

U.S. NUCLEAR REGULATORY COMMISSION STAFF'S RESPONSES
TO COMMISSION POST-HEARING QUESTIONS

- 1. Since there is nothing in guidance that defines “well in excess” of the Regulatory Guide 4.7 criterion for population density of 500 persons per square mile within 20 miles of the site, could you give us more detail on how you determined that the Turkey Point site did not exceed that criterion, given that the population densities for the 0-10 mile radius and the 0-20 mile radius exceed the 500 persons per square mile criterion by approximately thirty to forty percent?**

Staff Response: In its review of the combined license (COL) application for the proposed Turkey Point Units 6 and 7, the Staff determined that the Regulatory Guide (RG) 4.7, Revision 3, “General Site Suitability Criteria for Nuclear Power Stations,” population density criterion of 500 persons per square mile was exceeded. As recognized in the Commission’s question, there is no guidance that establishes a numerical threshold of what constitutes “well in excess” of 500 persons per square mile.¹ In Final Safety Analysis Report (FSAR) Section 2.1.3, “Population Distribution,” the applicant presented population projection data for the year 2030 to include radial distances of 0-1, 1-2, 2-3, 3-4, 4-5, 5-10 and 10-20 miles. Using this data, the Staff determined the population density as an average over the radial distance of 0-5 miles would be about 58 people per square mile, for 0-10 miles about 718 people per square mile, and for 0-20 miles about 656 people per square mile. The latter two values exceed the criterion in RG 4.7 by about 30-40 percent. The projected maximum density value determined within 20 miles of the Turkey Point site is about 200 people per square mile in excess of 500 people per square mile which, for this site, is a reasonable proportion of the criterion. Therefore, it is the Staff’s technical determination that this density is not “well in excess” of the criterion.

Having determined that the population density exceeded the criterion, in accordance with the guidance in RG 4.7 and the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) 100.21(h)² for such a situation, the Staff considered other information to determine

¹ RG 4.7, Revision 3, states that “[a] reactor should be located so that, at the time of initial site approval and within about 5 years thereafter, the population density, including weighted transient population, averaged over any radial distance out to 20 miles (cumulative population at a distance divided by the circular area at that distance), does not exceed 500 persons per square mile. A reactor should not be located at a site where the population density is well in excess of the above value.”

The RG further states that “[i]f the population density of the proposed site exceeds, but is not well in excess of, the above preferred value, the analysis of alternative sites should pay particular attention to alternative sites with lower population density. However, consideration of other factors, such as safety, environmental, or economic concerns, may result in the site with higher population density being found acceptable.”

² 10 CFR 100.21(h) states that “[r]eactor sites should be located away from very densely populated centers. Areas of low population density are, generally, preferred. However, in determining the acceptability of a particular site located away from a very densely populated center but not in an area of low density, consideration will be given to safety, environmental, economic, or other factors, which may result in the site being found acceptable.” The footnote in 10 CFR 100.21(h) further notes that “[e]xamples of these factors include, but are not limited to, such factors as the higher population density

whether the site could be found acceptable. The Staff reviewed information provided by Florida Power & Light Company (FPL) regarding safety, environmental, economic, and other factors based on RG 4.7 guidance. Attention was given to the physical characteristics of the site, particularly with regard to the security and emergency plans and measures that ensure the public health and safety. The Staff found that when all factors were considered, and even with a population density greater than 500 persons per square mile, the site was acceptable because the application provided adequate assurance that the public health and safety would be assured.

After receiving this question from the Commission, the Staff reviewed Table I in NUREG-0478, "Metropolitan Siting – A Historical Perspective," published in October 1978. Using the data in Table I, the Staff determined that the highest population density at any radial distance out to 20 miles for the Turkey Point site is comparable to that of previously licensed sites. Examples include Limerick (density of 789 persons per square mile at 5 miles), Zion (density of 668 persons per square mile at 10 miles), and Connecticut Yankee (density of 716 persons per square mile at 20 miles).

- 2. In response to [Pre-Hearing] Question 19b, the Staff stated that the land exchange between the National Park Service and FPL is outside of NRC's regulatory purview and therefore NRC's EIS did not include this information. Does NRC's FEIS address the land exchange as part of the cumulative impacts analysis? If not, why not?**

Staff Response: Yes. The Staff accounted for the land exchange in Sections 2.2³ and 4.1⁴ of the final Environmental Impact Statement (EIS) as part of the baseline land use conditions, which are considered part of the Staff's cumulative impacts analysis. Because the land exchange is accounted for in the baseline land use conditions, the portion of the final EIS addressing cumulative land use impacts (Section 7.1) does not specifically mention the impacts associated with the land exchange. The land exchange involved FPL relinquishing a long-established but unused transmission line right-of-way encompassing 320 acres traversing the interior of Everglades National Park in exchange for the National Park Service (NPS) granting FPL the ability to build transmission lines on 260 acres of other parkland in a new right-of-way following a segment of the eastern boundary of Everglades National Park. NPS evaluated the land exchange action in an earlier NPS EIS. NPS approved the transfer, which is outside the NRC's regulatory purview, in a Record of Decision dated March 26, 2016. Because NPS already addressed the impacts of the land exchange in its EIS, those impacts were considered by the NRC Staff in Section 2.2 of the final EIS as part of the baseline land use conditions

site having superior seismic characteristics, better access to skilled labor for construction, better rail and highway access, shorter transmission line requirements, or less environmental impact on undeveloped areas, wetlands or endangered species, etc."

³ The portion of Section 2.2 that specifically addresses transmission line corridors acknowledges that "On March 16, 2016, the NPS approved acquisition of 320 acres of FPL lands in the East Everglades expansion area of Everglades National Park in exchange for 260 acres along approximately 6.5-mi of the park's eastern boundary" (EIS, p. 2-16).

⁴ Section 4.1.2 explains that "On March 16, 2016, the NPS signed a Record of Decision transferring approximately 260 acres of land along the western [sic, eastern] perimeter of the park [Everglades National Park] to FPL for transmission line use in exchange for receipt from FPL of approximately 360 [sic, 320] acres of land comprising an unused transmission line right-of-way traversing the eastern part of the park" (EIS, p. 4-13).

existing prior to building or operating Turkey Point Units 6 and 7 and their associated transmission lines. The land exchange was, therefore, one of multiple baseline conditions that influenced the Staff's evaluation of possible land use impacts from building the transmission lines in Section 4.1 of the final EIS. Section 7.1 of the final EIS specifically predicates its evaluation of cumulative land use impacts on the baseline land use conditions outlined in Section 2.2 and the project-specific land use impacts outlined in Section 4.1 (EIS, pp. 7-8 and 7-9).

3. What is the status of the permit under Section 404 of the Clean Water Act?

Staff Response: The United States Army Corps of Engineers (Corps) is continuing its review of the Department of the Army Permit application submitted June 30, 2009, by FPL in connection with the proposed Turkey Point Units 6 and 7 project. FPL's application for the proposed Turkey Point Units 6 and 7 seeks a Department of the Army permit authorization pursuant to Section 404 of the Federal Water Pollution Control Act (Clean Water Act), as amended, and Section 10 of the Rivers and Harbors Act of 1899. On March 13, 2015, the Corps published a public notice to solicit public comments (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16216A200) regarding FPL's Department of the Army permit application. As written by the Corps in Section 1.1.1.2 of the EIS, consideration of public comments received in response to the public notice will be reflected in the Public Interest Review and Clean Water Act Section 404(b)(1) analysis in the Corps' Record of Decision. The Corps has not indicated to the Staff when it plans to make the final decision regarding the permit.

4. If Turkey Point was not an existing nuclear power plant site and the exclusionary criteria were applied to it, would the exclusionary criteria have been met?

If not, how do you propose the Commission weigh the failure to meet the exclusionary criteria against the benefits of the proposed project, as required under Subpart A of Part 51, in determining whether the COLs should be issued?

Staff Response: 10 CFR Part 51 does not require the Commission to weigh the benefits of the project against the exclusionary criteria. Rather, 10 CFR 51.107(a)(3) requires the Commission to weigh the benefits of the project against the costs. Such a weighing is addressed by the Staff in Chapter 10 of the EIS. Based on its consideration of the benefits and costs, the Staff has recommended in Chapter 10 of the EIS that the COLs be issued. The standard the Commission must address is not whether the area around the proposed site would have met the exclusionary criteria used in site screening; it is whether the COL should be issued after weighing the benefits and costs.

The exclusionary criteria are not a regulatory requirement and NRC guidance (RG 4.7, and NUREG-1555, "Environmental Standard Review Plan" (ESRP)) does not use this terminology. Rather, the exclusionary criteria are a tool used by industry to simplify screening very large areas down to a manageable number of candidate areas. The exclusionary criteria are not applied directly to sites. The industry applies these criteria to the entire region of interest (ROI) (in this case the FPL service territory) to identify candidate areas within the ROI that would be favorable for the building and operation of new nuclear plants. Further screening of the candidate areas leads to the identification of the alternative sites. However, building a plant in an area that does not meet one or more exclusionary criteria would not necessarily be prohibited.

FPL's Augmented Site Selection Study Report (ADAMS Accession No. ML11250A130), Section 3.1, discusses FPL's use of the exclusionary criteria in the site selection process for FPL's COL application for Turkey Point Units 6 and 7. FPL evaluated its service territory based on (1) proximity to an adequate source of cooling water from rivers or the ocean, (2) proximity to an adequate source of cooling water from a qualifying wastewater-treatment plant, (3) avoiding census block groups with a population density >300 persons per square mile, (4) avoiding areas within the boundaries of special use lands (e.g., national parks), and (5) avoiding critical habitat. However, FPL did not apply the exclusionary criteria to select the Turkey Point site because the site was chosen based on the exception discussed in Section 9.3 of the ESRP (NUREG-1555). The use of the exception is documented in Section 9.3.1 of the EIS and Section 9.3.1 of FPL's environmental report. The Staff's response to pre-hearing Question 34 also discussed FPL's use of the exception. Because the exclusionary criteria were not applied to the Turkey Point site, assessing whether the criteria would be met in the area around the site would require speculation. Although the exclusionary criteria were not applied by FPL in selecting the Turkey Point site, the Staff evaluated the associated environmental issues in Chapters 4, 5, and 7 of the EIS.

Regardless of how the Turkey Point site was selected, FPL was required to compare that site to the alternative sites that were identified through the site selection process to determine that there was no obviously superior alternative site. In addition, in Section 9.3 of the EIS, the Staff conducted an independent evaluation of the alternative sites and compared them to the Turkey Point site. The Staff concluded that there was no obviously superior alternative site.

5. Has the NRC previously issued a construction permit or COL when the preferred site did not meet the exclusionary criteria? Has the special case exemption in NUREG-1555 for existing sites previously been used to bypass application of the exclusionary criteria?

Staff Response: As provided in the Staff's response to Question 4, above, the exclusionary criteria are not required by regulation or included in NRC guidance. These criteria are a tool the industry uses to simplify screening the entire ROI to identify candidate areas within the ROI that would be favorable for the building and operation of new nuclear plants. However, building a plant in an area that does not meet one or more exclusionary criteria would not necessarily be prohibited.

Regarding new reactor applications for which COLs have been issued⁵, the Staff has identified the South Texas Project Units 3 and 4 COL application as having used the exception in Section 9.3 of the ESRP to select the proposed site. In its review of the South Texas Project Units 3 and 4 COL application, the Staff did not evaluate whether the area around the site would have met the exclusionary criteria used by the applicant in its site selection process. Because the exclusionary criteria were not applied to the South Texas Project site, assessing whether the criteria would be met in the area around the site would require speculation.

⁵ Enrico Fermi Nuclear Plant, Unit 3 (Fermi), Levy Nuclear Plant, Units 1 & 2 (Levy), North Anna Power Station, Unit 3 (North Anna), South Texas Project Electric Generating Station, Units 3 & 4 (South Texas Project), Virgil C. Summer Nuclear Station, Units 2 & 3 (V.C. Summer), Vogtle Electric Generating Plant, Units 3 & 4 (Vogtle), and William States Lee III Nuclear Station, Units 1 & 2 (Lee).

With respect to plants licensed under 10 CFR Part 50, the Staff cannot definitively determine whether the applicants for the plants used exclusionary criteria in their siting processes, or whether the associated sites met all exclusionary criteria, if they were applied. Such information would date from the 1960s and 1970s and was not part of the evaluation of the Turkey Point Units 6 and 7 COL application. Collecting and evaluating such information would involve the expenditure of substantial resources by the Staff.

- 6. In response to the Staff’s RAI relating to the rationale for selecting Turkey Point as the preferred site, the applicant discussed five site features: ability to balance generation and load in Southeast Florida, unique cooling water supply source, land availability, existing nuclear power plant infrastructure, and emergency planning infrastructure.**

Please provide additional detail on how these factors resulted in Turkey Point being selected as the preferred site.

[FPL answer].

- 7. Has the NRC previously issued a COL despite the significant unresolved concerns of other federal agencies, such as the National Park Service and EPA?**

Has NRC previously relied on a FEIS to issue a COL where a cooperating federal agency expressed unresolved “serious concerns regarding the adequacy and accuracy of the FEIS”?

Staff Response: No. The NRC has previously issued 12 COLs, listed above in footnote 5. The NRC received comments on the draft EISs for these COLs, but did not receive comments expressing significant concerns on the final EISs from other Federal agencies. The proposed Turkey Point Units 6 and 7 environmental review is the only instance in which this has occurred. Nonetheless, the Staff is confident the final EIS analysis is adequate and meets the agency’s responsibilities under the National Environmental Policy Act and its regulations in 10 CFR Part 51.

Over the course of the environmental review, the Staff extensively engaged with NPS and United States Environmental Protection Agency (EPA) in an effort to resolve their concerns. Frequent interactions between the agencies occurred through public meetings, as well as multiple meetings both in person and via telecom, and through informal and formal correspondences. This high level of engagement with NPS and EPA resulted in the level of detail in the land use, ground and surface water hydrology, wetlands, and terrestrial and aquatic ecology resource areas in both the draft EIS and final EIS. Additionally, the Staff’s consideration of both agencies concerns was reiterated in the Staff’s response to letters from NPS and EPA on the final EIS (ADAMS Accession Nos. ML17151A369 and ML17151A381).

All draft EISs prepared by Federal agencies receive a rating from the EPA as required by Section 309 of the Clean Air Act. The two-prong rating system rates the environmental impacts of the proposed action and the adequacy of the information presented in the EIS. Despite receiving significant comments on the draft EIS, NRC’s Turkey Point Units 6 and 7 draft EIS

received a rating of Environmental Concerns-2 (EC-2)⁶ in a letter dated July 17, 2015 (ADAMS Accession No. ML15216A357) from EPA Region 4. Draft EISs that receive a rating lower than EC-2 or that EPA feels do not adequately take their comments into account may be referred to the Council on Environmental Quality within 25 days of the Notice of Availability of the final EIS in the *Federal Register*. In the case for Turkey Point, the EPA did not take such actions. The final EIS did not substantially change compared to the draft EIS. The NRC received a rating of EC-2 on several previously issued draft EISs supporting COLs that were subsequently granted by the Commission. Examples include the Fermi, Levy, and Lee COLs. Letters from EPA with the ratings for the aforementioned COLs can be found in ADAMS under Accession Nos. ML12018A211, ML103080058, and ML120790121, respectively.

8. Please identify each conservatism in the design basis flood calculation and the associated storm surge margins they provide.

Staff Response: The design basis flood elevation resulting from the storm surge calculation considers a combination of components, each of which the applicant modeled using conservative estimates. The conservative estimates bound the uncertainty in each component, and the resulting total storm surge is more than 9 feet higher than the storm surge of record in the State of Florida from Hurricane Andrew. In accordance with NRC guidance in NUREG-0800 Section 2.4.5, the storm surge calculation employed by the applicant treats the conservative estimates of these components as occurring concurrently, thereby increasing the overall conservatism of the resulting design basis flood elevation. The overall conservatism in the storm surge calculation is more than sufficient to provide reasonable assurance of adequate protection of public health and safety in regard to storm surge, and it is not necessary to calculate margin in each of the individual components. Moreover, the magnitude of the conservatism for each individual component is not always quantifiable. Nonetheless, the staff, as discussed below, identified two conservatisms in the analysis whose effect on the design basis flood elevation can be quantified.

As described in the FSER, Section 2.4.5, the multiple conservatisms in the storm surge calculation include:

- Hurricane Storm Surge (17.5 feet)

⁶ An EC-2 rating is defined as follows: “The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impacts. The EPA would like to work with the lead agency to reduce these impacts. Category 2 - Insufficient Information: The draft EIS does not contain sufficient information to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the proposal. The identified additional information, data, analyses, or discussion should be included in the final EIS.” Reference: <https://www.epa.gov/nepa/environmental-impact-statement-rating-system-criteria#EC> (Environmental Concerns).

- The applicant modeled various combinations of probable maximum hurricane (PMH) metrics (storm direction, forward speed, radius of maximum winds) to obtain the combination that yields the highest surge estimate for the proposed location of Turkey Point Units 6 & 7 (see FSAR Section 2.4.5.2.2.3 and FSAR Figures 2.4.5-205, 2.4.5-206, and 2.4.5-207).
- The applicant analyzed a large storm diameter for a storm as intense as the PMH, using a radius of maximum winds of 20 nautical miles. The large storm diameter increases the surge estimate. Furthermore, diameter and storm intensity are not independent, with the physics of hurricanes limiting high-intensity storms to smaller diameters. By comparison, Hurricane Andrew had a radius of maximum winds of 9 nautical miles at landfall.
- The PMH is more intense as measured by central pressure at landfall than any hurricane impacting the continental United States, with expected wind speeds well beyond the threshold speed of 157 miles per hour for the highest hurricane category (Category 5).
- The PMH does not weaken before landfall, as typically occurs for intense storms.
- The software used by the applicant tends to over predict storm surge in the upper range of surge values such as those of the PMH.
- For additional conservatism, the calculated PMH storm surge was increased by 20 percent (2.9 feet)—this is one conservatism in the storm surge calculation whose effect on the design basis flood elevation can be quantified.
- Wind wave runup (3.7 feet)
 - A ten-minute sustained straight-line wind of 159 miles per hour was used to generate wind waves. For comparison, this equates to a one-minute average wind speed of 188 miles per hour, which is significantly above the Category 5 hurricane one-minute average threshold wind speed of 157 miles per hour. While the conservatism in this calculation is not quantifiable, the high wind speed used to determine the wind wave runup yields a conservatively high value.
- Extreme high tide plus sea level anomaly (2.6 feet)
 - The allowance for high tide plus sea level anomaly at PMH landfall is 1.2 feet higher than the highest observed level in the local area—this is the second component of the design basis flood hazard calculation for which the conservatism can be quantified.
- Sea level rise (1.0 foot)
 - Future sea level rise 0.22 feet higher than estimated from local tide gauges.

In total, the analysis of the design basis flood elevation includes 4.1 feet of quantified conservatisms from 20 percent added to the calculated PMH storm surge (2.9 feet) and the extreme high tide plus sea level anomaly (1.2 feet). Other conservatisms in this analysis whose effects are not quantifiable include the intensity and size of the PMH, no weakening of the PMH prior to landfall, and the use of high wind speeds to generate the wind wave runup. The design plant grade elevation of 26.0 feet also provides a margin of 1.2 feet above the design basis flood elevation of 24.8 feet resulting from the storm surge calculation.