

3. SITE SAFETY ASSESSMENT

3.5.1.6 Aircraft Hazards

For an early site permit (ESP) application, the U. S. Nuclear Regulatory Commission (NRC) staff reviews the applicant's assessment of aircraft hazards to verify that the risks due to such hazards are sufficiently low for a new nuclear power plant that might be constructed on the proposed site.

3.5.1.6.1 Technical Information in the Application

In Section 2.2.2.5 of the Site Safety Analysis Report (SSAR), Exelon Generation Company, LLC (EGC or the applicant) presents information on airports and airways that could affect the design of systems, structures, and components important to the safety of a nuclear power plant or plants within the applicant's plant parameter envelope (PPE) that might be constructed on the proposed ESP site. This information is evaluated in SSAR Section 2.2.2.5.3.

Four private airports and airstrips are located within 10 kilometers (6 miles) of the proposed ESP site. The Spencer airport, owned by AmerGen and located 2 miles west-southwest of the site, is not operational. The remaining three airports or airstrips (Martin RLA Airport, Thorp Airport, and Bakers Strip) can only accommodate small single- or twin-engine aircraft. The Martin RLA Airport is about 4 miles south of the ESP site; the Thorp Airport is about 5 miles northwest of the site; and Bakers Strip is about 5.5 miles southeast of the site. These airports do not have commercial operations and are only available for public use in emergencies.

The closest public airports are the Central Illinois Regional Airport in Bloomington, about 23 miles north of the site; the Decatur Airport, about 23 miles south of the site; and the Rantoul National Aviation Center Airport (Frank Elliott Field), about 37 miles east of the site. The SSAR indicates that the Central Illinois Regional Airport and the Decatur Airport have scheduled commercial flights and have more than 50,000 operations per year. The Rantoul Airport, which does not have regularly scheduled commercial flights, has about 16,000 operations per year.

A detailed evaluation of potential hazards of airport flight operations was not necessary because the number of flights per year associated with the above airports does not exceed the threshold specified in Section 3.5.1.6 of NRC Review Standard (RS)-002, "Processing Applications for Early Site Permits." Therefore, the applicant did not include a detailed evaluation of the potential hazards of airport flight operations in the SSAR. However, the Clinton Power Station (CPS) Update Safety Analysis Report (USAR) contains an evaluation of the hazards of operations at the Martin RLA and Thorp Airports.

The SSAR states that a heliport is located at CPS for use by company helicopters.

Four low-altitude airways pass near the site. These airways, which are used by aircraft flying below 18,000 feet, are 8 nautical miles in width. The closest airway is V313, with a centerline passing less than 2 miles east of the site. The centerline of V233 passes less than 3 miles northwest of the site. The centerlines of V72 and V434 pass approximately 5 miles northeast of the site and 6 miles north-northeast of the site, respectively.

The applicant did not provide traffic data for these airways. However, the CPS USAR contains traffic estimates that were updated in November 2002 and have been extrapolated for a 40-year period on the basis of Federal Aviation Administration (FAA) estimates of the increase in air carrier operations between 1980 and 1992.

The airways are sufficiently close to the proposed site to require detailed evaluations of the potential hazards. In response to the staff's Request for Additional Information (RAI) 2.2.2-2, the applicant committed to revise SSAR Section 2.2.2.5.3 to provide detailed estimates of the probability of aircraft impacts from these Federal airways. The SSAR states that these airways are addressed in the CPS USAR and that the probability of an aircraft crash from these airways is within the guidelines of Section 3.5.1.6 of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants" (also referred to as the SRP). AmerGen updated the USAR evaluation in November 2002. The USAR analysis concludes that the probability of an aircraft crash on the CPS site from flights along the four airways is 5.42×10^{-8} per year. In the SSAR, the applicant estimates that the allowable footprint for the ESP safety-related facilities could be as large as 386,000 ft² (about 0.014 mi²) without exceeding the impact probability criterion of 1.0×10^{-7} per year in RS-002. The applicant further notes that the effective impact area computed for CPS is about 200,000 ft² (about 0.01 mi²).

The SSAR does not discuss hazards associated with military training routes. The aviation charts in SSAR Figure 2.2-3 do not show any military training routes near the proposed site.

3.5.1.6.2 Regulatory Evaluation

In RAI 1.5-1, the staff asked the applicant to provide a comprehensive list of NRC regulations applicable to its ESP SSAR. In its response to RAI 1.5-1, the applicant stated that RS-002 identifies the NRC regulations applicable to its ESP SSAR. The staff considered the regulatory requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 100, "Reactor Site Criteria," Subpart B, [in particular, the requirements of 10 CFR 100.20(b) and 10 CFR 100.21(e)], as identified in RS-002, Attachment 2, Section 3.5.1.6, in reviewing information regarding aircraft hazards that could affect the safe design and siting of a nuclear power plant(s) falling within the applicant's PPE that might be constructed at the proposed site. The staff reviewed this portion of the application for conformance with the applicable regulations and considered the corresponding regulatory guidance.

According to Section 3.5.1.6 of RS-002, the 10 CFR 100.20 requirement that individual and societal risks of potential plant accidents be low is met if the probability of aircraft accidents having the potential for radiological consequences greater than the exposure criteria in 10 CFR 50.34(a)(1) is less than about 1×10^{-7} per year.

The probability is considered to be less than about 1×10^{-7} per year if the distances from the site meet these three criteria:

- (1) 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 D is greater than 10 statute miles and the projected annual number of operations is less than $1000 D^2$.

- (2) The site is at least 5 statute miles from the edge of military training routes, including low-level training routes, except for routes used by more than 1000 flights per year or where activities (such as practice bombing) may create an unusual stress situation.
- (3) The site is at least 2 statute miles beyond the nearest edge of a Federal airway, holding pattern, or approach pattern.

If these three proximity criteria are not met, or if sufficiently hazardous military activities are identified, a detailed review of aircraft hazards should be performed. Section 3.5.1.6 of RS-002 provides guidance on performing such reviews.

In SSAR Table 1.5-1, the applicant identifies the applicable NRC guidance on identifying and evaluating aircraft hazards:

- RG 1.70, Revision 3, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants—LWR Edition"
- SRP Section 3.5.1.6
- RS-002 Section 3.5.1.6

3.5.1.6.3 Technical Evaluation

The applicant identified three private airfields near the proposed ESP site. The SSAR concludes that none of the fields has enough flight operations to require a detailed analysis of the risk to a plant at the proposed ESP site based on a criterion in RG 1.70 similar to the first criterion in the list above. This criterion only applies to the Thorp Airport and Bakers Strip. The criterion does not apply to the Martin RLA Airport because the distance from that airport to the ESP site is less than 5 miles.

The staff concurs with the applicant's conclusion that the hazards associated with Thorp Airport and Bakers Strip do not require a detailed analysis because their distance from the site and the number of annual operations at each airfield satisfy the first criterion.

The staff did an independent evaluation of the hazards associated with the Martin RLA Airport because it is within 5 miles of the ESP site. Since Martin RLA Airport is a private airfield, the staff finds it conservative to assume 500 general aviation operations per year from the facility. The staff conservatively assumed an effective area of 0.02 mi² for safety-related structures in the ESP site powerblock footprint on the basis of Figure 2.1-4 of the environmental report submitted with the ESP application and that 50 percent of the operations result in flights near the proposed ESP site. Using the procedure set forth in Section III.3(a) of Section 3.5.1.6 in Attachment 2 to RS-002, the staff estimates that an aircraft from the Martin RLA Airport has a probability of about 6×10^{-8} per year of impacting the ESP facility. This probability is lower than the 10^{-7} threshold in the acceptance criteria in SRP Section 3.5.1.6. Thus, the staff concludes that aircraft hazards associated with the Martin RLA Airport do not pose a significant risk to facilities at the proposed ESP site. The staff has not identified any additional private airfields within 16 kilometers (10 miles) of the site.

The applicant identified three public airports near the proposed ESP site and determined that the number of operations at each airport was lower than in criterion 1 above. The staff did an independent review of public airports in the vicinity of the proposed ESP site and identified 10 airports within 50 miles of the site. Table 3.5.1.6-1 below lists these airports, including the three identified by the applicant. The table provides the distance from each airport to the proposed ESP site, the number of operations per year, and a description of the distribution of operations by aircraft type (the information on airport location and operations was obtained from AirNav.com on November 16, 2004 at <http://www.airnav.com/airports/us/IL>). FAA information regarding the site was updated on September 30, 2004. On the basis of the airport distances from the airports to the site and the annual number of operations, these airports satisfy criterion 1. Hence, hazards of operations at these airports near the proposed ESP site do not pose a significant risk to safety-related structures that might be built at the site.

The applicant identifies four airways that pass near or over the proposed ESP site. The SSAR does not present an analysis of the risks associated with the airways. Rather, it relies on the CPS USAR analysis of the risk. AmerGen updated this analysis in November 2002. The USAR analysis follows the guidance in SRP Section 3.5.1.6, which is similar to the guidance for the review of ESP applications in RS-002. Using the results of the USAR analysis, the applicant estimates that a safety-related structure of an ESP facility could have an effective footprint of about 386,000 ft² (about 0.014 mi²) and still meet the SRP criterion of about 10⁻⁷ per year.

The staff performed an independent assessment of the risks associated with the airways. The staff assumed a powerblock footprint of 0.02 mi² (on the basis of Figure 2.1-4 of the environmental report submitted with the ESP application). The staff based its estimate of the traffic along each airway in 2065 on the traffic estimates in the USAR and an annual growth rate of 1.5 percent. This growth rate is slightly larger than the rate assumed in the USAR. Table 3.5.1.6-2 lists the resulting risk estimates by airway, using the in-flight crash rate of 4x10⁻¹⁰ per mile from RS-002. The total risk is estimated to be about 5.0x10⁻⁸ per year. This estimate is about the same as the USAR risk estimate for a crash into the current CPS unit. Because many aircraft using the low-altitude airways are small and the assumptions used in the probability estimates are conservative, the staff concludes that the probability of an aircraft crash on the ESP site having radiological consequences greater than the 10 CFR 50.34(a)(1) criteria is less than 5.0x10⁻⁸.

3.5.1.6.4 Conclusions

The staff reviewed the applicant's aircraft hazard analysis using the procedures set forth in RS-002, Section 3.5.1.6. As discussed above, the staff reviewed the applicant's assessment of aircraft hazards at the site with a probability of less than about 10⁻⁷ per year for an accident having the potential for radiological consequences greater than the exposure criteria in 10 CFR 50.34(a)(1). The staff also did independent analyses. Based on these analyses, the staff concludes that aircraft hazards at the proposed ESP site pose no undue risk to the health and safety of the public. Therefore, the staff concludes that, from the perspective of aircraft hazards, the proposed site is acceptable for siting a plant or plants of the types specified by the applicant. In addition, the site meets the relevant requirements of 10 CFR Part 52, "Early Site Permits; Standard Design Certifications; and Combined Licenses for Nuclear Power Plants," and 10 CFR Part 100.

Table 3.5.1.6-1 Public Airports Near the Proposed ESP Site

Airport	Distance from ESP Site (mi)	Reported Operations Per Year	Operations by Aircraft Type
Central Illinois Regional	20	57,305	71% general, 23% air taxi, 5% commercial
University of Illinois	31	129,575	91% general, 9% air taxi
Decatur	23	55,480	69% general, 15% air taxi, 12% military, 5% commuter
Piatt County	19	5,996	100% general
Abraham Lincoln Capital	50	66,795	70% general, 20% air taxi, 9% military
Rantoul	37	20,075	100% general
Frasca Field	34	14,965	90% general, 10% air taxi
Logan County	26	6,987	80% general, 19% air taxi, 1% military
Pekin	49	9,125	77% general, 22% air taxi
Paxton	42	4,015	95% general, 5% air taxi

Table 3.5.1.6-2 Probability of Aircraft Impacts from Federal Airways

Airway	Distance to Airway Centerline (mi)	Present (2002) Traffic (Flights per Year)	Projected Traffic for 2065 (Flights per Year)	Effective Footprint Area (mi ²)	Width of Airway Plus 2x Distance to Edge of Airway (mi)	Probability of Impact (yr ⁻¹) ^(a)
V313	1.5	7,300	18,650	0.02	9.21	1.62x10 ⁻⁸
V233	2.0	7,300	18,650	0.02	9.21	1.62x10 ⁻⁸
V434	6.0	5,475	13,988	0.02	12.0	9.3x10 ⁻⁹
V72	4.75	3,650	9,325	0.02	9.5	7.9x10 ⁻⁹
					Total	4.96x10 ⁻⁸

^(a) Assuming an inflight crash probability of 4x10⁻¹⁰ per mile.