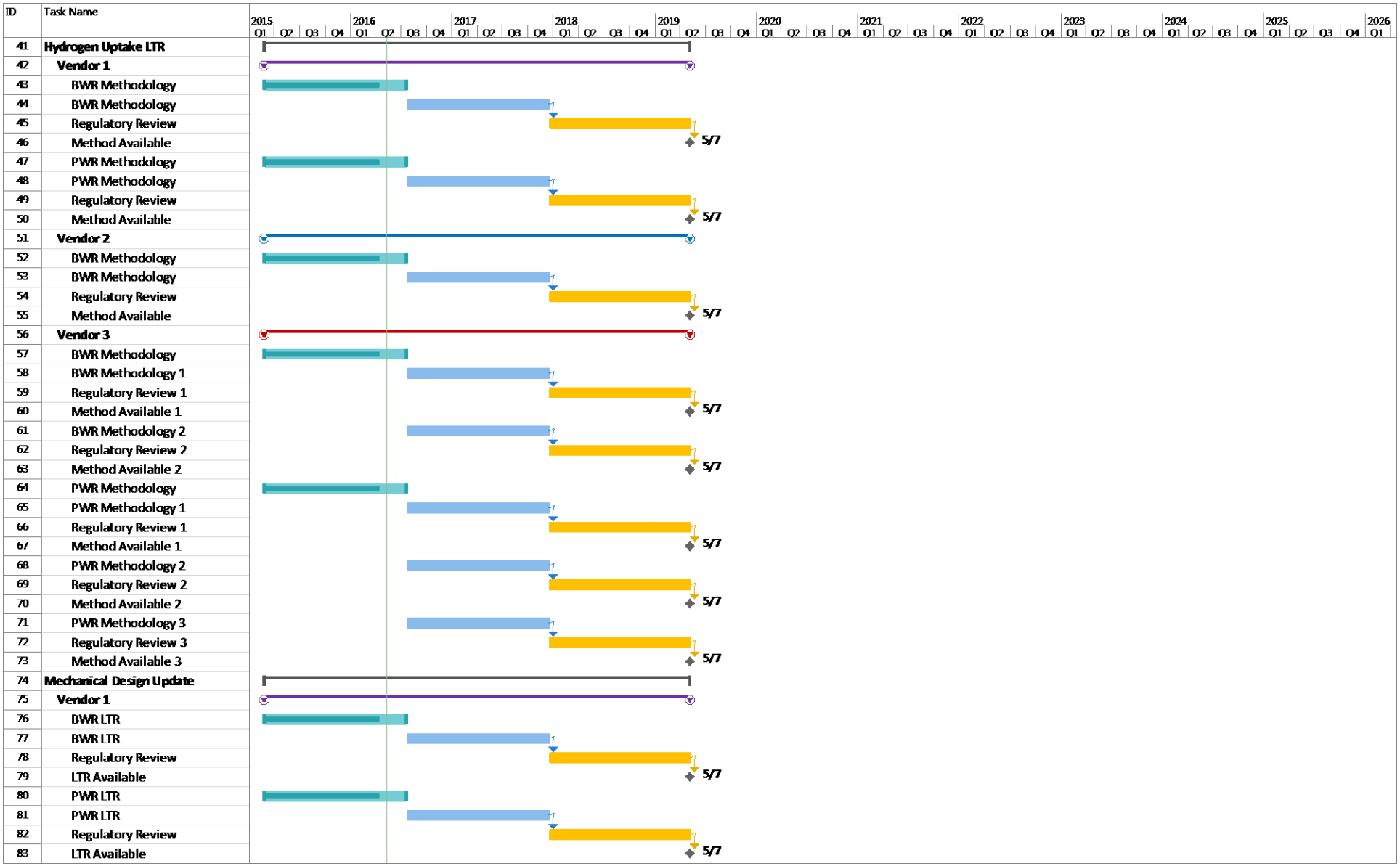
cc (Enclosure):

NRC Senior Resident Inspector
NRC Regional Administrator – Region [X]
NRC PM

Appendix D: *High Level Vendor/Licensee/Regulator Activities*

ID	Task Name
2	**RuleMaking Activities**
3	Public Meetings
4	ACRS
5	EDO Package
6	Commissioners
7	FRN Publication
8	**LOCA Methodology / 50.46c Supplements**
9	**Vendor 1**
10	BWR Methodology
11	BWR Methodology
12	Regulatory Review
13	Method Available
14	PWR Methodology
15	PWR Methodology
16	Regulatory Review
17	Method Available
18	**Vendor 2**
19	BWR Methodology
20	BWR Methodology
21	Regulatory Review
22	Method Available
23	**Vendor 3**
24	BWR Methodology
25	BWR Methodology 1
26	Regulatory Review 1
27	Method Available 1
28	BWR Methodology 2
29	Regulatory Review 2
30	Method Available 2
31	PWR Methodology
32	PWR Methodology 1
33	Regulatory Review 1
34	Method Available 1
35	PWR Methodology 2
36	Regulatory Review 2
37	Method Available 2
38	PWR Methodology 3
39	Regulatory Review 3
40	Method Available 3

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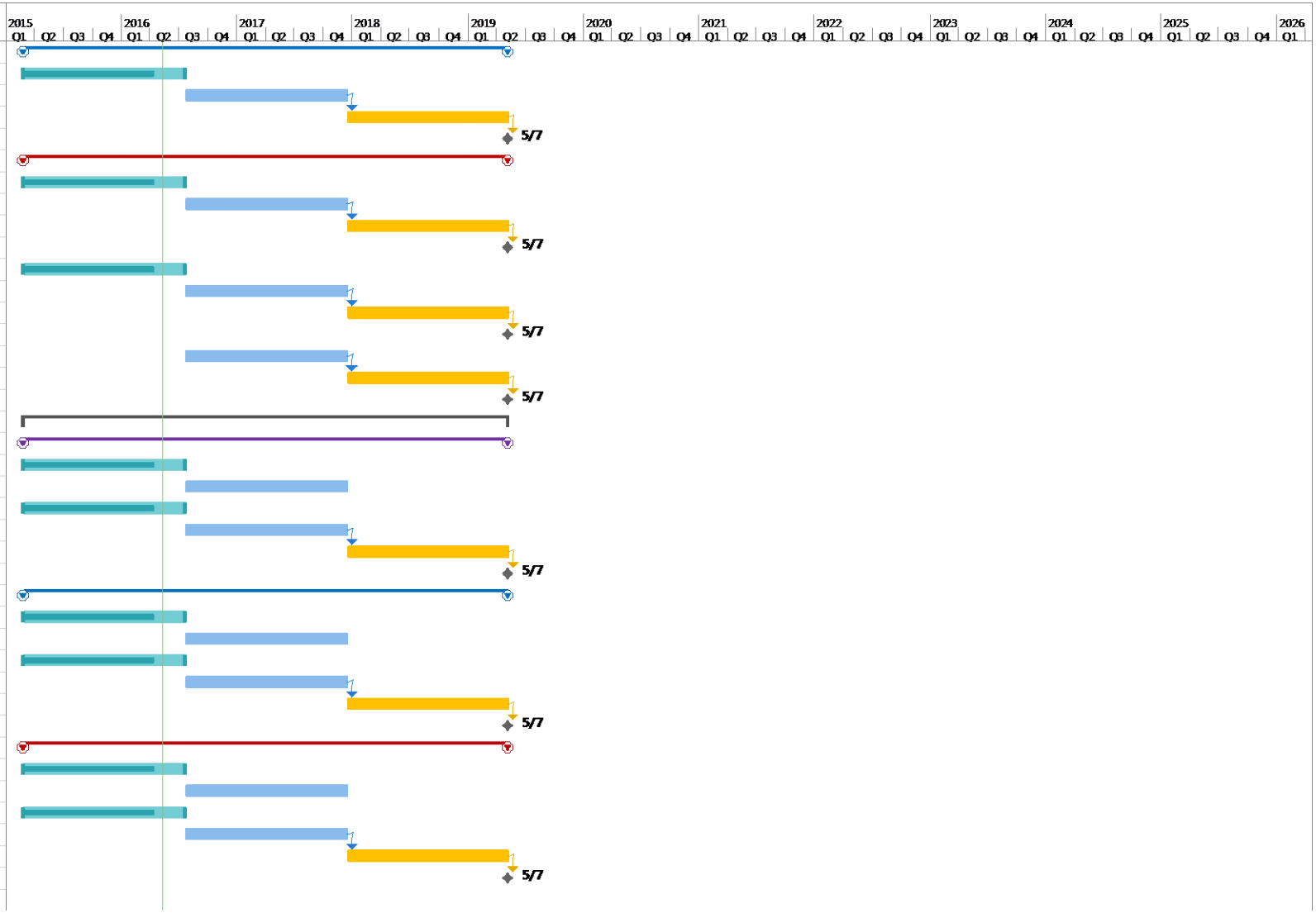
2015 Q1 Q2 Q3 Q4
2016 Q1 Q2 Q3 Q4
2017 Q1 Q2 Q3 Q4
2018 Q1 Q2 Q3 Q4
2019 Q1 Q2 Q3 Q4
2020 Q1 Q2 Q3 Q4
2021 Q1 Q2 Q3 Q4
2022 Q1 Q2 Q3 Q4
2023 Q1 Q2 Q3 Q4
2024 Q1 Q2 Q3 Q4
2025 Q1 Q2 Q3 Q4
2026 Q1
41 Hydrogen Uptake LTR
42 Vendor 1
43 BWR Methodology
44 BWR Methodology
45 Regulatory Review
46 Method Available
47 PWR Methodology
48 PWR Methodology
49 Regulatory Review
50 Method Available
51 Vendor 2
52 BWR Methodology
53 BWR Methodology
54 Regulatory Review
55 Method Available
56 Vendor 3
57 BWR Methodology
58 BWR Methodology 1
59 Regulatory Review 1
60 Method Available 1
61 BWR Methodology 2
62 Regulatory Review 2
63 Method Available 2
64 PWR Methodology
65 PWR Methodology 1
66 Regulatory Review 1
67 Method Available 1
68 PWR Methodology 2
69 Regulatory Review 2
70 Method Available 2
71 PWR Methodology 3
72 Regulatory Review 3
73 Method Available 3
74 Mechanical Design Update
75 Vendor 1
76 BWR LTR
77 BWR LTR
78 Regulatory Review
79 LTR Available
80 PWR LTR
81 PWR LTR
82 Regulatory Review
83 LTR Available
5/7
5/7
5/7
5/7
5/7
5/7
5/7
5/7

ID	Task Name
84	**Vendor 2**
85	BWR LTR
86	BWR LTR
87	Regulatory Review
88	LTR Available
89	**Vendor 3**
90	BWR LTR
91	BWR LTR
92	Regulatory Review
93	LTR Available
94	PWR LTR
95	PWR LTR Non-B&W
96	Regulatory Review
97	LTR Available Non-B&W
98	PWR LTR B&W
99	Regulatory Review
100	LTRAvailable B&W
101	**Breakaway Oxidation Program**
102	**Vendor 1**
103	Material Testing
104	Material Testing
105	Procedure Development
106	Procedure Development
107	Regulatory Review
108	Program Available
109	**Vendor 2**
110	Material Testing
111	Material Testing
112	Procedure Development
113	Procedure Development
114	Regulatory Review
115	Program Available
116	**Vendor 3**
117	Material Testing
118	Material Testing
119	Procedure Development
120	Procedure Development
121	Regulatory Review
122	Program Available
123	



ID	Task Name
124	**Licensee Activities**
125	**Compliance Preparations**
126	Vendor Planning & Work Scope
127	Regulatory Compliance Plannin
128	Minimum Annual Update
129	Minimum Annual Update
130	Vendor / Licensee Negotiations
131	Input / Model Development
132	**Compliance LAR**
133	Support Contract Inplace
134	Development
135	Regulatory Review
136	50.92 Approval
137	Site Implementation