Environmental Assessment Supporting Final Rule, 10 CFR Parts 50 and 52—Consideration of Aircraft Impacts for New Nuclear Power Reactors

U.S. Nuclear Regulatory Commission

May 2009

[7590-01-P]

NUCLEAR REGULATORY COMMISSION

ENVIRONMENTAL ASSESSMENT AND FINDING OF

NO SIGNIFICANT IMPACT

The Nuclear Regulatory Commission (NRC) is amending its regulations to require applicants for new nuclear power reactors to perform a design-specific assessment of the effects of the impact of a large, commercial aircraft. The requirements affected by this rulemaking include Title 10, Section 50.8, "Information collection requirements: Office of Management and Budget approval," of the *Code of Federal Regulations* (10 CFR 50.8); 10 CFR 50.34, "Contents of construction permit and operating license applications; technical information"; 10 CFR 50.150, "Aircraft impact assessment"; 10 CFR 52.47, "Contents of applications; technical information"; 10 CFR 52.59, "Criteria for renewal"; 10 CFR 52.79, "Contents of applications; technical information in final safety analysis report"; 10 CFR 52.137, "Contents of applications; technical information"; and 10 CFR 52.157, "Contents of applications; technical information in final safety analysis report."

The Commission believes that it is prudent for nuclear power plant designers to take into account the potential effects of the impact of a large, commercial aircraft. The Commission has determined that the impact of a large, commercial aircraft is a beyond-design-basis event, and the NRC's requirements that apply to the design, construction, testing, operation, and maintenance of design features and functional capabilities for design basis events will not apply to design features or functional capabilities selected by the applicant solely to meet the requirements of this final rule (aircraft impact rule). The NRC's approach to aircraft impacts is consistent with its previous approach to beyond-design-basis events. The objective of this rule

is to require nuclear power plant[1] designers to perform a rigorous assessment of the design to identify design features and functional capabilities that could provide additional inherent protection to withstand the effects of an aircraft impact (i.e., meet the rule's acceptance criteria). This rule should result in new nuclear power reactor facilities being more inherently robust with regard to an aircraft impact than if they were designed in the absence of this final rule. This final rule provides an enhanced level of protection beyond that which is provided by the existing adequate protection requirements, which all operating power reactors are required to meet.

The final rule requirement to perform a design-specific assessment to identify design features and functional capabilities applies to applicants for new construction permits; new operating licenses that reference a new construction permit; new standard design certifications; renewal of any of the four existing design certifications if the design has not previously been amended to comply with the final rule; new standard design approvals; manufacturing licenses that do not reference a standard design certification or standard design approval, or that reference a standard design certification issued before the effective date of the rule which has not been amended to comply with the rule; and combined licenses that do not reference a standard design certification, standard design approval, or manufactured reactor, or that reference a standard design certification issued before the effective date of the rule which has not been amended to comply with the rule. All of these applicants as a whole are referred to as "applicants for new nuclear power reactors" throughout the remainder of the environmental assessment. These applicants are required to perform an assessment of the effects on the

[1] The requirements of the final aircraft impact rule may apply, in some contexts, to the designer who is responsible for, or seeks certification or regulatory approval of something less than a complete nuclear power plant, *e.g.*, a nuclear reactor without site-specific elements such as the ultimate heat sink. For ease of discussion in the remainder of the environmental assessment, reference to a "nuclear power plant designer" or "facility designer" is meant to include, in the appropriate context, a designer of something less than a complete nuclear power plant, but is at least as encompassing as a "nuclear reactor." Similarly, a reference to the design of a "facility" also encompasses, in the appropriate context, the design of something less than a complete nuclear power plant, e.g., the design of a reactor.

designed facility of the impact of a large, commercial aircraft. Using realistic analyses, applicants must identify and incorporate into the design those design features and functional capabilities to show, with reduced use of operator action, that the reactor core remains cooled or the containment remains intact and spent fuel cooling or spent fuel pool integrity is maintained (herein after referred to as the acceptance criteria). Applicants are required to describe how such design features and functional capabilities meet the acceptance criteria of the rule. Applicants and licensees are subject to requirements for the control of changes to the design features and functional capabilities identified as a result of complying with this final rule.

The Commission-approved design basis threat (DBT) does not include an aircraft attack. The NRC published its final DBT rule in the *Federal Register* on March 19, 2007 (72 FR 12705) (10 CFR 73.1, "Purpose and scope"). Two well-established bases support the exclusion of aircraft attacks from the DBT. First, it is not reasonable to expect a licensee with a private security force using weapons legally available to it to be able to defend against such an attack. Second, such an act is in the nature of an attack by an enemy of the United States (U.S.). Power reactor licensees are not required to design their facilities or otherwise provide measures to defend against such an attack, as provided by 10 CFR 50.13, "Attacks and destructive acts by enemies of the United States; and defense activities."

The current requirements, in conjunction with the revisions to 10 CFR 50.54, "Conditions of licenses" (74 FR 13926; March 27, 2009), to address loss of large areas of the plant due to explosions or fires, will continue to provide adequate protection of the public health and safety and the common defense and security. Nevertheless, the Commission has decided to also require applicants for new nuclear power reactors to incorporate into their design additional features to show that the facility can withstand the effects of an aircraft impact. This final rule to address the capability of new nuclear power reactors relative to an aircraft impact is based both

on enhanced public health and safety and enhanced common defense and security, but is not necessary for adequate protection. Rather, this rule's goal is to enhance the facility's inherent robustness at the design stage.

Requiring applicants for new nuclear power reactors to perform a rigorous aircraft impact assessment and identify and incorporate into their design those design features and functional capabilities that address the effects of a beyond-design-basis aircraft impact is consistent with the NRC's historic approach to beyond-design-basis events and with the NRC's position in its "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants" (50 FR 32138; August 8, 1985). The policy statement notes, "The Commission expects that vendors engaged in designing new standard [or custom] plants will achieve a higher standard of severe accident safety performance than their prior designs." The NRC reiterated that regulatory approach in its "Policy Statement on the Regulation of Advanced Nuclear Power Plants," (59 FR 35461, July 12, 1994), when it stated, "The Commission expects that advanced reactors would provide enhanced margins of safety and/or utilize simplified, inherent, passive, or other innovative means to accomplish their safety functions." These concepts continue to be NRC policy as reflected in the NRC's 2008 "Policy Statement on the Regulation of Advanced Reactors" (73 FR 60612; October 14, 2008). This regulatory approach has demonstrated its success, as all designs subsequently submitted to and certified by the Commission represent substantial improvement in safety for operational events and accidents. The final aircraft impact rule will further enhance the safety of new nuclear power plants for aircraft impacts and is consistent with these policy statements.

This new aircraft impact assessment rule complements the revisions to 10 CFR 50.54(hh) to mitigate the effects of large fires and explosions. The 10 CFR 50.54(hh) provisions on mitigating large fires and explosions codify the adequate protection requirement

imposed on existing operating reactors by Interim Compensatory Measures (ICM) Order, Item B.5.b. The 10 CFR 50.54(hh) provisions, therefore, are necessary for adequate protection and must remain in regulations that are applicable to all currently operating reactors and must be satisfied by all newly licensed power reactors. Current reactor licensees have already developed and implemented procedures to comply with the 10 CFR 50.54(hh) requirements, and would not require any additional action to comply with those rule provisions. New applicants for and new holders of operating licenses under 10 CFR Part 50 and combined licenses under 10 CFR Part 52 will be required to develop and implement procedures that will employ mitigating strategies similar to those now employed by current licensees to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire. The requirements in 10 CFR 50.54(hh) relate to the development of procedures for addressing certain events that are the cause of large fires and explosions that affect a substantial portion of the nuclear power plant and are not limited or directly linked to an aircraft impact. The rule contemplates that the initiating event for such large fires and explosions could be any number of DBT or beyond-DBT events. In addition, the NRC regards 10 CFR 50.54(hh) as necessary for reasonable assurance of adequate protection to public health and safety and common defense and security. This is consistent with the NRC's designation of the orders on which 10 CFR 50.54(hh) is based as being necessary for reasonable assurance of adequate protection.

In contrast to the adequate protection requirements of 10 CFR 50.54(hh), this aircraft impact final rule will enhance safety and security by requiring an assessment of newly designed facilities to show that the facility can withstand the effects of an aircraft impact. New nuclear power reactor applicants will be subject to both the requirements of the aircraft impact rule and the requirements in 10 CFR 50.54(hh). The overall objective of these rules is to enhance a

nuclear power plant's capabilities to withstand the effects of a large fire or explosion, whether caused by an aircraft impact or other event, from the standpoints of both design and operation. The impact of a large, commercial aircraft on the nuclear power plant is regarded as a beyond-design-basis event. In light of the NRC's view that effective mitigation of the effects of events causing large fires and explosions (including the impact of a large, commercial aircraft) can be provided through operational actions, the NRC believes that the mitigation of the effects of aircraft impacts through design should be regarded as a safety enhancement which is not necessary for adequate protection. Therefore, the aircraft impact rule—unlike 10 CFR 50.54(hh)—is regarded as a safety enhancement, which is not necessary for adequate protection.

The NRC regards the aircraft impact and 10 CFR Part 50.54(hh) rulemakings to be complementary in scope and objectives. The aircraft impact rule focuses on enhancing the design of future nuclear power plants to withstand large, commercial aircraft impacts, with reduced use of operator actions. The provisions of 10 CFR 50.54(hh) focus on ensuring that the nuclear power plant's licensees will be able to implement effective mitigation measures for large fires and explosions, including (but not explicitly limited to) those caused by the impact of a large, commercial aircraft.

Consideration of a rule to require applicants for new nuclear power reactors to perform an aircraft impact assessment and describe design features and functional capabilities addressing such impacts, which are beyond-design-basis scenarios, is similar to the Commission's consideration in the mid-1980's of new rules addressing accidents more severe than design basis accidents. The 1985 "Policy Statement on Severe Reactor Accidents" explained the Commission's conclusion that, although it was proposing criteria to show new reactor designs to be acceptable for severe accident concerns, then-existing plants posed no

undue risk to public health and safety, and thus, there was no need for action on operating reactors based on severe accident risks. The Commission's reasoning in the severe accident context supports its conclusion that although new nuclear power reactors should be assessed for aircraft impacts and designed to show that they can withstand the effects of an aircraft impact, existing reactors and designs provide adequate protection of the public health and safety and common defense and security.

ENVIRONMENTAL ASSESSMENT

Identification of the Action:

The objective of this rulemaking is to require applicants for new nuclear power reactors to perform a design-specific assessment of the effects of the impact of a large, commercial aircraft. The applicant is required to use realistic analyses to identify and incorporate design features and functional capabilities to show, with reduced use of operator actions, that either the reactor core remains cooled or the containment remains intact, and either spent fuel cooling or spent fuel pool integrity is maintained. These requirements apply to applicants for new construction permits; new operating licenses that reference a new construction permit; new standard design certifications; renewal of any of the four existing design certifications if the design has not previously been amended to comply with the rule; new standard design approvals; manufacturing licenses that don't reference a standard design certification or standard design approval, or that reference a standard design certification issued before the effective date of the rule which has not been amended to comply with the rule; and combined licenses that don't reference a standard design certification, standard design approval, or manufactured reactor, or that reference a standard design certification issued before the effective date of the rule which has not been amended to comply with the rule. In addition, these

amendments contain requirements for control of changes to any design features or functional capabilities credited to show that the facility can withstand the effects of an aircraft impact. This rule should result in new nuclear power reactor facilities being more inherently robust with regard to an aircraft impact than if they were designed in the absence of this final rule. This final rule provides an enhanced level of protection beyond that which is provided by the existing adequate protection requirements, which all operating power reactors are required to meet.

The approach in this rulemaking will maintain a level of specificity in 10 CFR Part 50 and 10 CFR Part 52 that is comparable to the current regulations, while revising requirements to be consistent with Commission direction to require applicants for new nuclear power reactors to perform a design-specific assessment of the effects of the impact of a large, commercial aircraft.

The Need for the Action:

The purpose of this action is to implement a regulatory process to require nuclear power plant designers to perform a rigorous assessment of the design to identify design features and functional capabilities that could provide additional inherent protection to withstand the effects of an aircraft impact.

Environmental Impacts of the Final Action:

The NRC has concluded that there will be no significant adverse radiological environmental impacts associated with implementation of the final rule. The rule will result in all newly designed and constructed nuclear power plants (i.e., those designed and constructed after the effective date of the final rule) using designs that have incorporated design features functional capabilities to withstand the effects of the impact of a large, commercial aircraft. The impact of a large, commercial aircraft is a beyond-design-basis event. Thus, the final rule will

not require changes to the design basis functional requirements for the facility's structures, systems, and components that function to limit the release of radiological effluents during and following postulated accidents. As a result, all of the structures, systems, and components associated with limiting the releases of offsite radiological effluents will continue to be able to perform their functions; consequently, there will be no significant radiological effluent impact. The NRC also notes that the incorporation of such design features and functional capabilities into the design of nuclear power plants should result in a decrease in radiological consequences attributable to the beyond design basis event of an aircraft impact. While this is not the primary basis for the NRC's determination on the lack of environmental impact attributable to the final aircraft impact rule, it does provide additional context for the NRC's determination in this regard.

In addition, the standards and requirements applicable to radiological releases and effluents are not affected by this rulemaking and continue to apply to the nuclear power reactors affected by this rulemaking. Implementation of the final rule will not result in impacts to a facility related to normal operation and any associated releases.

The NRC believes that this rule has the potential effect of increasing environmental protection by requiring reactor designers to consider and implement design features and functional capabilities to address aircraft impacts. By doing so, there would be a potential decrease in the possibility of radiological releases to the environment stemming from an aircraft impact on a nuclear power plant, which effectively increases the level of environmental protection provided.

Therefore, this action will not significantly increase the probability or consequences of accidents, nor result in changes in the types of any effluents that may be released offsite, and will not result in a significant increase in occupational or public radiation exposure.

Alternatives to the Action:

As an alternative to the rulemaking described above, the NRC considered not taking the action (i.e., the “no-action” alternative). Not revising the regulations for applicants for new nuclear power reactors would result in no change in current environmental impacts since these requirements have no environmental impact and taking no action therefore results in no net change to the environment. However, the no-action alternative would not change the governing regulations for these applicants and the regulations would not reflect the need for nuclear power plant designers to perform an assessment of the design to identify design features and functional capabilities that could provide additional inherent protection to withstand the effects of an aircraft impact. The NRC has concluded that requiring applicants for new nuclear power reactors to perform an aircraft impact assessment is a desirable regulatory outcome, and has rejected the no-action alternative.

Alternative Use of Resources:

This action does not involve the use of any resources not previously considered by the NRC in its past environmental statements for issuance of standard design certifications, construction permits, operating licenses, combined licenses, and manufacturing licenses for nuclear power reactors.

Agencies and Persons Consulted:

The NRC developed the final rule and this environmental assessment. In accordance with its stated policy, the NRC provided a copy of the proposed rule to designated liaison officials for each State. No other agencies were consulted.

FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the action.

Documents related to this rulemaking may be viewed and downloaded electronically through the Federal e-Rulemaking Portal. Go to http://www.regulations.gov and search for documents filed under Docket ID [NRC-2007-0009]. Documents may also be examined and/or copied for a fee, at the NRC's Public Document Room, Public File Area O F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852. Publicly available documents are available electronically at the NRC's electronic Reading Room at http://www.nrc.gov/reading-rm/adams.html. From this page, the public can gain entry into the Agencywide Documents Access and Management System, which provides text and image files of NRC's public documents.

Dated at Rockville, Maryland, this 8th day of May 2009.

For the Nuclear Regulatory Commission.

/RA/

Michael R. Johnson, Director
Office of New Reactors