

## **3.0 DESIGN OF STRUCTURES, COMPONENTS, EQUIPMENT, AND SYSTEMS**

### **3.5.1.6 Aircraft Hazards**

#### **3.5.1.6.1 Introduction**

For the early site permit (ESP) application, PSEG Power, LLC and PSEG Nuclear, LLC (the applicant) provided information evaluating the potential hazards associated with aircraft. The U.S. Nuclear Regulatory Commission (NRC) staff reviewed these evaluations to ensure that the risks associated with potential aircraft hazards are sufficiently low.

#### **3.5.1.6.2 Summary of Application**

In Site Safety Analysis Report (SSAR), Section 2.2.2.7, "Airports, Airways, and Military Training Routes," the applicant presented information concerning the airports, airways and military training routes in the vicinity of the site to evaluate potential hazards with respect to nuclear units that might be constructed on the proposed PSEG ESP Site.

The applicant stated that the helipad for Salem Generating Station (SGS) and Hope Creek Generating Station (HCGS) is the only heliport or airport within 8 kilometers (km) (5 miles (mi)) of the PSEG Site. Additionally, there are seven airports and one heliport located within 8 to 16.1 km (5 to 10 mi) of the PSEG Site. Pertinent information and data on all airports within 16.1 km (10 mi), and other nearby public airports beyond 16.1 km (10 mi) is presented in SSAR Table 2.2-11, "Airport Operations within the PSEG Site Region," along with the annual number of operations for each of the airports.

There are four Federal airways (V123-312, V29, V157, and V213 within 16.1 km (10 mi) of the PSEG Site. There are also two high altitude routes J42-150 and J191. The closest military routes are six (SR800, SR805, SR844, SR845, SR846 and SR847) slow speed low-altitude military training routes as indicated in SSAR Figure 2.2-2, "Airports and Airways within 10 miles of the PSEG Site." The nearest edges of the military training routes are located within 8 km (5 statute mi) of the PSEG Site.

There are no military facilities within 16.1 km (10 mi) of the PSEG Site. New Castle County Airport is the closest facility with military operations (Air National Guard) and it is located 23 km (14.5 mi) northeast of the site. The closest dedicated military facility is Dover Air Force Base, in Delaware, which is located 38.3 km (23.8 mi) south of the site. The operations at Dover Air Force Base are 100 percent military and the numbers appear in SSAR Table 2.2-11.

#### **3.5.1.6.3 Regulatory Basis**

The acceptance criteria for aircraft hazards are based on meeting the relevant requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 52.17, "Contents of Applications, Technical Information," and 10 CFR Part 100, "Reactor Site Criteria." The staff considered the following regulatory requirements and guidance in reviewing the site location and area description.

- 10 CFR 52.17, as it relates to the requirement that the applicant provide the location and description of any nearby military or transportation facilities and routes.

- 10 CFR Part 100, as it relates to the following:
  - 10 CFR 100.20(b), as it relates to the requirement that the nature and proximity of man-related hazards (e.g., airports, transportation routes, and military facilities) must be evaluated to establish site characteristics for use to determine whether a plant design can accommodate commonly occurring hazards, and whether the risk of other hazards is very low.
  - 10 CFR 100.21(e), which states that the potential hazards associated with nearby transportation routes, industrial, and military facilities must be evaluated and site characteristics established such that potential hazards from such routes and facilities will pose no undue risk to the type of facility proposed to be located at the site. Review Standard, (RS)-002, Section 3.5.1.6, "Guidance for Processing Applications for Early Site Permits," Regulatory Guide (RG) 1.206, "Regulatory Guide for Combined License Applications for Nuclear Power Plants," and NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," specify that the above regulatory requirements are met if the probability of aircraft accidents having the potential for radiological consequences greater than the 10 CFR Part 100 exposure guidelines is less than about  $10^{-7}$  per year. The probability is considered to be less than about  $10^{-7}$  per year by inspection if the distance from the site meets all the following criteria:
    - The site-to-airport distance (D) is between 5 and 10 statute miles and the projected annual number of operations is less than  $500 D^2$ , or the site-to airport distance (D) is greater than 10 statute mi, and the projected annual number of operations is less than  $1000 D^2$ .
    - The site is at least 5 statute miles from the edge of military training routes, including low-level training routes, except for those associated with usage greater than 1,000 flights per year, or where activities (such as practice bombing) may create an unusual stress situation.
    - The site is at least 2 statute miles beyond the nearest edge of a Federal airway, holding pattern, or approach pattern.

If the above proximity criteria are not met, or if sufficiently hazardous military activities are identified, then a detailed review of aircraft hazards should be performed. The guidance on the performance of such reviews appears in RS-002, Section 3.5.1.6, RG.1.206, and NUREG-0800.

#### 3.5.1.6.4 Technical Evaluation

In SSAR Section 3.5.1.6, the applicant addressed the aircraft hazards evaluations. There are seven airports and a helipad between 8 and 16.1 km (5 and 10 mi) of the location of the proposed plant at the PSEG Site. The airports have a very small infrequent number (sporadic) of flights annually that would not contribute to exceeding the acceptable aircraft hazards probability of  $10^{-7}$  per year, and therefore are not considered a safety hazard. Based on the review of the information provided by the applicant and the information obtained from sources available in the public domain, the staff considers the applicant's conclusion acceptable.

There are six airports within 16.1 to 48.3 km (10 to 30 mi) having projected number of flights from each of the airports much less than the respective plant-to-distance criterion of  $1000 D^2$ , where D is the distance in miles from the site to the airport. Therefore, the aircraft crash

probability is considered to be acceptable as less than about  $10^{-7}$  per year. Based on the review of the flight data information, the staff considers the applicant's approach and conclusion acceptable as it meets the acceptance criteria.

The applicant addressed military airports and routes considering New Castle County Airport located 23.3 km (14.5 mi) northeast of the site, with military operations (Air National Guard) and Dover Air Force Base located 38.3 km (23.8 mi) south from the site. The applicant identified the closest military training route to be VR1709 located 59.5 km (37 mi) from the PSEG Site, and screened the route out from evaluation based on the distance. However, based on independent review of the information, the staff identified several potential military training routes within close proximity of the site. These are SR800, SR805, SR844, SR845, SR846, and SR847. Therefore, in Request for Additional Information (RAI) 40, Question 03.05.01.06-1, the staff requested that the applicant provide additional information in the SSAR pertaining to these routes, to address and include these routes in aircraft hazards evaluation.

In a December 14, 2011, response to RAI 40, Question 03.05.01.06-1, the applicant provided confirmation of the identified military training routes within 8 km (5 mi) of the PSEG Site. The applicant provided pertinent information used in aircraft hazard probability determination and committed to revise the aircraft probability determination to include these identified military training routes. In a March 13, 2012, supplemental response to RAI 40, Question 03.05.01.06-1, the applicant provided additional probability calculations that reflect the inclusion of the identified military training routes. The applicant determined that since only large military aircrafts are flown on these military training routes, only the large aircraft crash probability is affected in the revised calculations, and still the large aircraft crash probability remains below the  $10^{-7}$  per year acceptance criteria. The applicant provided the revisions to SSAR application Sections 2.2.2.7.2, 3.5.1.6.2, and Figure 2.2-2. The staff confirmed that per commitment in the response to RAI 40, Question 03.05.01.06-1, the applicant has incorporated the changes in SSAR Revision 1, dated May 21, 2012, specifically in Sections 2.2.2.7.2 and 3.5.1.6.2. However, the staff identified that the applicant did not include revised SSAR Figure 2.2-2. Subsequently, the applicant included, and the staff verified, that revised SSAR Figure 2.2-2, "Airports and Airways Within 10-Miles of the PSEG Site, Rev 1," was included in SSAR Revision 2, and, therefore, the staff considers RAI 40, Question 03.05.01.06-1 resolved.

The applicant addressed and evaluated the airways for the aircraft hazards probability. The applicant identified three airways (V123-312, V29, and J42-150) that are within 3.2 km (2 mi) of the site. The applicant performed aircraft hazard probability for each of the four reactor design technologies separately, using the U.S. Department of Energy's (DOE's) four-factor formula that uses crash rates for non-airport operations referenced in DOE-STD-3014-96, "Accident Analysis for Aircraft Crash into Hazardous Facilities." The staff considers the applicant's approach and methodology reasonable and acceptable in determining the aircraft hazard calculations, as it conforms to the staff review guidance. The applicant used calculated effective areas for each aircraft type and reactor design considered. Since the details are not provided in the SSAR, in RAI 40, Question 03.05.01.06-1, the staff requested that the applicant provide detailed calculations of these site-specific effective areas for each of the reactor designs and aircraft type. In a December 14, 2011, response, the applicant provided information pertaining to the effective area calculations. The staff considers this acceptable as the methodology satisfies the requirements and guidance.

The applicant determined the probability of aircraft crash per year for a large aircraft and a small aircraft, for each of the reactor designs considered. The large aircraft crash probability for each of the reactor designs is less than the acceptable probability of  $10^{-7}$  per year. However, the

small aircraft crash probability for each of the reactor designs exceeded the aircraft crash probability of  $10^{-7}$  per year, thereby posing a threat that the resulting dose due to radioactive release could exceed the 10 CFR Part 100 exposure criteria. The radiological consequences of 10 CFR Part 100 exposure criteria are considered met if it is demonstrated that the probability of radiological release or core damage frequency (CDF) is less than  $10^{-7}$  per year. Therefore, the applicant applied the respective conditional core damage probability (CCDP) of each reactor design to the calculated small aircraft crash probability of the respective design to calculate the CDF. Based on the calculated CDF values, the applicant concluded that the resultant CDFs for each of the reactor design technologies is less than the acceptance criteria of  $10^{-7}$  per year. The staff considers that the applicant's approach and methodology of the CDF determination is reasonable and acceptable, as it is in accordance with guidance. However, the applicant did not provide the CCDP values. Therefore, in RAI 40, Question 03.05.01.06-1, the staff requested that the applicant provide CCDP values for each reactor design with references. In a December 14, 2011, response to RAI 40, Question 03.05.01.06-1, the applicant provided CCDP values for each of the reactor designs considered. CCDP is determined based on design-specific Probabilistic Risk Assessment (PRA), and it is addressed under the "Severe Accidents" section of a combined license (COL) application to determine whether or not the aircraft accident is a design-basis event. The technical review of the information involving CCDP determination is conducted in conjunction with a COL application review. Therefore, the staff has identified this as COL Action Item 3.5.1.6-1 as described below:

#### COL Action Item 3.5.1.6-1

An applicant for a COL or CP referencing this early site permit (ESP), should evaluate and demonstrate compliance with the design-basis aircraft accident probability acceptance criterion of  $1 \times 10^{-7}$  per year or less, in accordance with the probabilistic risk assessment (PRA) guidance provided in NUREG-0800, Chapter 19 ("Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors"), and should provide the determined core damage frequency (CDF) based on the design selected.

The staff reviewed the applicant's assumptions and calculations and finds them reasonable, consistent and acceptable, as they comply with the requirements of 10 CFR 52.17, 10 CFR 100.20(b), and conform to the guidance in RS-002, RG 1.206, and NUREG-0800. The staff performed independent confirmatory aircraft crash probability calculations, using the highest of most recent 5-year (2006-2010) Federal Aviation Administration (FAA) supplied flight operations data within 5 miles of the site. The crash probability calculated by the staff using conservative crash rates per mile is comparable to the highest probability determined by the applicant. Based on the independent estimation of the probability of a potential aircraft crash, the staff confirms that the probability of aircraft accidents, resulting in radiological consequences greater than 10 CFR Part 100 exposure guidelines, is less than an order of magnitude of  $10^{-7}$  per year for the PSEG Site.

#### 3.5.1.6.5 Conclusion

The staff reviewed the applicant's aircraft hazard analysis using the guidelines in RS-002, Section 3.5.1.6, RG 1.206, and NUREG-0800. As discussed above, the staff independently verified the applicant's assessment of aircraft hazards at the PSEG Site and concludes that the estimated probability of an accident having the potential for radiological consequences in excess of the exposure criteria contained in 10 CFR Part 100 is less than an order of magnitude of  $10^{-7}$  per year.

Based on these considerations, and also including COL Action Item 3.5.1.6-1, the staff concludes that aircraft hazards do not present an undue risk to the safe operation of nuclear units at the PSEG Site, and finds the PSEG Site acceptable for one or two nuclear units as proposed. The staff also concludes that the PSEG Site meets the relevant requirements related to aircraft hazards of 10 CFR Part 52 and 10 CFR Part 100 for compliance with respect to determining the acceptability of the site.