



RULEMAKING ISSUE (Affirmation)

December 9, 2020

SECY-20-0112

FOR: The Commissioners

FROM: Margaret M. Doane
Executive Director for Operations

SUBJECT: DIRECT FINAL RULE: ADVANCED BOILING WATER REACTOR
DESIGN CERTIFICATION RENEWAL (RIN 3150-AK04;
NRC-2017-0090)

PURPOSE:

The purpose of this paper is to obtain Commission approval to publish in the *Federal Register* the enclosed direct final rule (Enclosure 1) and companion proposed rule (Enclosure 2) to amend Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," to renew the certification for the U.S. Advanced Boiling Water Reactor (ABWR) standard design. This paper does not address any new commitments or resource implications.

SUMMARY:

The direct final rule will renew the design certification of the U.S. ABWR standard design by completely replacing Appendix A, "Design Certification Rule for the U.S. Advanced Boiling Water Reactor," to 10 CFR Part 52. In December 2010, General Electric-Hitachi Nuclear Energy Americas, LLC (GEH or the applicant), submitted its application for renewal of the design certification of the U.S. ABWR standard design (Agencywide Documents Access and Management System (ADAMS) Accession No. [ML110040176](#)), as codified in Appendix A to 10 CFR Part 52. The GEH renewal application includes the U.S. ABWR Design Control Document (DCD), Revision 7, as corrected in March 2020 (ADAMS Accession

CONTACTS: Dennis Andrukat, NMSS/REFS
301-415-3561

James Shea, NRR/DNRL
301-415-1388

No. [ML20093K254](#)), its corresponding environmental report, as amended August 2016 (ADAMS Accession No. [ML16235A415](#)), and two GEH technical reports, NEDO-33875 and NEDO-33878, (ADAMS Accession Nos. [ML17059C523](#) and [ML18092A306](#), respectfully). GEH requested that the U.S. Nuclear Regulatory Commission (NRC) certify the U.S. ABWR standard design for a renewed period of 15 years. The staff completed its technical review of the application in March 2020 and made public a final safety evaluation report in May 2020 (ADAMS Accession No. [ML20129J892](#)), to document its review of the U.S. ABWR design certification renewal. In October 2020, the NRC published this final safety evaluation report as Supplement 2 to NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design" (ADAMS Accession No. [ML20301A886](#)).

BACKGROUND:

The NRC issued the agency's first design certification rule, for the U.S. ABWR, in the *Federal Register* (62 FR 25800), effective June 11, 1997. On December 7, 2010, GEH submitted its design certification renewal application for the U.S. ABWR standard design pursuant to the requirements of Subpart B, "Standard Design Certifications," of 10 CFR Part 52. The NRC formally accepted the application for docketing on February 18, 2011 (76 FR 9612). The GEH renewal application includes the U.S. ABWR DCD, Revision 7, dated December 20, 2019, as corrected in March 2020, and its corresponding environmental report. The direct final rule will renew the certification for the U.S. ABWR standard design for a period of 15 years.

The U.S. ABWR design is a single-cycle, forced-circulation, boiling-water reactor, with a rated power of 3,926 megawatts thermal, originally designed by General Electric (GE). The original design incorporated updated safety enhancements from previous GE boiling-water reactors, including a reinforced concrete reactor containment vessel with built-in liner, reactor coolant recirculation system driven by internal pumps, advanced electric/hydraulic control rod drives using a screw mechanism, and integrated digital control system and instrumentation.

There is no need to maintain the original U.S. ABWR design certification because South Texas Project Nuclear Operating Company (STPNOC), the only entity to hold a combined license (COL) referencing the U.S. ABWR design certification rule, has relinquished its COLs for South Texas Project, Units 3 and 4 (COLs NPF-97 and NPF-98) (ADAMS Accession No. [ML18184A338](#); June 22, 2018). The NRC approved the termination of these COLs on July 12, 2018 (ADAMS Accession No. [ML18179A217](#)). Additionally, the STPNOC's DCD option, which addressed the aircraft impact assessment requirements, has expired, and GEH is using its own approach for aircraft impact assessment. Because there is no need and has been no request to maintain the reference to the original U.S. ABWR DCD or STPNOC DCD, the direct final rule would replace the current Appendix A to 10 CFR Part 52 in its entirety. As such, the direct final rule does not include discussion of design differences between the original U.S. ABWR DCD and the STPNOC DCD.

DISCUSSION:

Rulemaking Procedure

The renewal of the U.S. ABWR design certification includes design changes made in light of industry operating experience as outlined in various NRC generic communications, as well as Fukushima-related design enhancements that enable a potential COL applicant to comply with the requirements of 10 CFR 50.155, "Mitigation of Beyond-Design-Basis Events." The renewed design also includes design changes that are necessary to meet the requirements of

10 CFR 50.150, "Aircraft Impact Assessment," in accordance with 10 CFR 52.59(a). Further, the design includes updates to clarify design information and correct known errors or typos. In addition, the U.S. ABWR design has been constructed and operated overseas. This has enabled additional updates and minor design changes to be made to the ABWR standard design that are based on construction and actual plant operating experience. In total, the U.S. ABWR design certification renewal includes 39 design issues that the staff evaluated and documented in 40 separate supplemental chapters or sections in the final safety evaluation report. The renewed U.S. ABWR design certification would not include any significant design changes to the physical plant structures, systems, or components, so in accordance with 10 CFR 52.59(c), the U.S. ABWR design certification renewal amendments do not entail an essentially new standard design.

The staff approved the U.S. ABWR renewed design as provided in the U.S. ABWR DCD, Revision 7, as corrected. The NRC staff's review is documented in Supplement 2 to staff's original safety evaluation report (NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design" (ADAMS Accession No. [ML20301A886](#))).

The staff analyzed options for conducting rulemaking for this first-of-its-kind design renewal. The staff compared timelines and resources required for standard notice and comment rulemaking with the efficiencies offered by the direct final rule process. The direct final rule process can be used for amendments that an agency predicts will be noncontroversial and will not generate significant adverse comments from the public. The staff believes this design renewal fits these parameters, and if approved by the Commission, the staff will publish a direct final rule in the *Federal Register*, to become effective 90 days from publication. In addition, the environmental assessment for the renewal will be published for public comment as part of the companion proposed rule and is consistent with 10 CFR 51.31(b). Like the rule itself, if the NRC receives comments on the environmental assessment that amount to a significant adverse comment on the rule, the agency would withdraw the direct final rule. If the NRC desires to proceed with the rulemaking, it would publish a subsequent final rule that addresses the comments received on the companion proposed rule (including the environmental assessment) that was published concurrently with the direct final rule. The NRC would also issue a revised environmental assessment.

U.S. Advanced Boiling Water Reactor Original Certification

The U.S. ABWR was the first standard design to be certified by the NRC under 10 CFR Part 52 (System 80+ was certified at the same time). The standard design certification was valid for 15 years from the date of issuance, as described in 10 CFR 52.55, "Duration of Certification." The original U.S. ABWR was designed by GE and incorporates features of the earlier GE Boiling Water Reactor designs in Europe, Japan, and the United States. The original design incorporated safety improvements as described previously. On May 12, 1997, the NRC issued the U.S. ABWR design certification rule in the *Federal Register* (62 FR 25800).

At the time that the ABWR standard design was certified, the NRC's regulations required issuance of a final design approval as a prerequisite to design certification. Consistent with this requirement, a final design approval for the U.S. ABWR design was issued on July 13, 1994, and published in the *Federal Register* on July 20, 1994 (59 FR 37058). On December 1, 1994, the NRC published a notice (59 FR 61647) that it had extended the expiration date of the final design approval to July 13, 2009. In 2007, Appendix O was replaced with Subpart E, "Standard Design Approvals," which described the process of issuing a standard design approval,

replacing the final design approval (72 FR 49351). As discussed in the statements of consideration for the 2007 rulemaking, the NRC did not specifically provide a renewal process for either the final design approval or standard design approval. Also, the NRC changed its regulation so that a standard design approval is not a prerequisite for a design certification. Therefore, the issued final design approval has expired; a renewal was neither requested nor available, nor is a standard design approval being sought concurrently with the U.S. ABWR design certification renewal.

Design Certification Renewal Review Criteria

The regulations that specify requirements for design certification renewals are under Subpart B of 10 CFR Part 52. In 10 CFR 52.57(a), the NRC states, in part, that an application for renewal must contain all information necessary to bring up to date the information and data contained in the previous application. The staff considers updates pursuant to § 52.57(a) to include clarifications consistent with the original understanding of the design information, and changes to correct known errors, typos, or defects as defined in 10 CFR part 21, "Reporting of defects and noncompliance." In 10 CFR 52.59(a), the agency states that the Commission shall issue a rule granting the renewal if the design, either as originally certified or as modified during the rulemaking on the renewal, complies with the Atomic Energy Act of 1954, as amended, and the Commission's regulations applicable and in effect at the time the certification was issued, provided, however, that the first time the Commission issues a rule granting the renewal for a standard design certification in effect on July 13, 2009, the Commission shall, in addition, find that the renewed design complies with the applicable requirements of 10 CFR 50.150. The staff uses the term "modification" to refer to changes made pursuant to the updating requirement in 10 CFR 52.57(a) or to meet the standards in 10 CFR 52.59(a). The staff evaluated modifications against the standards in 10 CFR 52.59(a).

Applicant-proposed design changes that are not modifications are called "amendments." In accordance with 10 CFR 52.59(c), amendments must comply with the Atomic Energy Act and the Commission's regulations applicable and in effect at the time of renewal. In addition, while 10 CFR 52.63(a) imposes more restrictive limits on the types of changes that may be made while a design certification rule is in effect, 10 CFR 52.59(c) allows the U.S. ABWR design certification renewal applicant greater flexibility in seeking changes to the U.S. ABWR design certification. Thus, an U.S. ABWR design certification renewal application that includes amendments to the certified U.S. ABWR design is not required to address the criteria in 10 CFR 52.63, "Finality of Standard Design Certifications." However, if the amendment request entails such an extensive change to the design certification that an essentially new standard design is being proposed, 10 CFR 52.59(c) provides that an application for a design certification must be filed.

In addition, 10 CFR 52.59(b) states that the Commission may impose other requirements if it determines any of the following:

1. the requirements are necessary for adequate protection to public health and safety or common defense and security;
2. the requirements are necessary for compliance with the NRC's regulations and orders applicable and in effect at the time the certification was issued; or
3. there is a substantial increase in overall protection of the public health and safety or the common defense and security to be derived from the new requirements, and the direct and

indirect costs of implementing those requirements are justified in view of this increased protection.

As discussed below, the staff determined that it did not need to impose other requirements under 10 CFR 52.59(b).

The design for the U.S. ABWR design certification renewal is based on the regulations in effect at the time of original certification, with the exception of changes to meet 10 CFR 50.150 and those design amendments proposed by the applicant in accordance with 10 CFR 52.59(c). These changes are based on regulations in effect at the time of the design certification renewal. Meanwhile, those changes identified as modifications are based on regulations in effect at the time of original certification, except for modifications to meet 10 CFR 50.150. While some of the regulations in effect at initial certification were specific to design certifications under 10 CFR Part 52 (e.g., 10 CFR 52.47(a)(1)(iii)–(ix) (1997)), most of the applicable regulations were under 10 CFR 52.47(a)(1)(i) (1997), which required that the design certification application contain the following:

[t]he technical information which is required of applicants for construction permits and operating licenses by 10 CFR Part 20, “Standards for Protection Against Radiation,” and Part 50, “Domestic Licensing of Production and Utilization Facilities,” and its appendices, and Parts 73, “Physical Protection of Plants and Materials,” and 100, “Reactor Site Criteria,” and which is technically relevant to the design and not site-specific.

Similarly, 10 CFR 52.47(a)(1)(ii) (1997) required the design certification application to demonstrate “compliance with any technically relevant portions of the Three Mile Island requirements set forth in 10 CFR 50.34(f).” The requirements referenced by 10 CFR 52.47(a)(1)(i)–(ii) that are relevant to the U.S. ABWR are discussed in the final safety evaluation report for the original certification and, as applicable, in the U.S. ABWR final safety evaluation report supplements.

Overview of Renewal Issues

In the final rule for the original certification (62 FR 25800), the Commission stated that the NRC “does not plan or expect to be able to conduct a de novo review of the entire design if a certification renewal application is filed under § 52.59.” Instead, the Commission stated that it expected that the focus of the renewal review would be on changes to the design that are proposed by the applicant and insights from relevant operating experience with the certified design or other designs, or other material new information arising after the NRC staff’s review of the design certification. The staff performed its review of the GEH renewal application consistent with these Commission expectations.

The U.S. ABWR design certification renewal included 39 total DCD design changes, including 20 amendments, that the staff evaluated in Supplement 2 to NUREG-1503. Except as modified by this supplement to the final safety evaluation report, the findings made in NUREG-1503 and its Supplement 1 remain in full effect. The renewed U.S. ABWR design certification significant changes include the following: (1) modifications related to the aircraft impact assessment, (2) enhanced design of the emergency core cooling system suction strainer, (3) correction to the size of the containment overpressure protection system, and (4) Fukushima lessons-learned-related safety enhancements, including an additional alternating current (ac) independent water addition system with external connections for portable water

addition; non-safety electrical connections for portable ac power; and safety-related, wide-range spent fuel pool instrumentation.

The staff identified policy, regulatory, and operating experience issues during the review process for the U.S. ABWR design certification renewal application. In a letter dated July 20, 2012 (ADAMS Accession No. [ML12125A385](#)), the NRC listed 28 changes that it considered to be regulatory improvements or changes that could meet the criteria in 10 CFR 52.59(b). These suggested changes for GEH consideration included (1) suggested design changes based on industry operating experience since the original certified design approval, (2) suggested design updates based on updated NRC policy and regulatory guidance, and (3) clarifications suggested by the staff and corrections of typos in the original certified design DCD. In Items 26, 27, and 28 of its July 20, 2012, letter, the NRC asked the applicant to address U.S. ABWR DCD design changes related to aspects of the NRC Fukushima Near-Term Task Force Recommendations (ADAMS Accession No. [ML111861807](#)) 4.2 (Mitigating Strategies), 7.1 (Safety-Related Spent Fuel Pool Instrumentation), and 9.3 (Emergency Preparedness Upgrades). Subsequently, during the mitigation of beyond-design-basis events rulemaking that created 10 CFR 50.155, the Commission decided not to impose mitigation strategy requirements on design certifications.¹ However, the requirements of 10 CFR 50.155 would apply to a combined license holder who references the U.S. ABWR standard design certification. Therefore, GEH decided to retain the U.S. ABWR design enhancements that could provide a potential COL applicant the means for meeting the mitigation of beyond-design-basis events rule requirements of 10 CFR 50.155.

GEH submitted responses to address 22 of the suggested 28 design items in U.S. ABWR DCD, Revision 6, submitted on February 19, 2016 (ADAMS Accession No. [ML16214A015](#)). GEH submitted justifications explaining how the original U.S. ABWR design certification contains sufficient information to alleviate the need for changes to the design certification with respect to renewal for the other 6 of the 28 items. In a letter dated February 2, 2018 (ADAMS Accession No. [ML17097A470](#)), the staff agreed with the GEH assessment that the six items were not required to be addressed by the U.S. ABWR design certification renewal. In summary, the staff determined that the six items are not necessary for compliance with the applicable regulations in effect at initial certification and, therefore, are also not necessary for reasonable assurance of adequate protection of the public health and safety or to support the findings required by 10 CFR 52.59(a) to renew the design certification. In addition, during the renewal application review, GEH identified additional changes to correct errors and design clarifications and incorporated them in Revision 7 of the U.S. ABWR DCD.

Operational Experience

During the period in which the U.S. ABWR design certification renewal application was undergoing review, a new operational experience issue regarding electrical safety-related design vulnerabilities emerged. Therefore, the staff requested that GEH address the issue

¹ In the mitigation of beyond-design-basis events proposed rule regulatory analysis (ADAMS Accession No. [ML15266A133](#)), the Commission proposed to not make the mitigation of beyond-design-basis events proposed rule applicable to existing design certifications, which included the U.S. ABWR, because “[t]he issues that may be resolved in a DC (design certification) and accorded issue finality may not include operational matters, such as the elements of the [mitigation of beyond-design-basis events] proposed rule.” However, as noted in SECY-19-0066, “Staff Review of NuScale Power’s Mitigation Strategy for Beyond-Design-Basis External Events,” the design certification can provide for finality under 10 CFR 52.63 and Section VI of Appendix A to 10 CFR Part 52 for the adequacy of the systems, structures and components to perform their mitigation strategies functions, as analyzed in the Final Safety Analysis Report.

described in NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System," dated July 27, 2012 (ADAMS Accession No. [ML12074A115](#)), in its U.S. ABWR design certification renewal. Specifically, the NRC asked the applicant to provide information on the following: (1) the protection scheme to detect and automatically respond to a single-phase open circuit condition or high-impedance ground fault condition on power circuits covered by 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion 17, "Electric Power Systems," and (2) the operating configuration of engineered safety feature buses at power. GEH proposed DCD modifications, related to the design vulnerability in the electric power system initiated by an open phase condition (OPC). As part of the updated DCD, Revision 7, the applicant submitted the proposed design features and inspections, tests, analyses, and acceptance criteria associated with the detection, alarm, and response to OPC and unbalanced phase condition (UPC) in the offsite power system to automatically detect OPC and UPC and alarm in the main control room, under all operating electrical system configurations and plant loading conditions. The applicant also proposed that the safety-related buses can be automatically separated from the offsite power source and can transfer safety-related loads to the unaffected offsite power source or the emergency diesel generators when an OPC or UPC occurs.

Environmental Review

The finality of all environmental issues concerning severe accident mitigation design alternatives in the original U.S. ABWR design certification rule relied on site parameters being within those specified in the technical support document for the original U.S. ABWR, dated December 1994 as amended November 30, 2010. However, as an outcome from an Atomic Safety and Licensing Board memorandum and order in the South Texas Project Electric Generating Station Units 3 and 4 Combined License proceeding (LBP-11-07, [ML110591049](#)), it was determined that no list of site parameters is specified in the U.S. ABWR technical support document. Therefore, the NRC staff re-evaluated the criteria to apply finality for the severe accident mitigation design alternative (SAMDA) evaluation to a future U.S. ABWR licensing action. To this end, the NRC staff selected the criteria for finality as the averted risk person-rem value for each SAMDA provided in Table 5 of the original technical support document. Although the SAMDA finality criteria for this design certification renewal action cannot be based on site parameters, the selected criteria, if met, provide assurance that a SAMDA would still not be cost beneficial at a proposed site for the U.S. ABWR design. Therefore, the NRC finds that the evaluation performed by GEH is reasonable and sufficient.

Design Certification Renewal Approval

On December 7, 2010, as part of the renewal application (ADAMS Accession No. [ML110040176](#)), GEH requested that the NRC renew the standard design certification for the U.S. ABWR design for a renewed period of 15 years. Consistent with the renewal duration specified in 10 CFR 52.61, the staff recommends that the design certification be renewed for 15 years following the U.S. ABWR design certification renewal rule effective date.

The staff issued a review schedule on August 30, 2016 (ADAMS Accession No. [ML16209A316](#)), which was based on resolving all open items by January 2017. The staff issued a letter dated August 3, 2017 (ADAMS Accession No. [ML17199G648](#)), to inform the applicant that the NRC would not be able to meet the schedule outlined in the letter of August 30, 2016, due to some still unresolved technical design issues. On May 31, 2019 (ADAMS Accession No. [ML19142A186](#)), after GEH provided the NRC with its final acceptable responses to all remaining requests for additional information and its final proposed changes to the U.S. ABWR DCD, the NRC issued a revised schedule projecting completion of the advanced final safety evaluation by the end of June 2019, a full Advisory Committee on Reactor Safeguards (ACRS) meeting in October 2019, and the supplemental final safety evaluation report to be completed by March 2020. The staff and GEH have met this revised schedule, and GEH continues to be in timely renewal while the staff completes its review and rulemaking.

Access to Safeguards Information and Other Nonpublic Information

Paragraph E of Section VI, "Issue Resolution," of the direct final rule states that the NRC will specify at an appropriate time the procedures on how an interested member of the public may obtain access to safeguards information and other nonpublic information for the U.S. ABWR design to request and participate in hearings that involve licenses and applications that reference the U.S. ABWR design.

Backfitting and Issue Finality Considerations

The U.S. ABWR design certification renewal rule does not constitute a backfit as defined in the backfit rule (10 CFR 50.109) and is consistent with applicable issue finality provisions in 10 CFR Part 52. There are no operating licenses under 10 CFR Part 50 referencing the U.S. ABWR design certification rule. The U.S. ABWR design certification renewal rule is consistent with applicable issue finality provisions in 10 CFR Part 52 because it does not impose new or changed requirements on the original U.S. ABWR design certification in the current Appendix A to 10 CFR Part 52, nor on any other existing design certification rules in Appendices B through F to 10 CFR Part 52. In addition, there is no active COL or manufacturing license issued by the NRC that currently references the U.S. ABWR design certification rule. For these reasons, neither a backfit analysis nor a discussion addressing the issue finality provisions in 10 CFR Part 52 was prepared for this rule.

RECOMMENDATION:

The staff recommends that the Commission approve the enclosed direct final rule and companion proposed rule for publication in the *Federal Register*. The staff recommends that the design certification be renewed for 15 years following the effective date of the U.S. ABWR design certification renewal final rule.

- (1) Upon Commission approval, the NRC will simultaneously publish the direct final rule and the companion proposed rule in the *Federal Register* for a 30-day public comment period.
- (2) The staff prepared an environmental assessment to evaluate severe accident mitigation design alternatives for the direct final rule. The assessment resulted in a finding of no significant impact (Enclosure 3).

- (3) The staff received approval from the Director, Office of the Federal Register, to incorporate by reference the renewed U.S. ABWR DCD into Appendix A of 10 CFR Part 52.
- (4) The direct final rule does not contain any new or amended collections of information subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing collections of information were approved by the Office of Management and Budget, approval number 3150-0151.
- (5) The staff has determined that this is not a major rule under the Congressional Review Act of 1996 and has received verification from Office of Management and Budget.
- (6) The Office of Public Affairs will inform the public and media outlets when the direct final rule is published.
- (7) The Office of Congressional Affairs will inform the appropriate congressional committees.

RESOURCES:

Enclosure 4 includes a discussion of the resources.

COORDINATION:

The Office of the General Counsel reviewed this package and has no legal objection.

The Office of the Chief Financial Officer reviewed this package and determined that it has no financial impact.

The ACRS has reviewed the renewal application, including its design changes. The ACRS has provided the Commission its final letter, dated October 31, 2019 (ADAMS Accession No. [ML19305D117](#)), on those portions of the application that concern safety. The ACRS determined that it does not need to review the rulemaking package. The staff will provide the ACRS information copies of the published final rule and the companion proposed rule.

Margaret M. Doane
Executive Director
for Operations

Enclosures:

1. Direct Final Rule
2. Companion Proposed Rule
3. Environmental Assessment
4. Resources

SUBJECT: DIRECT FINAL RULE: ADVANCED BOILING WATER REACTOR DESIGN
 CERTIFICATION RENEWAL (RIN 3150-AK04; NRC-2017-0090) DATED:
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OFFICE	NRR/DNRL/NRLB	NMSS/REFS/RRPB*	Tech Editor*	NMSS/REFS/RRPB*
NAME	JShea	DAndrukat	JDougherty	GLappert
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