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the combination wet and dry cooling tower system's expected smaller impact on the aquatic environment, the staff concludes that a combination wet and dry cooling system for Unit 3 would be preferable to a once-through cooling system.

~~8.2.2 Plant Cooling System: Unit 3 Wet Cooling System~~

~~Wet, mechanical and natural draft cooling towers transfer heat to the atmosphere through evaporation and conduction. Assuming all the heat transfer is through evaporation, a wet cooling design would consume more water than either the once-through design or the combination wet and dry cooling system proposed in the ER (Dominion 2006). The increased use of makeup water requirements for a wet cooling design would increase impingement and entrainment slightly over the proposed design.~~

~~The use of a wet cooling tower design versus the proposed combination wet and dry cooling system design for Unit 3 would increase water withdrawals from Lake Anna. The impact of the increased evaporative losses of a wet cooling tower design would be particularly noticeable during drought years. The results of water balance calculations suggest that the use of a wet cooling tower system for the 2001 through 2003 critical water period would have resulted in an additional 1.0 m (3.4 ft) drawdown of the lake in September 2002. In comparison, use of the proposed combination wet and dry cooling system would only have drawn the lake down by an additional 0.5 m (1.6 ft). The use of a wet cooling tower design would also prolong the duration of low-flow conditions downstream of the dam. The staff concludes that based on the expected smaller impact on the lake level and downstream flows, a combination wet and dry cooling system design for Unit 3 is preferable to a wet cooling tower design.~~

8.2.3 Plant Cooling System: Unit 3 Dry Cooling System

The use of a dry cooling design versus the proposed combination wet and dry cooling system design for Unit 3 would largely eliminate the impacts on aquatic biota in Lake Anna and the North Anna River downstream. The lake would not be heated by rejected heat from Unit 3, and there would be no additional consumptive water use.

A dry cooling tower designed to dissipate heat may reduce water-related impacts of operating Unit 3, but it also has some disadvantages. In particular, dry cooling systems are more expensive to build and are not as efficient as wet cooling systems. To achieve the necessary cooling, dry systems move a large amount of air through a heat exchanger, and the fans that force the air through the heat exchanger use a significant amount of power. Dominion estimates that the power needed to operate dry cooling towers would be 8.5 to 11 percent of the plant power output (Dominion 2006). The power needed to operate a dry tower for Unit 3 would be about 150 MW(e). This power demand reduces the net power output of the plant. The power needed for operating the combination wet and dry cooling system would be 1.7 to 4 percent. This, in turn, would increase the environmental impacts of fuel use and spent fuel

transport and storage. The fans and the large volume of air required for cooling also result in elevated noise levels. The dry cooling tower would also occupy more land than a once-through or wet tower cooling system.

~~The staff concludes that based on its analysis that Lake Anna could support Unit 3 using a combination wet and dry cooling system and given the environmental impact of increased use of resources needed by using a less efficient dry cooling system, a combination wet and dry cooling system is preferable to a dry cooling system for Unit 3.~~

8.3 Alternative Sites, Region of Interest, and Selection and Evaluation Process

NRC regulations require that the ER submitted in conjunction with an application for an ESP include an evaluation of alternative sites to determine whether there is an "obviously superior" alternative to the site proposed (10 CFR 52.17(a)(2)). An ESP applicant has the option to provide as much or as little information regarding the impacts of constructing and operating the proposed unit(s); however, the ER must address all environmental impacts of construction and operation necessary to make the comparison and determination regarding alternative sites. For the North Anna ESP review, the staff concluded that it had sufficient information on the relevant environmental issues to determine that none of the alternative sites was environmentally preferable to the proposed site. This is the minimum determination that must be made; otherwise the staff would recommend that the ESP request be denied. At the CP/COL stage of the process, the applicant will be required to provide sufficient information to resolve environmental issues not considered in the ESP proceeding as well as any new and significant information regarding issues that were resolved in the ESP proceeding.

In the discussion that follows, based on the approach used by the staff to estimate environmental impacts and on the staff's expert judgment, the staff believes that the impact levels that were assigned for the resource areas are defined sufficiently to be used for the purposes of a comparison between the proposed and the alternative sites. While these impact determinations are estimates, the staff relied on higher level information (i.e., reconnaissance-level information) was informed by the provisions of state and local regulations, by extensive institutional experience with the licensing of existing reactors (including analyses developed during recent license renewal reviews, such as those in the associated License Renewal GEIS), and by the judgment and professional experience of individual staff reviewers with respect to their areas of expertise. The staff applied the same methodology to the North Anna ESP site and the alternative sites review. Therefore, although the comparisons in the alternatives analysis described in the following sections are based on reconnaissance-level information, the staff considers them to be informed comparisons, and has concluded that they are sufficient for making the determination concerning the existence of an obviously superior site. For certain environmental issues, there may not have been sufficient site-specific generated information to