



Serial: NPD-NRC-2009-127
June 30, 2009

10 CFR 52.79

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

**SHEARON HARRIS NUCLEAR POWER PLANT, UNITS 2 AND 3
DOCKET NOS. 52-022 AND 52-023
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 007 RELATED TO
REGIONAL CLIMATOLOGY**

Reference: Letter from Manny Comar (NRC) to James Scarola (PEC), dated August 21, 2008, "Request for Additional Information Letter No: 007 Related to SRP Section 02.02.01-02.02.02 for the Shearon Harris Nuclear Plant Units 2 and 3 Combined License Application"

Ladies and Gentlemen:

Progress Energy Carolinas, Inc. (PEC) hereby submits our response to the Nuclear Regulatory Commission's (NRC) request for additional information provided in the referenced letter.

A supplemental response to the NRC request is addressed in the enclosure. The enclosure also identifies changes that will be made in a future revision of the Shearon Harris Nuclear Power Plant Units 2 and 3 application.

If you have any further questions, or need additional information, please contact Bob Kitchen at (919) 546-6992, or me at (919) 546-6107.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on June 30, 2009.

Sincerely,

A handwritten signature in black ink, appearing to read "Garry D. Miller".

Garry D. Miller
General Manager
Nuclear Plant Development

Enclosure

cc: U.S. NRC Region II, Regional Administrator
Mr. Brian Hughes, U.S. NRC Project Manager

DO94
NRD

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**Shearon Harris Nuclear Power Plant Units 2 and 3
Response to NRC Request for Additional Information Letter No. 007 Related to
SRP Section 02.02.01-02.02.02 for the Combined License Application,
dated August 21, 2008**

<u>NRC RAI #</u>	<u>Progress Energy RAI #</u>	<u>Progress Energy Response</u>
02.02.01-02.02.02-2	H-0382	Response enclosed – see following pages
02.02.01-02.02.02-3	H-0383	Response enclosed – see following pages
02.02.01-02.02.02-4	H-0384	Response enclosed – see following pages

<u>Attachment</u>	<u>Progress Energy RAI #</u>	<u>Pages Included</u>
Revised FSAR Figure 2.2.2-202 (Rev 1) Airports and Airways in Vicinity of HAR	H-0384	2

NRC Letter No.: HAR-RAI-LTR-007

NRC Letter Date: August 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.02.02-2

Text of NRC RAI:

RG 1.206 provides guidance regarding the information that is needed to ensure potential hazards in the site vicinity are identified and evaluated to meet the siting criteria in 10 CFR 100.20 and 10 CFR 100.21. The FSAR Section 2.2.2.7 does not provide this information adequately to review this section. The NRC staff finds that the Sanford-Lee County Regional Airport (TTA) is located approximately 8.7 miles west-southwest of the HAR plant site. On the basis of the applicant information provided with daily 129 aircraft operations, the projected annual operations for this airport estimated to be 47085 and would exceed the airport distance/operations criterion of $500d^2$ ($500 \times 8.7 \times 8.7 = 37845$) and therefore an evaluation of aircraft hazards should be performed in Section 3.5.1.6. Please check, address and evaluate appropriately.

PGN RAI ID #: H-0382

PGN Response to NRC RAI:

The Sanford-Lee County Regional Airport is located approximately 9 miles from the HAR plant site. Based on the location of the airport and the number of operations per year at the airport (47,085 from FSAR Table 2.2.2-202), an evaluation of the aircraft hazards has been performed.

The evaluation determined that the probability of small aircraft crashing on seismic category I structures (i.e. Containment/Shield Building and Auxiliary Building) is calculated to be 4.783×10^{-6} per year. This crash probability results in a core damage frequency (CDF) of 0.28×10^{-12} per year which is much smaller than the current plant CDF acceptance criteria of 1.0×10^{-8} per year. Therefore, small aircraft crash probability is acceptable. The probability of large aircraft crashing on seismic category I structures is calculated as 0.415×10^{-7} per year. This meets the acceptance criteria of 1×10^{-7} per year in Subsection 19.58.2.3.1 of DCD. Therefore, the probability of crash for large aircrafts is acceptable.

Associated HAR COL Application Revisions:

The following changes were made to the HAR FSAR in Revision 1:

1. Revise the first sentence of the third paragraph of FSAR Section 2.2.2.7 from:
"The Sanford-Lee County Regional Airport is located approximately 31 km (19 mi.) southwest of the plant location."

To read:

"The Sanford-Lee County Regional Airport is located approximately 14.5 km (9 mi.) southwest of the plant location."

2. Revise FSAR Table 2.2.2-202 (See response to NRC RAI # 02.02.01-02.02.02-1) under column "Distance to Site" for the "Sanford-Lee County Regional Airport" from:

"31 km

(19 mi.)"

To read:

"14.5 km

(9 mi.)"

The following changes will be made to the HAR FSAR in a future amendment:

1. Revise FSAR Subsection 3.5.1.6 from:

"Add the following text to the end of DCD Subsection 3.5.1.6:

The HAR 2 and 3 are remote from federal airways, airport approaches, military installations or airspace usage and; therefore, an aircraft hazards analysis is not required. Specifically:

- a. No federal airways, holding patterns, or approaches pass within 3.22 kilometers (2 miles) of the nuclear facility (Subsection 2.2.2.7),
- b. No airports are located within 8.05 kilometers (5 miles) of the site (Table 2.2.2-201),
- c. There are no airports with projected operations greater than $193d^2$ ($500 d^2$) movements per year located within 16.10 kilometers (10 statute miles) and greater than $386d^2$ ($1000 d^2$) outside 16.10 kilometers (10 statute miles) where d is the distance in kilometers (statute miles) from the site (Table 2.2.2-202),
- d. There are no military installations or any airspace usage that might present a hazard to the site within 32.19 kilometers (20 miles) of the site (Section 2.2)."

To read:

"Add the following text to the end of DCD Subsection 3.5.1.6.

The Sanford Lee County Regional Airport is located approximately 14.5 km (9 mi.) southwest of the HAR. Sanford-Lee County Regional Airport is the only airport that fails the deterministic screening criteria because its number of operations of 47,085 per year exceeds the threshold of 41,269 operations. The airport has one runway (Runway 3/21), and it is located to the south-west of the plant. The outer boundary of four airways is routed within 2 miles of the HAR site: IR718, V3-66-155, J207 and J52-55 (shown on Figure 2.2.2-202). Thus, an aircraft hazards evaluation needs to be performed for HAR 2 and 3.

The evaluation determined that the probability of small aircraft crashing on seismic category I structures (i.e. Containment/Shield Building and Auxiliary Building) is calculated to be 4.783×10^{-6} per year. This crash probability results in a core damage frequency (CDF) of 0.28×10^{-12} per year which is much smaller than the current plant CDF acceptance criteria of 1.0×10^{-8} per year. Therefore, small aircraft crash probability is acceptable. The probability

of large aircraft crashing on seismic category I structures is calculated as 0.415×10^{-7} per year. This meets the acceptance criteria of 1×10^{-7} per year in Subsection 19.58.2.3.1 of DCD. Therefore, the probability of crash for large aircrafts is acceptable. The acceptance criteria and methodology are discussed below.

Probabilistic Acceptance Criteria

Based on discussion in Subsection 19.58.2.3.1 of the DCD, separate probabilistic acceptance criteria are used for small and large aircrafts. The definition of small and large aircraft is based on documented discussion with Westinghouse.

Small aircraft is an aircraft with less than 30 seats with pay load less than 7500 pounds. All aircraft not meeting the above small aircraft definition are considered as large aircraft.

- Acceptance Criteria for Large Aircraft:

Total probability of crash on Seismic Category I structures must be less than 1×10^{-7} per year.

- Acceptance Criteria for Small Aircraft:

Equation 19.58-1 of the DCD will be applied with the initiating event frequency (IEF) equal to the calculated small aircraft crash probability per year. The small aircraft crash probability is acceptable if the calculated core damage frequency is less than 1.0×10^{-8} per year.

The calculation details for airport and the airways follows:

Calculation for Sanford-Lee Airport

The equation used is obtained from Item 3 in Section III of SRP 3.5.1.6 (Reference 201). Because there is only one runway, this equation is:

$$P_{\text{airport}} = \sum_j (C_j \cdot N_j \cdot A_j) \quad (1)$$

In Equation (1),

C_j = Probability per square mile of a crash per aircraft movement for aircraft type j

N_j = Number (per year) of movements for aircraft type j

A_j = Effective plan area (square miles) for aircraft type j

P_{airport} = Probability of crash per year from airport operations

C_j :

The value of C_j for each aircraft type is obtained from table in Item 3 of Section III of SRP 3.5.1.6 (Reference 201). Since the distance D from runway end to plant is in the range 8

miles to 9 miles, for some aircraft types the SRP table lists "NA", meaning information is not available. An extrapolation procedure, employing available value from the last listed crash rate in SRP table and applicable values in the applicable Tables of DOE-STD-3014-96 (Reference 202), were used to obtain crash rates marked "NA" in the SRP table. For example, for general aviation C at the desired distance turned out to be zero. On the other hand, for military aircraft the calculated C value was non-zero.

N_j:

Although the total annual operations at this airport as 47,085. Further data collection showed that this is an annual average. The maximum could be as high as 59,000. Also about 2% is air taxi traffic, another 2% is small military aircraft and the rest is general aviation. This information was used in probability calculation with Equation (1).

A_j:

Effective plant impact area is calculated by considering only seismic Category I structures. Per the DCD, this is restricted to Containment/ Shield Building and Auxiliary Building. As required by Item 7 in Section III of SRP 3.5.1.6 (Reference 201), A_j must include appropriate fly-in area and skid area. Additional details are not provided in SRP. The methodology in Section B.4 of the DOE-STD-3014-96 (Reference 202) provides details for buildings of rectangular foot print and of constant height above grade.

The value of A_j depends on the aircraft type because of differences in wing spans, crash angle, and skid distance. Table 3.5-201 lists the total areas for different aircraft types.

Calculation for Airways

Item 2 of Section III of SRP 3.5.1.6 (Reference 201) provides an equation to calculate probability of crash from a nearby airway. This equation contains a constant

C = in-flight crash rate per mile using the airway

For commercial aircraft, a C value of 4×10^{-10} per aircraft mile is provided in Reference 201. However, the reference does not provide C values for other types of aircraft (i.e., military aviation and general aviation). Because of the above unavailability of constant C for all aircraft types and since FAA does not provide clear flight information on specific airways, the Ref. 1 equation for airways is not used in this assessment for airways.

Section 5.3.2 of DOE-STD-3014-96 (Reference 202) provides complete equations for calculating probability of aircraft crash from non-airport operations. The procedure is implemented using Tables in Appendix B of Reference 202.

The probability of crash from airways is calculated using the equation below:

$$P_{\text{all_airways}} = \sum_j (N_j \cdot P_j \cdot f_j \cdot A_j) \quad (2)$$

$N_j \cdot P_j$ = expected number of in-flight crashes per year for aircraft type j (occurrence per year)

f_j = conditional probability, given a crash, that the crash occurs within one-square-mile area surrounding the facility of interest (per square mile)

A_j = impact area of the buildings of facility for aircraft type j (square mile)

Values of $N_j \cdot P_j \cdot f_j$ are provided in Table B-14 of Reference 202 for General aviation and in Table B-15 of Ref.2 for commercial and military aviations. Values of A_j for each aircraft type is the same as that used for airport operations and Equation (1).

When Using Tables B-14 and B-15, the maximum value listed for Savannah River Site and average Continental United States (CONUS) was used. Savannah information is included because Savannah River Site is closest of all-sites listed in these tables to HAR site.

Calculated Crash Probability Results

Based on phone contacts with several airports near HAR site (including Raleigh-Durham International Airport, Sanford-Lee County Regional Airport and Fayetteville Regional Airport), the air taxi operations meet the definition small aircraft provided in the acceptance criteria above. Accordingly, the following aircraft types are considered as "small" aircrafts: air taxi, general aviation and small military. Large aircrafts are considered to be: air carrier and large military aircraft.

With the above identification of large and small aircrafts, the results are:

$$\begin{aligned} P_{\text{small_airport}} + P_{\text{small_airway}} &= 0.0178 \times 10^{-6} + 4.766 \times 10^{-6} \\ &= 4.78 \times 10^{-6} \text{ per year} \end{aligned}$$

$$P_{\text{large_airport}} + P_{\text{large_airway}} = 0 + 0.415 \times 10^{-7} = 0.415 \times 10^{-7} \text{ per year}$$

Conclusions from Probability Results

For large aircraft, acceptance criterion is 1×10^{-7} per year. Therefore, large aircraft crash probability of 0.415×10^{-7} is acceptable.

For small aircraft, apply Equation (19.58-1) of the DCD with conditional core damage probability (CCDP) of 5.85×10^{-8} . Plant core damage frequency is:

$$CDF_{\text{small_aircraft}} = (4.78 \times 10^{-6}) \times (5.85 \times 10^{-8}) = 0.28 \times 10^{-12} \text{ per year}$$

Clearly, the core damage frequency due to small aircraft crash is much smaller than the core damage frequency acceptance criteria of 1.0×10^{-8} per year, and the calculated small aircraft crash probability is acceptable.”

2. After FSAR Subsection 3.5.4 add new Subsection 3.5.5:

“3.5.5 REFERENCES

201. NUREG-0800, Standard Review Plan (SRP) 3.5.1.6, “Aircraft Hazards”, Rev. 3, March 2007.
202. Department of Energy Standard DOE-STD-3014-96, “Accident Analysis Into Hazardous Facilities”, October 1996.”

3. Add new FSAR Table 3.5-201 to FSAR Section 3.5:

**Table 3.5-201
Impact Area for Combined Containment/Shield and Auxiliary Buildings for Different Aircrafts**

Aircraft Type	A _i (mile ²)	
	Part I	Part II
Air Carrier	0.03415	0.01872
Air Taxi	0.01230	0.01630
General Aviation	0.00984	0.01290
Small Military	0.02035	0.01981
Large Military	0.02364	0.02529

The following change will be made to the HAR ER in a future amendment:

1. In Subsection 2.5.2.8, revise the last paragraph on page 2.5-351 from:

“No airports are located within 8 km (5 mi.) of the site, and no airports that have greater than 500 d² movements per year are within 16 km (10 mi.), as shown in Table 2.5-27 (Reference 2.5-124, Reference 2.5-125, Reference 2.5-126, Reference 2.5-127, Reference 2.5-128,

and Reference 2.5-129). As defined in Regulatory Guide 1.206, d equals the distance in miles from the site.”

To read:

“No airports are located within 8 km (5 mi.) of the site, one airport within 16 km (10 mi.), Sanford Lee County Regional Airport, has greater than 193d² (500d²) movements per year and no airport greater than 16 km (10 mi.) away has greater than 386d² (1000d²) movements per year, as shown in Table 2.5-27 (Reference 2.5-124, Reference 2.5-125, Reference 2.5-126, Reference 2.5-127, Reference 2.5-128, and Reference 2.5-129). As defined in Regulatory Guide 1.206, d equals the distance in miles from the site.”

The following changes were made to the HAR ER in Revision 1:

1. In Subsection 2.5.2.8, revise the second sentence of fifth paragraph on page 2.5-350 from:

“Five airports are located within 32 km (20 mi.) of the site, as shown in Table 2.5-27. These airports include RDU (30.5 km [19 mi.]), Sanford Lee County Regional Airport (30.5 km [19 mi.]), Deck Airport (11 km [7 mi.]), Cox Airpark (13 km [8 mi.]) and Triple W Airpark (22.5 km [14 mi.]). Deck, Cox, and Triple W are owned privately with very little aircraft operations (Table 2.5-27) (Reference 2.5-124, Reference 2.5-125, Reference 2.5-126, Reference 2.5-127, Reference 2.5-128, and Reference 2.5-129).”

To read:

“Twelve airports are located within 32 km (20 mi.) of the site. These airports include one major public airport, RDU (30.5 km [19 mi.]); two general public aviation airports, Sanford-Lee County Regional Airport (14.5 km [9 mi.]) and Triple W Airport (23.3 km [14.5 mi.]) (Table 2.5-27), and nine privately owned airports. The nine privately owned airports are shown below (Reference 2.2-216):

- Bagwell
- Barclaysville Field
- CAG Farms
- Cox
- Deck Airpark
- Eagles Landing
- Fuquay/Angier Field
- Moretz Riverside Landing
- Womble Field.”

2. Subsection 2.5.2.8, revise the second sentence of the second complete paragraph on page 2.5-350 from:

The Sanford Lee County Regional Airport is located approximately 30.4 km (18.9 mi.) southeast of the HAR.

To read:

The Sanford Lee County Regional Airport is located approximately 14.5 km (9 mi.) southwest of the HAR.

3. Revise ER Table 2.5-27 (See response to NRC RAI # 02.02.01-02.02.02-1) under column "Distance to Site" for the "Sanford Lee County Regional Airport" from:

"31 km

(19 mi.)"

To read:

"14.5 km

(9 mi.)"

Attachments/Enclosures:

None

NRC Letter No.: HAR-RAI-LTR-007

NRC Letter Date: August 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.02.02-3

Text of NRC RAI:

RG 1.206 provides guidance regarding the information that is needed to ensure potential hazards in the site vicinity are identified and evaluated to meet the siting criteria in 10 CFR 100.20 and 10 CFR 100.21. The FSAR Section 2.2.2.7 does not provide this information adequately to review this section. The NRC staff's review indicates that there is a military route, IR718, with a centerline approximately 1.4 miles north of the HAR site, whose nearest edge is less than 5 miles from the HAR site. Therefore, NRC Staff considers that the applicant should evaluate and address the aircraft hazards associated with this route in Section 3.5.1.6. Please evaluate or provide a justification for its exclusion.

PGN RAI ID #: H-0383

PGN Response to NRC RAI:

Military route IR718 is located within 2 miles of the HAR site. Therefore, an aircraft hazards evaluation of this military route has been conducted.

The evaluation determined that the probability of small aircraft crashing on seismic category I structures (i.e. Containment/Shield Building and Auxiliary Building) is calculated to be 4.783×10^{-6} per year. This crash probability results a core damage frequency (CDF) of 0.28×10^{-12} per year which is much smaller than the CDF acceptance criteria of 1.0×10^{-8} per year. Therefore, small aircraft crash probability is acceptable. The probability of large aircraft crashing on seismic category I structures is calculated as 0.415×10^{-7} per year. This meets the acceptance criteria of 1×10^{-7} per year in Subsection 19.58.2.3.1 of DCD. Therefore, the probability of crash for large aircrafts is acceptable.

Associated HAR COL Application Revisions:

The following changes were made to the HAR FSAR in Revision 1:

1. Revise the last sentence of the second paragraph of Subsection 2.2.2.7 from:

“There are no active airways, including V-3-6B-J55 (shown on Figure 2.2.2-202) that fall within the plant location.”

To read:

“The outer boundary of four airways are routed within 2 miles of the HAR site: IR718, V3-66-155, J207 and J52-55 (shown on Figure 2.2.2-202).”

For the other changes to FSAR Section 3.5, see **Associated HAR COL Application Revisions** for the response to NRC RAI No 02.02.01-02.02.02-2 (H-0382).

Attachments/Enclosures:
None

NRC Letter No.: HAR-RAI-LTR-007

NRC Letter Date: August 21, 2008

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 02.02.02-4

Text of NRC RAI:

RG 1.206 provides guidance regarding the information that is needed to ensure potential hazards in the site vicinity are identified and evaluated to meet the siting criteria in 10 CFR 100.20 and 10 CFR 100.21. The FSAR Section 2.2.2.7 does not provide this information adequately to review this section. The NRC Staff's review indicates that there two Federal jet routes Airway J207 and J52-55, whose nearest edges are well within 2 miles of HAR site. Therefore, in accordance with the acceptance criteria 3.5.1.6, the aircraft hazards associated with these jet routes should be evaluated and addressed in Section 3.5.1.6. Please evaluation, or provide justification for their exclusion.

PGN RAI ID #: H-0384

PGN Response to NRC RAI:

The centerline of Airways V3-66-155, J207 and J52-55 are located 5.5, 2.6 and 3.8 miles, respectively, of the HAR site. The boundary of each these airways is 4 nautical miles from the centerline. Thus, the outer boundary of each of these airways is within 2 miles of the HAR site. Therefore, an aircraft hazards evaluation of these airways has been conducted.

The evaluation determined that the probability of small aircraft crashing on seismic category I structures (i.e. Containment/Shield Building and Auxiliary Building) is calculated to be 4.783×10^{-6} per year. This crash probability results a core damage frequency (CDF) of 0.28×10^{-12} per year which is much smaller than the CDF acceptance criteria of 1.0×10^{-8} per year. Therefore, small aircraft crash probability is acceptable. The probability of large aircraft crashing on seismic category I structures is calculated as 0.415×10^{-7} per year. This meets the acceptance criteria of 1×10^{-7} per year in Subsection 19.58.2.3.1 of DCD. Therefore, the probability of crash for large aircrafts is acceptable.

Associated HAR COL Application Revisions:

The following changes were made to the HAR FSAR in Revision 1:

1. Revise the last sentence of the second paragraph of Subsection 2.2.2.7 from:

“There are no active airways, including V-3-6B-J55 (shown on Figure 2.2.2-202) that fall within the plant location.”

To read:

“The outer boundary of four airways are routed within 2 miles of the HAR site: IR718, V3-66-155, J207 and J52-55 (shown on Figure 2.2.2-202).”

2. Replace FSAR Figure 2.2.2-202, in its entirety, with the version listed under **Attachments/Enclosures to Response to NRC** below. A second sheet has been added to Figure 2.2.2-202 that indicates the routes of Airways J207 and J52-55.

For the other changes to FSAR Section 3.5, see **Associated HAR COL Application Revisions** for the response to NRC RAI No 02.02.01-02.02.02-2 (H-0382).

Attachments/Enclosures:

Revised FSAR Figure 2.2.2-202 (Rev 1) – Airports and Airways in Vicinity of HAR

Attachments To Letter NPD-NRC-2009-127



Scale not available.

Progress Energy Carolinas
 Shearon Harris Nuclear Power Plant
 Units 2 and 3
 Part 2, Final Safety and Analysis Report
 New Hill, North Carolina

Airports and Airways in Vicinity of HAR

FIGURE 2.2.2-202 Sheet 1 of 2

