

May 3, 2004

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION  
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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In the Matter of

Docket No. 52-008

Dominion Nuclear North Anna, LLC

(Early Site Permit for North Anna ESP Site)

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**CONTENTIONS OF BLUE RIDGE ENVIRONMENTAL DEFENSE LEAGUE,  
NUCLEAR INFORMATION AND RESOURCE SERVICE,  
AND PUBLIC CITIZEN  
REGARDING EARLY SITE PERMIT APPLICATION  
FOR SITE OF NORTH ANNA NUCLEAR POWER PLANT**

**I. INTRODUCTION**

Pursuant to 10 C.F.R. § 2.309 and the Atomic Safety and Licensing Board's ("ASLB's") Initial Prehearing Order of March 8, 2004, Petitioners Blue Ridge Environmental Defense League ("BREDL"), Nuclear Information and Resource Service ("NIRS") and Public Citizen, hereby submit their contentions regarding Dominion Nuclear North Anna, L.L.C.'s ("Dominion's") application for an Early Site Permit ("ESP") that would allow it to build and operate one or two new nuclear power plants on the site of the North Anna nuclear power plant. As demonstrated below, these contentions should be admitted because they satisfy the NRC's admissibility requirements in 10 C.F.R. § 2.309.

## **II. CONTENTIONS**

Below Petitioners present their contentions, which are numbered in accordance with the ASLB's instructions in its March 8, 2004, Initial Prehearing Order. Contentions related to the Site Safety Analysis begin with 2. Contentions relating to environmental issues begin with 3. Contentions relating to emergency planning begin with 4. There are no contentions under the "administrative" or "miscellaneous" categories proposed by the ASLB in its order.

### **1. Administrative Contentions**

Petitioners are not submitting any administrative contentions at this time.

### **2. Contentions Regarding Site Safety Analysis**

#### **Contention 2.1: Failure to provide adequate safety assessment of reactor interaction**

**Contention:** The ESP application for the North Anna site fails to comply with 10 C.F.R. § 52.17 because its safety assessment does not contain an adequate analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequences evaluation factors identified in 10 C.F.R. § 50.23(a)(1). In particular, the safety assessment does not adequately take into account the potential effects on radiological accident consequences of co-locating new reactors with advanced designs next to an older reactor. The safety assessment should contain a comprehensive evaluation and analysis of the ways in which interaction of the old and new plants under accident conditions may exacerbate the consequences of a radiological accident. Without such an evaluation and analysis, the presiding officer cannot make a finding that, taking into

consideration the site criteria in Part 100 of the regulations, the proposed reactors can be operated “without undue risk to the health and safety of the public.” 10 C.F.R. § 52.21.

This contention is supported by the Declaration of David A. Lochbaum, Nuclear Safety Engineer, In Support of Petitioners’ Contentions (May 3, 2004), copy attached as Exhibit 2.1-1.

**Basis:** Pursuant to 10 C.F.R. § 52.17, an ESP application must contain:

a description and safety assessment of the site on which the facility is to be located. The assessment must contain an analysis and evaluation of the major structures, systems, and components of the facility that bear significantly on the acceptability of the site under the radiological consequence evaluation factors identified in § 50.34(a)(1) of this chapter.

Pursuant to 10 C.F.R. § 50.34(a)(1)(ii), an ESP application must consider such “radiological consequence evaluation factors” as whether and to what extent “generally accepted engineering standards” are used to design the new plant, whether and to what extent the new reactor design incorporates “unique, unusual, or enhanced safety features having a significant bearing on the probability or consequences” of an accident release of radiation, and plant design features that are “intended to mitigate the radiological consequences of accidents.”<sup>1</sup>

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<sup>1</sup> Section 50.34(a)(1) has two subsections, (i) and (ii). Subsection (ii) presumably is the relevant provision, because it applies to post-1997 applications for construction permits, design certification, or combined licenses. The relevant portion of Subsection (ii) requires submission of the following information:

(i) A description and safety assessment of the site and a safety assessment of the facility. It is expected that reactors will reflect through their design, construction and operation an extremely low probability for accidents that could result in the release of significant quantities of radioactive fission products. The following power reactor design characteristics and proposed operation will be taken into consideration by the Commission:

(A) Intended use of the reactor including the proposed maximum power level and the nature and inventory of contained radioactive materials;

The safety assessment for the North Anna ESP application is deficient because it does not adequately consider the relationship between the design of the proposed new reactors and the design of the existing reactors on the site. The new reactor designs already certified by NRC and those currently under review by NRC are allegedly “safer” and less likely to have an accident involving significant core damage. For instance, the potential reactor designs listed in the application include the AP-1000 pressurized water reactor, the gas-turbine modular helium reactor (“GT-MHR”), and the pebble-bed modular reactor (“PBMR”). ESP Application § 1.3.2. The vendors of these reactors contend that the designs contain features which lessen the likelihood of an accident, and which also lessen the severity of an accident, should one occur. Consequently, the design basis accidents (“DBAs”) and source terms resulting from DBAs for the proposed reactors are significantly less severe than for the existing operating reactors. Consequently, the new reactors are designed with fewer features to protect station

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(B) The extent to which generally accepted engineering standards and applied to the design of the reactor;

(C) The extent to which the reactor incorporates unique, unusual or enhanced safety features having a significant bearing on the probability or consequences of accidental release of radioactive materials;

(D) The safety features that are to be engineered into the facility and those barriers that must be breached as a result of an accident before a release of radioactive material to the environment can occur. Special attention must be directed to plant design features intended to mitigate the radiological consequences of accidents. In performing this assessment, an applicant shall assume a fission product release [footnote omitted] from the core into the containment, assuming that the facility is operated at the ultimate power level contemplated. The applicant shall perform an evaluation and analysis of the postulated fission product release, using the expected demonstrable containment leak rate and any fission product cleanup systems intended to mitigate the consequences of the accidents, together with applicable site characteristics, including site meteorology, to evaluate the offsite radiological consequences. Site characteristics must comply with part 100 of this chapter. . . .

workers from radiation released during accident conditions, including loss-of-coolant accidents. An accident at the existing reactor could, therefore, have significant adverse effects on the operation of the new reactor.

There are many sites in the United States with more than one operating nuclear power reactor. Many of these multiple-unit sites feature reactors of essentially duplicate design. Some of these multiple-unit sites have reactors of different design, such as the reactors at the Arkansas Nuclear One site supplied by two distinctly different manufacturers. But the reactors at these multiple-unit sites shared the common trait of having the potential for a postulated accident causing significant amounts of radiation to be released. Placing a new reactor design at a site with one or more operating reactors of an earlier vintage creates a more difficult situation.

The interaction of control room designs for older and newer reactors provides an example of this problem. The control room design for the new reactors may be sufficient to adequately protect workers from postulated accidents at that reactor and from postulated accidents at nearby reactors of the same or similar design. But the control room design for the new reactors may not adequately protect workers from postulated accidents at nearby reactors of different design (e.g., the current fleet of operating reactors).

As required by General Design Criterion 19 of Appendix A to Part 50, a control room:

shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the

duration of the accident. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

The reactors operating today, such as North Anna Units 1 and 2, are designed with ventilation systems that maintain the control rooms at higher pressure than outside so that in event of an accident, clean air leaks out of the control room rather than radioactive air leaking in. Some outside air must be drawn in to create the positive pressure inside the control rooms- this outside air passes through charcoal and HEPA filters to remove radioactivity before it reached the operators in the control rooms. Because these existing reactors cannot preclude the occurrence of an accident resulting in significant release of radiation, GDC-19 requires their control rooms be designed to protect workers from exposure to that radiation.

Because new reactor designs are allegedly safer, the protection for control room operators is less. Assuming the new reactor designs are safer, building one next to an existing reactor means that it will be exposed to radiation released during an accident at North Anna Units 1 and 2. Thus, it is unreasonable to protect the operators in the control room of the new reactor(s) at the North Anna site, but not the operators in the control room of the existing reactors. The applicant has not shown that the workers in the control room of a new plant or plants would be adequately protected from a design basis accident or a severe accident, as required by GDC 19.

Environmental qualification of electrical equipment provides another example of the potentially adverse interaction between old and new plant designs. Pursuant to 10 C.F.R. § 50.49 and General Design Criterion 4 of Appendix A to Part 50, nuclear power

plant electrical equipment must be qualified to withstand the severity of accident conditions that are predicted for that plant design. Because accidents at nuclear plants of relatively new design are not expected to be as severe as accidents than for older plants, electrical equipment in the new plants at the North Anna site may not be qualified to withstand levels of heat or radiation that may be generated by an accident at the existing plant. This should be of concern to the applicant because of the relatively close proximity of the new and existing plants.<sup>2</sup>

**Contention 2.2: Failure to Evaluate Site Suitability for Below-Grade Placement of Reactor Containment**

**Contention:** The Site Safety Analysis Report for the North Anna ESP is inadequate because it does not evaluate the suitability of the site to locate the reactor containment below grade-level. Below-grade construction is advisable and appropriate, if not necessary, in order to maintain an adequate level of security in the post-9/11 threat environment.

**Basis:**

**a. Legal requirements.** Pursuant to 10 C.F.R. § 52.17, an ESP application must contain “a description and safety assessment of the site on which the facility is to be located.” Section 52.17 also requires that site characteristics “must comply with part 100 of this chapter.” Part 100 requirements include the stipulation that: “[s]ite characteristics must be such that adequate security plans and measures can be developed.” 10 C.F.R. § 100.21(f). The site conditions that must be evaluated include “soil and rock stability,

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<sup>2</sup> Section 2.1.1.1 of the ESP application for North Anna reports that the proposed plant site border is within 570 feet of the Unit 1 containment building. A radiological release could therefore impact the new reactor(s).

liquefaction potential, natural and artificial slope stability, cooling water supply, and remote safety-related structure siting.”

**b. Rationale for requiring below-grade construction of containments.** The applicant should be required to evaluate the North Anna site for below-grade construction of the containment because, as currently designed and constructed, nuclear power plants are unacceptably attractive and vulnerable targets for terrorist attacks and sabotage. The attractiveness of nuclear plants as terrorist targets is well-recognized. In his 2002 State of the Union Address, for example, President Bush stated that nuclear power plants are priority targets for terrorists.

<http://www.cnn.com/2002/ALLPOLITICS/01/29/bush.speech.txt/>. The fact that nuclear plants are still high on Al Qaeda’s target list was recently confirmed by Robert Hutchings, chairman of the National Intelligence Council (which reports to the CIA Director). Reuters, “U.S. Intelligence Official: Qaeda Posed Plane Threat,” New York Times (February 17, 2004), copy attached as Exhibit 2.2-1.

The vulnerability of containment structures and associated irradiated fuel storage ponds to terrorist attack, particularly to aircraft penetration, has also been recognized in NRC documents and press articles. For example, a 1987 NRC-sponsored study found that a 12,500 pound aircraft had a 32% chance of crashing through a 6-foot thick reinforced concrete wall, and an 84% chance of penetrating through a 2-foot thick reinforced concrete wall. NUREG-/CR-5042, Evaluation of External Hazards to Nuclear



Power Plants in the United States (December 1987), relevant excerpts attached as Exhibit 2.2-2.<sup>3</sup>

A 1982 study by Argonne National Laboratory also concluded that U.S. reactor containments have not been adequately evaluated for effects of explosion and fire from impact associated with penetration by an aircraft. While the study is not available from the NRC's Public Document Room, it was described by the Washington Post in an October 25, 2001 article. Peter Behr, "Nuclear Plants Vulnerability Raised Attack Concerns: 1982 Report on Danger of Jet Crashes Into Reactors Was Open To Public," Washington Post at A4 (October 25, 2001), copy attached as Exhibit 2.2-3. According to the article, Argonne National Laboratory calculated the impact of various commercial aircraft at varying speeds. The study determined that the containment dome would be penetrated at the highest flight speeds. The study also determined that the ignition of a small percentage of the aviation fuel inside the containment dome would have the force of 1,000 pounds of explosives and "could lead to rather violent explosion environment and impose upon the primary containment relatively severe loads." *Id.* As quoted by the Washington Post article, the Argonne study raised the concern that:

Based on the review of past [NRC] licensing experience, it appears that fire and explosion hazards have been treated with much less care than the direct aircraft impact and the resulting structural response.

Therefore, the claim that these fire/explosion effects do not represent a threat to nuclear power plant facilities has not been clearly demonstrated.

*Id.* Moreover, according to NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," § 3.5.2 (January 2001), one

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<sup>3</sup> Notably, a "large" aircraft was defined as weighing 12,500 pounds, even though the report observed that a Boeing B727-200 has a maximum takeoff weight of 209,500 pounds (or roughly the equivalent of 17 "large" aircraft). *Id.*, Table 6.4 at 6-27.

out of two aircraft flying today is large enough to penetrate a 5-foot thick reinforced concrete wall, such as the side of a irradiate fuel storage pond. *Id.* Relevant pages of the report are attached as Exhibit 2.2-4.

The various advanced reactor generation designs that are being considered by Dominion in its application were developed before the terrorist attacks of September 11, and before the NRC undertook a comprehensive evaluation of its regulations to evaluate their adequacy to protect against the terrorist threat. Thus, they are not specifically designed to protect against assault by attackers with the level of determination and capability demonstrated by the September 11 terrorist attackers. In fact, the new generation of advanced reactors does not have as robust a containment as the current generation. For example, as a general matter, the containment thickness of the current generation of nuclear power plants is about 2-3 feet.<sup>4</sup> The containments of the allegedly new “inherently safe” reactor containment building designs are equivalent or even thinner. For example, the Westinghouse AP 600 Advanced Pressurized Water Reactor has a 3-foot thick containment wall of reinforced concrete.<sup>5</sup>

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<sup>4</sup> For example, the containment dome for the Clinton nuclear power station in Clinton, Illinois and the Grand Gulf nuclear power station in Port Gibson, Mississippi and other Boiling Water Reactor Mark III designs are 0.25-inches of steel and 2.5-feet of reinforced concrete. NUREG/CR-1037, Containment Performance Working Group Report at 2-29 (May 1985). Similarly, the thickness of the containment dome of the Davis-Besse reactor, a Pressurized Water Reactor, is 13/16-inch of steel and 2.5-feet thick reinforced concrete. NUREG/CR-5567, PWR Dry Containment Issue Characterization at 8 (August 1990). The thickness of the containment dome at the Surry nuclear power station, also a PWR, is 2.5 feet of reinforced concrete. NUREG/CR-5662, Hydrogen Combustion, Control, and Value-Impact Analysis for PWR Containments at 145 (June 1991).

<sup>5</sup> Declaration of Paul V. Gunter (May 3, 2004), attached as Exhibit 2.2-5.

**c. Viability of below-grade construction**

Below-grade construction of nuclear reactor containments is a viable design security measure that would protect the reactor containment from assault by aircraft or other high-power weapons. In fact, consideration of below-grade construction was recommended as a prudent design feature over 50 years ago by Dr. Edward Teller, one of the founders of the U.S. nuclear industry. In a July 23, 1953, letter to the Joint Committee on Atomic Energy, Dr. Teller noted:

[t]he various committees dealing with reactor safety have come to the conclusion that none of the powerful reactors built or suggested up to the present time are absolutely safe. Though the possibility of an accident seems small, a release of the active products in a city or densely populated area would lead to disastrous results. It has been therefore the practice of these committees to recommend the observance of exclusion distances, that is, to exclude the public from areas around reactors, the size of the area varying in appropriate manner with the amount of radioactive poison that the reactor might release. Rigid enforcement of such exclusion distances might hamper future development of reactors to an unreasonable extent. In particular, the danger that a reactor might malfunction and release its radioactive poison differs for different kinds of reactors. It is my opinion that reactors of sufficiently safe types might be developed in the near future. *Apart from the basic construction of the reactor, underground location or particularly thought-fully constructed safety devices might be considered.*

Letter from Dr. Edward Teller to the Honorable Sterling Cole, Chairman of the Joint Committee on Atomic Energy, United States Congress (emphasis added), copy attached as Exhibit 2.2-6.<sup>6</sup>

There is no indication in the ESP application that the applicant considered the suitability of the site for below-grade construction of the reactor containment. While the application evaluates the suitability of the site for construction of a foundation for the facility, suitability for underground construction would require a much more

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<sup>6</sup> Petitioners note that they were unable to obtain a copy of the original letter. The copy that is attached is was retyped and posted on the website of the Nuclear Age Peace Foundation.

sophisticated and in-depth analysis of geological and hydrogeological conditions.

Therefore, Petitioners contend that the applicant has not provided sufficient information within its site safety analysis to permit a finding that the propose site is suitable for new nuclear reactors.

### **3. Environmental Contentions**

#### **Contention 3.1: Inadequate Discussion of Severe Accident Impacts**

**Contention:** The ER's discussion of severe accident is inadequate, because it relies on the findings and conclusions of NUREG-1437, Vol. 1, the Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants (1996) ("NUREG-1437), without providing specific design information that would justify the applicability of the NUREG.

**Basis:** As required by NEPA, Section 7.2 of the ER for the North Anna site provides an analysis of environmental impacts of severe accidents at the proposed new nuclear reactor(s). *See* ER at 3-7-30. *See also* NUREG-1555, Environmental Standard Review Plan (1999). SERI's analysis is deficient, however, because it incorporates the findings and conclusions of NUREG-1437, without justifying the applicability of the NUREG.

In correspondence with the Nuclear Energy Institute ("NEI"), the NRC Staff has set limits on the use of NUREG-1437 to support or substitute for the severe accident analysis required of an ESP application. In early 2003, NEI wrote to the NRC, suggesting parameters for permitting reliance on NUREG-1437. Letter from Dr. Ronald L. Simard, NEI, to James E. Lyons, re: Resolution of Generic Topic ESP-10 (Use of License Renewal Generic Environmental Impact Statement (NUREG-1437) for Early Site Permits) (February 6, 2003) (hereinafter "Simard Letter"), copy attached as Exhibit

3.1-1. In responding to the Simard Letter, the NRC made it clear that ESP applicants could not make unqualified reliance on NUREG-1437, cautioning that:

the process suggested in Items 2, 3, and 4 [of the Simard Letter], and the concluding remarks of your letter implies that the ESP applicant can adopt the conclusions of the GEIS in its application without detailed knowledge of the design and operational characteristics of a facility that may be built on the proposed site. The GEIS documents the staff's evaluation of the environmental impacts of LWR reactors of known design, locations, and operating experiences. The analysis results documented in the GEIS may not be representative of the environmental impacts of a facility that could be built on the site proposed in an ESP application. Therefore, although the environmental impacts of the construction and operation of a nuclear facility located on the proposed site may be similar to those identified in the GEIS, it is incumbent on the ESP applicant to justify its conclusion regarding these impacts.

The NRC does believe that there may be useful insights in the GEIS that an ESP applicant can consider for its purposes in developing its environmental report, but, as stated above, the burden for justifying relevance and demonstrating completeness rests entirely with the applicant. In addition, the NRC retains the prerogative to utilize well-established NEPA techniques, such as tiering, cooperation and adoption, where the NRC believes that it is appropriate.

Letter from James E. Lyons, NRC, to Dr. Ronald L. Simard, NEI, re: Resolution of Early Site Permit Topic 10 (ESP-10), Use of License Renewal Generic Environmental Impact Statement (NUREG-1437) for Early Site Permits (April 1, 2003) (hereinafter "Lyons Letter I"), copy attached as Exhibit 3.1-2. In a subsequent letter, Mr. Lyons Letter further clarified that:

[t]he NRC will perform its review on severe accident environmental impacts in accordance with ESRP Section 7.2. If specific plant design information is available (e.g., a detailed design with a Level 3 PRA), then this information would be used in the evaluation. However, even in the absence of a detailed plant design (e.g., the specific reactor type or technology is undecided), a severe accident impacts analysis is technically feasible at the ESP stage using a PPE approach and the existing guidance in ESRP [Early Site Review Plan] Section 7.2. Such a approach could involve characterizing the spectrum of credible releases from candidate future plant designs, in terms of representative source terms and their respective frequencies, and using these release characteristics in conjunction with site-specific population and meteorology to determine site-specific risk

impacts for the surrogate design. Release characteristics could be developed through a survey of severe accident analyses for previously certified ALWRs and/or operating reactors. Risk impacts could be assessed using the same metrics as in previous plant-specific and generic EISs, such as NUREG-0974, “Limerick 1 and 1 Operating License” and NUREG-1437. These metrics include population dose, early and latent fatalities, and economic costs. The metrics would be used to determine the acceptability of the proposed site at the ESP stage.

Letter from James E. Lyons, NRC, to Dr. Ronald L. Simard, NEI, re: Response to Letter on Early Site Permit Topic 12 (EP-12, NEPA Consideration of Severe Accident Issues at 2 (June 25, 2003) (hereinafter “Lyons II Letter”), attached as Exhibit 3.1-3.

Contrary to the guidance of the Lyons I Letter and the Lyons II Letter, the ER for the North Anna site fails to justify the use of NUREG-1437 as a surrogate for a severe accident analysis for the proposed new reactor(s). Section 7.2.2, which purports to address the “Applicability of Existing Generic Severe Accident Studies,” makes only broad generalizations in support of the applicability of NUREG-1437, related to the characteristics of the site, whether regulatory controls can be assumed to work, and whether plant lifetime has an effect on risk. It is not possible to find any characterization of “the spectrum of credible releases from candidate future plant designs, in terms of representative source terms and their respective frequencies,” or the use of “release characteristics in conjunction with site-specific population and meteorology to determine site-specific risk impacts for the surrogate design.” *See* Lyons II Letter at 2. Nor does the ER show that Dominion has developed “[r]elease characteristics . . . through a survey of severe accident analyses for previously certified ALWRs and/or operating reactors,” or assessed risk impacts “using the same metrics as in previous plant-specific

and generic EISs, such as NUREG-0974, “Limerick 1 and 1 Operating License” and NUREG-1437.”<sup>7</sup>

The ER simply makes no attempt to analyze the potential for severe accidents with respect to any of the advanced designs proposed by Dominion. There is no indication in the ER that the design information used for NUREG-1437 would be applicable to the advanced designs proposed by Dominion, or that the behavior of those advanced reactors under severe accident conditions would be the same or similar. Accordingly, SERI’s severe accident analysis is fatally deficient.

### **Contention 3.2 Waste Confidence**

Contention 3.2 is broken down into two contentions, 3.2.1 and 3.2.2. Contention 3.2.1 challenges Dominion’s failure to evaluate whether and in what time frame spent fuel generated by the proposed new reactors can be safely disposed of. The contention rests on the premise that the Waste Confidence decision does not apply to this proceeding. Contention 3.2.2 argues that in the event the Waste Confidence Decision is found to apply, it should be reconsidered.

#### **Contention 3.2.1: Failure to Evaluate Whether and in What Time Frame Spent Fuel Generated by Proposed Reactors Can Be Safely Disposed Of**

**Contention:** The ER for the North Anna ESP is deficient because it fails to discuss the environmental implications of the lack of options for permanent disposal of the irradiated (*i.e.*, “spent”) fuel that will be generated by the proposed reactors if they are built and operated. Nor has the NRC made an assessment on which Dominion can rely regarding

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<sup>7</sup> In fact, Section 7.2.1 of the North Anna ER appears to be a cookie-cutter discussion, as it duplicates, almost word-for-word, the discussion of severe accidents in Section 7.2.2 of the ER for the Grand Gulf ESP application.

the degree of assurance now available that radioactive waste generated by the proposed reactors “can be safely disposed of [and] when such disposal or off-site storage will be available.” Final Waste Confidence Decision, 49 Fed. Reg. 34,658 (August 31, 1984), citing *State of Minnesota v. NRC*, 602 F.2d 412 (D.C. Cir. 1979). Accordingly, the ER fails to provide a sufficient discussion of the environmental impacts of the proposed new nuclear reactors.

**Basis:** The ER for the proposed new reactors does not contain any discussion of the environmental implications of the lack of options for permanent disposal of the irradiated fuel to be generated by two new reactors on the North Anna site. Therefore, it is fatally deficient. *State of Minnesota v. NRC*, 602 F.2d at 416-17.

While Dominion may have intended to rely on the NRC’s Waste Confidence decision, issued in 1984 and most recently amended in 1999, that decision is inapplicable because it concerns plants that are currently operating, not new plants. The second finding of the Waste Confidence Decision, as amended in 1999, is that the Commission has:

reasonable assurance that at least one mined geologic repository will be available within the first quarter of the twenty-first century, and that sufficient repository capacity will be available within 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of any reactor to dispose of the commercial high-level radioactive waste and spent fuel originating in such reactor and generated up until that time. (This finding revised the finding in the original decision that a mined geologic repository would be available by the years 2007 to 2009).

Waste Confidence Decision Review: Status, 64 Fed. Reg. 68,005, 68,006 (December 6, 1999). Clearly, the Commission’s finding applies to any existing reactor, including reactors whose licenses are revised or renewed. The Commission gives no indication that



it has confidence that repository space can be found for spent fuel and other high-level radioactive waste from new reactors licensed after December of 1999.

Moreover, the revised second finding in the 1999 Waste Confidence review statement conspicuously fails to assert confidence in the likelihood that more than one repository will be licensed. In fact, the Commission has backtracked on its original 1984 “Nuclear Waste Confidence Decision,” in which the Commission expressed confidence that “one or more” repositories would open between 2007 and 2009. Waste Confidence Decision, 49 Fed. Reg. at 34,673. The 1999 Status Report states merely that “at least one” repository will open by 2025. 64 Fed. Reg. at 68,006.

It is also clear that the inventory of spent fuel and other high-level radioactive waste being generated by the *current* generation of nuclear reactors is far greater than what can be accommodated in the single repository in which the Commission places its confidence, Yucca Mountain, Nevada. The proposed Yucca Mountain repository can only accept 63,000 metric tons of commercial high-level radioactive waste and irradiated nuclear fuel, at least until a second national repository became operational.<sup>8</sup> Even

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<sup>8</sup> Under the Nuclear Waste Policy Act (“NWPA”), 63,000 metric tons is the legal limit for commercial waste storage that can be “disposed of” at Yucca Mountain, Nevada, at least until a second repository is operational elsewhere in the U.S. As the NWPA states at Section 114(d):

The [NRC] decision approving the first such application [for a license to open and operate a repository] shall prohibit the emplacement in the first repository of a quantity of spent fuel containing in excess of 70,000 metric tons of heavy metal or a quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent fuel until such time as a second repository is in operation...”

42 U.S.C. § 10134(d). By long-established DOE policy, the first 70,000 metric tons of irradiated nuclear fuel and solidified high-level radioactive waste “disposed of” at Yucca Mountain, Nevada would include 90% commercial nuclear reactor waste, and 10% DOE

assuming only 40 years of operations with no operating license renewals and no new nuclear reactors, the U.S. Department of Energy (DOE) has known since at least the mid-1990's – that is, since before the most recent (1999) NRC review of its “Nuclear Waste Confidence Decision” -- that by the year 2030 or so, well over 80,000 metric tons of irradiated nuclear fuel generated at commercial nuclear reactors will exist in the U.S. U.S. Nuclear Waste Technical Review Board (“NWTRB”) “Disposal and Storage of Spent Nuclear Fuel: Finding the Right Balance,” Figure 2 at page 11 (March 1996), copy attached as Exhibit 3.2.1-1. This is significantly in excess of the “disposal” capacity at Yucca Mountain.

NRC's now-routine approval of 20 year license extensions to old commercial nuclear reactors will only increase the quantity of high-level radioactive waste that exceeds the capacity limits at the proposed Yucca Mountain, Nevada repository. In its “Final Environmental Impact Statement for a Repository for Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada,” (Feb. 2002) (hereinafter “Yucca Mountain EIS”), DOE predicted the generation of over 105,000 metric tons of commercial irradiated nuclear fuel by the year 2046. *Id.*, Table A-8, page A-16. While NRC's standard license extension term is 20 years, the DOE prediction assumed that the term of license extensions would be only 10 years. DOE also assumed no new commercial nuclear reactors in the U.S. Thus, the high-level waste and spent fuel

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waste from the nuclear weapons production complex and nuclear energy research activities. 90% of 70,000 metric tons means that only 63,000 metric tons of commercial irradiated nuclear fuel could be “disposed of” at Yucca Mountain, Nevada, at least until a second national repository is operational in the United States. *See* Yucca Mountain EIS at A-1.

generated by the *current* generation of reactors will far exceed the capacity of the single repository that the NRC has identified as feasible and likely.<sup>9</sup>

Accordingly, the spent fuel and other high-level radioactive wastes generated at the proposed new reactors could not be “disposed of” at Yucca Mountain unless and until a second national repository is operating. But the Commission has not expressed confidence that a second repository will open. Any spent fuel or other high-level radioactive waste generated after the year 2011 or so (after 63,000 metric tons of commercial irradiated nuclear fuel has been generated) would have nowhere to go, would lack “disposal” space at a repository, unless and until a second repository is opened and operating in the U.S. somewhere other than Yucca Mountain, Nevada – a process that could very well take many decades, based on the experience of trying to open the first repository at Yucca Mountain, Nevada.

Moreover, Congress has not given the NRC any basis for assuming that a second repository will be opened. Section 161(b) of the NWPA provides that: “[t]he Secretary [of Energy] shall report to the President and to Congress on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository.” 42 U.S.C. §

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<sup>9</sup> Experience also shows that the NRC has been overly optimistic about the opening of the first repository. It took from 1982 (the year the Nuclear Waste Policy Act was passed) until 2002 – 20 full years -- just for the DOE to recommend Yucca Mountain as “suitable” for repository development (a recommendation, by the way, that is being challenged in federal court by the State of Nevada). Although DOE still predicts the Yucca Mountain repository will open by the year 2010, the U.S. General Accounting Office (GAO) has reported that a repository at Yucca Mountain, Nevada probably could not open to receive waste shipments till 2015. GAO-02-191, “Nuclear Waste: Technical, Schedule, and Cost Uncertainties of the Yucca Mountain Repository Project” (December, 2001). Even this date is doubtful, given the serious technical criticism of DOE’s current repository design. *See, e.g.*, U.S. NWTRB, “Technical Report on Localized Corrosion” (November 25, 2003). In addition, several legal challenges have been filed against the Yucca Mountain repository and the proposed standards for operation.

10172a(b). Section 161(a) also states that: “The Secretary [of Energy] may not conduct site-specific activities with respect to a second repository unless Congress has specifically authorized and appropriated funds for such activities.” 42 U.S.C. §

10172a(a). The Secretary of Energy has not made a finding that a second repository is needed, nor has Congress specifically authorized or appropriated funds for site-specific activities.

The Commission’s failure to express confidence that a second repository will be opened any time soon also implicates the third and fourth findings of the Waste Confidence Decision, *i.e.*, that spent fuel and other high-level radioactive waste can be safely stored at reactor sites for up to 30 years. 64 Fed. Reg. at 68,006. If the Commission has no confidence that a repository will open at some reasonable time in the future, it must be assumed that spent fuel may sit at the reactor site for an indefinite period of time. The environmental impacts of such indefinite storage must be evaluated before an Early Site Permit can be granted.

**Contention 3.2.1: Even if the Waste Confidence Decision Applies to This Proceeding, It Should be Reconsidered.**

**Contention:** Even if the Waste Confidence Decision applies to this proceeding, it should be reconsidered, in light of significant and pertinent unexpected events that raise substantial doubt about its continuing validity, *i.e.*, the increased threat of terrorist attacks against U.S. facilities.

**Basis:** In its 1999 “Nuclear Waste Confidence Decision” revision, NRC stated “the Commission would consider undertaking a comprehensive reevaluation of the Waste Confidence findings...if significant and pertinent unexpected events occur raising

substantial doubt about the continuing validity of the Waste Confidence findings.” 64 Fed. Reg. at 68,007. Clearly, the catastrophic terrorist attacks upon the United States on September 11<sup>th</sup>, 2001 constituted significant and pertinent unexpected events that raise substantial doubts about the continuing validity of the third and fourth findings of the revised Waste Confidence Decision. These findings are:

3. The Commission finds reasonable assurance that high-level radioactive waste and spent fuel will be managed in a safe manner until sufficient repository capacity is available to assure the safe disposal of all high-level waste and spent fuel (This finding is identical to the finding in the original Waste Confidence Decision in 1984).

4. The Commission finds reasonable assurance that, if necessary, spent fuel can be stored safely and without significant environmental impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin, or at either onsite or offsite independent spent fuel storage installations. (This finding is basically identical to that in the original Waste Confidence Decision with the addition of the consideration of license renewal and spent fuel storage 30 years beyond the licensed life for operation of a reactor).

64 Fed. Reg. at 68,006. The terrorist threat to irradiated nuclear fuel and high-level radioactive waste – whether it is being stored on-site at commercial reactors in storage pools or dry casks; stored in away-from-reactor Independent Spent Fuel Storage Installations; or transported by truck, train, or barge between nuclear plants and off-site interim storage facilities – demands an evaluation of whether (a) it is appropriate to store spent fuel and other highly radioactive waste for 30 years or more pending availability of a permanent repository, and (b) whether nuclear power should be phased out as quickly as possible as a matter of environmental protection, national security, public safety, and common defense.

The homeland security risks posed by indefinite temporary storage of spent fuel have been recognized by Energy Secretary Spencer Abraham:

Yucca Mountain is an important component of homeland security. More than 161 million people live within 75 miles of one or more nuclear waste sites, all of which were intended to be temporary. We believe that today these sites are safe, but *prudence demands we consolidate this waste from widely dispersed, above-ground sites into a deep underground location that can be better protected.*

Statement of Spencer Abraham, Secretary of Energy, Before the Energy and Natural Resources Committee, U.S. Senate (May 16, 2002), copy attached as Exhibit 3.2.1-2 (emphasis added). It is undisputed that neither fuel storage pools nor dry storage facilities are designed to withstand the type of determined and sophisticated attack that was carried out on September 11, 2001.

To protect against and mitigate the impacts of terrorist attacks, the NRC has developed a system to maintain a constant state of alert, undertaken a comprehensive review of the adequacy of its safety and security regulations, and upgraded its security requirements for all operating nuclear facilities in the United States. Clearly, under NEPA it is also appropriate to consider whether the Commission continues to have a basis for expressing confidence that stored spent fuel and other high-level radioactive waste is safe from a terrorist attack.

Petitioners are aware that the Commission has ruled that environmental impacts of terrorist attacks are not cognizable under NEPA. *See, e.g., Pacific Gas & Electric Co.* (Diablo Canyon Independent Spent Fuel Storage Installation), CLI-03-01, 57 NRC 1 (2003); *Private Fuel Storage, L.L.C.* (Independent Fuel Storage Installation), CLI-02-25, 56 NRC 340 (2002). Petitioners request that the Commission reconsider this policy, in light of (a) the obvious attractiveness and vulnerability of spent fuel to terrorist attack, (b) the Secretary of Energy's recognition of the relationship between homeland security and assured capacity for timely spent fuel disposal; and (c) the Commission's explicit

statement in the Waste Confidence status review that it would undertake a comprehensive reevaluation of the Waste Confidence findings if “significant and pertinent unexpected events” occur raising substantial doubt about the continuing validity of the Waste Confidence findings. Clearly, that condition is met here.

**Contention 3.3: Failure to Adequately Address Environmental Impacts of Proposed Reactors on Lake Anna**

**Contention:** In general, this contention asserts that the ER for the North Anna ESP application fails to adequately address the environmental impacts of the proposed new reactor(s) on Lake Anna and associated water bodies. The contention is broken into four subparts. Contentions 3.3.1 through 3.3.3 identify aspects in which Dominion Contention 3.3.1 asserts that the ER does not contain a complete or sufficient assessment of the adequacy of water supplies required for the operation of new units at the North Anna site. Contention 3.3.2 asserts that the ER does not adequately address the adverse impact of operating one or two additional reactors on the health of fish and other aquatic life in Lake Anna and the North Anna River. Contention 3.3.3 asserts that the ER does not contain a complete or adequate assessment of the potential impacts of the proposed expansion of the North Anna nuclear complex on water-based recreational uses of the lake and on homeowners who live around the lake. Contention 3.3.4 asserts that the ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because it fails to consider alternatives to the use of Lake Anna water for cooling Units 3 and 4, as well as the no-action alternative.

In addition, the ER fails to discuss conflicts between Dominion’s proposed use of water to cool the proposed new reactor(s), and state and federal law which protects those waters. Failure to address these conflicts violates 10 C.F.R. § 51.45(d), which requires an

applicant to address the status of its compliance with state and federal law governing the proposed project.

These contentions are supported by the expert Declaration of Barry Sulkin, attached as Exhibit 3.3-1.

**General legal basis:** Pursuant to the National Environmental Policy Act (“NEPA”), 42 U.S.C. § 4332, and NRC implementing regulations at 10 C.F.R. § 51.45(b)(1) and (2), Dominion’s ER must describe the environmental impacts of its proposed action. As further described in the regulations of the President’s Council on Environmental Quality, the impacts that must be discussed include direct and indirect impacts, and possible conflicts between the proposed action and the objectives of Federal, regional, State, and local land use plans, policies and controls for the area concerned. 40 C.F.R. § 1502.16. In addition, the ER must evaluate the cumulative impacts of the proposed reactor(s), in combination with each other and with the existing reactors. *LaFlamme v. FERC*, 852 F.2d 389, 401 (9<sup>th</sup> Cir. 1988), citing 40 C.F.R. § 1508.7.

The standard for an adequate NEPA review of environmental impacts is rigorous. The agency must “carefully consider,” *i.e.*, take a “hard look” at the environmental impacts of a proposed action. *Hughes River Watershed Conservancy v. Sierra Club*, 81 F.3d 437, 443 (4<sup>th</sup> Cir. 1996), citing *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

**General factual basis:** Petitioners note that the primary sources of the information that is provided in these contentions consist of the results of (1) reviews conducted by the U.S. Fish and Wildlife Service (“FWS”) in 2001 and 2003 of Dominion's recent application for renewal of its existing operating license for Units 1 and



2<sup>10</sup>; (2) a review by the Commonwealth of Virginia of Dominion's ESP application for a federal consistency certification under the Virginia Coastal Zone Management Act and the federal Coastal Resources Management Program, a process to evaluate whether the proposed operation will comply with applicable environmental requirements<sup>11</sup>; and (3) personal inspection of the area made by Barry Sulkin on April 5, 2004. The FWS reviews of 2001 and 2003 document significant adverse impacts from the existing reactors. The Commonwealth of Virginia's review also describes serious adverse environmental impacts of current and proposed operations. In fact, VDEQ concludes that Dominion's ESP application does not "form an adequate basis for the preparation of an Environmental Impact Statement by the Nuclear Regulatory Commission (NRC)."<sup>12</sup>

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<sup>10</sup> See letter from John P. Wolflin, U.S. Fish and Wildlife Service, to Andrew Kugler, NRC, re: NUREG-1437, Final Supplement 7 to Generic Environmental Impact Statement Regarding North Anna Power Station (NAPS), Units 1 and 2 (February 4, 2003) hereinafter "FWS, February 4, 2003 letter to NRC"), copy attached as Exhibit 3.3-2; letter from John P. Wolflin, U.S. Fish and Wildlife Service, to Andrew Kugler, NRC, re: Virginia Electric & Power Company, License Nos. NPF-4 and NPF-7, North Anna Power Station, Lake Anna, Spotsylvania and Louisa Counties, Virginia (November 7, 2001) (hereinafter "FWS, November 7, 2001 letter to NRC"), copy attached as Exhibit 3.3-3.

<sup>11</sup> See, e.g., letter from Ellie L. Irons, VDEQ, to Pamela F. Faggert, Dominion Virginia Power Company, re: Federal Consistency Certification under the Coastal Zone Management Act and the Virginia Coastal Resources Management Program: North Anna Early Site Permit Application, DEQ-03-223F (February 10, 2004) (hereinafter "VDEQ letter to Dominion, February 10, 2004"), and attachments, copy attached as Exhibit 3.3-4. The attachments to VDEQ letter to Dominion, February 10, 2004, include several pieces of correspondence, two of which are separately marked as exhibits for the convenience of the ASLB and parties: letter from Gary Martel, Virginia Department of Game and Inland Fisheries, to Ellie Irons, VDEQ (January 27, 2004) (hereinafter "VDGIF, January 27, 2004 letter to VDEQ"), (Exhibit 3.3-5); and Memorandum from Joseph P. Hassell, VDEQ, to Ellie Irons, VDEQ (January 15, 2004) (hereinafter "VDEQ, January 15, 2004 memo to Ellie Irons") (Exhibit 3.3-6).

<sup>12</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 1.

Dominion withdrew its request of the Commonwealth of Virginia for a federal consistency certification review on January 12, 2004.<sup>13</sup>

**Sub-contentions:**

**Contention 3.3.1: Inadequate Discussion of Impacts on Water Quantity in Lake Anna and Downstream**

**Contention:** The ER does not contain a complete or sufficient assessment of the adequacy of water supplies required for the operation of new units at the North Anna site. In particular, the ER does not sufficiently address the adequacy of water supplies in Lake Anna for the proposed new Units 3 and 4, and fails to identify the supplementary external water source for Unit 4. The ER also fails to account for the impact of an additional unit or units on the river flow downstream.

**Basis:**

**a. Background on Lake Anna water supply.** Lake Anna is a man-made lake, which was constructed in 1971 by damming the North Anna River in order to provide cooling water for the North Anna Power Station ("NAPS"). ER at 3-2-20. Lake Anna is about 27 kilometers (17 miles) long, with a total volume of 550,000 acre-feet. Three dikes divide Lake Anna into two sections. The larger section, with an area of 9,600 acres, is used as the source for cooling water for the two existing units. The smaller impoundment, referred to as the Waste Heat Treatment Facility ("WHTF"), or locally as the "hot side" of the lake, has an area of about 3,400 acres and is used as a waste treatment unit for the hot water discharge from the two existing units. The water partially

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<sup>13</sup> VDEQ letter to Dominion, February 10, 2004, page 1.

cools before entering the larger portion of the lake by transferring heat to the atmosphere and by mixing with the ambient waters in that portion of the lake. The hot water remains in the WHTF either 7 days (ER at 3-5-42) or 14 days (ER at 3-2-71). Approximately half of the heat is dissipated from the water before the water enters the larger section of the lake. ER at 3-5-42.

When the two currently existing units of the NAPS are operating, the reactors draw 1.9 million gallons per minute (gpm) (4,246 cubic feet per second (cfs)) from Lake Anna, circulate it through the condensers, and discharge it to the WHTF. ER § 5.3.1.1. This represents 2.8 % of the total volume of Lake Anna when the lake level is 250 feet (ft) above mean sea level (msl). ER § 5.3.1.2. An additional 28,725 gpm (64 cfs) are withdrawn for other plant uses. ER § 5.3.1.1. The average annual flow to Lake Anna is 166,000 gpm (370 cfs). ER § 5.2.1. All of the water withdrawn from the lake is returned at a higher temperature. ER § 5.3.1.2.

Water flows out of the lake through the Lake Anna Dam, which is required by the Commonwealth of Virginia to discharge at least 40 cfs. However, this value was renegotiated after the recent drought (1989-2002) to allow the lake discharge flow to go as low as 20 cfs under drought conditions, defined as when the water level in Lake Anna is equal to or less than 248 ft msl. The State Water Control Board recommended 80 cfs in 1971, but was overruled by the State Corporation Commission.<sup>14</sup>

Dominion proposes that the new Unit 3 would be a once-through system, like the two existing units, in which water is withdrawn from Lake Anna, circulated through the condensers, and returned to the lake via the WHTF. The new Unit 4 would use a closed-

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<sup>14</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 4.

cycle system with cooling towers for plant cooling and heat dissipation. A once-through Unit 3 would require an additional 1.14 million gpm (2,540 cfs) and a closed-cycle Unit 4 would require up to 31,418 gpm (70 cfs). ER § 5.3.1.

Dominion intends to use Lake Anna to supply most of the water for the proposed two new units, including plant cooling, initial fill and make-up water for the cooling tower, demineralized water system, and fire protection. Up to 9,874 gpm (22 cfs) for the two units would also be required for “incidental plant water usage.” ER § 5.3.1. Water for the cooling towers of Unit 4 would be supplemented from an unspecified “outside source” to replace water that had evaporated. ER § 5.3. According to the VDEQ, the state permit for Unit 3 cooling water would be the “single largest consumptive withdrawal ever considered in the history of the Virginia Water Protection Permit Program.”<sup>15</sup>

**b. Insufficiency of ER to address water supplies or identify supplementary external water source for Unit 4.** The ER has does not sufficiently address the adequacy of water supplies in Lake Anna for the proposed new Units 3 and 4 and fails to identify the supplementary external water source for Unit 4.

The operation of the NAPS requires a Virginia Pollutant Discharge Elimination System (“VPDES”) permit for the discharge of thermally polluted water, according to the Clean Water Act (“CWA”) regulations that require permits to contain requirements to protect state standards. 40 C.F.R. § 122.44(b) and (d). These regulations include the intake of water as well as the release. The addition of two new reactors would increase the amount of water withdrawn from Lake Anna by more than 60% when the lake level is

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<sup>15</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 3. The Virginia Water Protection Permit Regulation (9 VAC 25-210) program regulates water withdrawals.

250 ft msl, which would be insufficient to protect state standards and thus contrary to the CWA. 40 C.F.R. § 122.44(b) and (d).

Dominion asserts that “the available water supply from the Lake Anna watershed is adequate to meet plant water needs for the existing units plus Unit 3 alone, or the existing units plus Units 3 and 4, on a long-term average basis.” ER § 5.2.1.5. This is in direct contradiction with the conclusion reached by the VDEQ analysis of the ESP application, which concluded that “The site is probably not suitable for the construction of two new reactors of the size proposed due to a lack of sufficient water resources.”<sup>16</sup>

According to the ER, additional sources of water could be required for Unit 4 on short-term bases during droughts. ER § 5.2.1. Dominion proposes three options for minimizing the adverse hydrologic impacts of reducing the Lake Anna water levels. ER § 5.2.1.3. Two of the options would require the “use of an external source of water.” *Id.* The third depends on the type of plant chosen for Unit 4. ER § 5.2.1.3. The ER fails to include any proposals for the origin of this external source of water. ER § 5.2.1.3. Analyses by both the VDEQ and the VDGIF conclude that the water source for Unit 4 is likely to be Lake Anna, because no other options, such as groundwater or nearby surface water, would be capable of producing the large quantities of water that would be needed.<sup>17</sup>

Dominion intends to delay evaluating “the requirement of the external water supply and the environmental impact of bringing this water to Unit 4” until it submits the combined construction and operation license (“COL”) application. ER § 3.4.1.1 and ER at 3-5-21. Failure to identify the source of water for Unit 4 makes it impossible to

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<sup>16</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 6.

<sup>17</sup> VDEQ, February 10, 2004 letter to Dominion, page 3.

adequately assess the impact of the proposed expansion. Moreover, this issue relates directly to whether the site is appropriate for any additional units and should be fully addressed before site redress is permitted and the COL application is submitted.

Based on available information, it must be assumed for the purposes of impact evaluation that the proposed expansion of additional units at NAPS would result in all needed cooling water coming from the same source of Lake Anna. Indeed, VDGIF concludes that Unit 4's "water consumption should be addressed as if water were being withdrawn from the lake (or Unit 4 should not be part of the permitting process)."<sup>18</sup> VDEQ also recommends that if Dominion does not identify a water source for Unit 4, NRC should consider denying the ESP application for a new fourth reactor.<sup>19</sup>

**c. Failure to account for impacts on river flow downstream.** The addition of one or two new units to the North Anna Power Station would have significant impacts on downstream resources by increasing the frequency of reduced river flows from the North Anna Dam. The State of Virginia's regulations governing water withdrawals require that a minimum release of 40 cubic feet per second ("cfs") be maintained out of the North Anna Dam to maintain instream flows and water quality below the dam. However, revised provisions in the VPDES permit allow flows out of the dam to go even lower to 20 cfs when Lake Anna water surface elevation falls below 248 feet above mean sea level (msl) due to drought conditions.<sup>20</sup> At the lowest flow rates, only 5.4% of the natural flow is released from the dam. According to the Tennant method for flow

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<sup>18</sup> VDGIF, January 27, 2004 letter to VDEQ, page 2

<sup>19</sup> VDEQ, February 10, 2004 letter to Dominion, page 3.

<sup>20</sup> VPDES Permit No. VA0052451, Part I.F (Lake Level Contingency Plan).

recommendations, the resulting flow downstream is rated “severe degradation.” Even at 40 cfs, the downstream flow is considered “poor.”<sup>21</sup>

Under natural or pre-dam conditions (1929-1971), drought flow frequency (< 20 cfs) in the river below the present dam location occurred 4.2% of the time. Currently, drought flows occur 5.3% of the time. With a third reactor, the frequency would increase to 11.8%. In its comments on the ESP application, the VDEQ states that it is concerned that “nearly perennial conditions of severe degradation will likely be created each fall” with an additional reactor.<sup>22</sup>

A fourth reactor would further increase the frequency of drought flows, but Dominion fails to calculate the frequency in its flow analysis in Section 5.2.2, stating instead that it would be addressed in the COL application.

Under current operating conditions with the two existing units, it is apparent that there is already inadequate water in the system. When the lake level falls below 244 ft msl, the existing plants are required to shut down. During the 2002 drought, lake levels dropped to 245.1 ft msl. With an additional Unit 3, the level would have fallen 2.5 feet lower to 242.6 ft msl, which would have required that the reactors be shut down.<sup>23</sup> With the addition of Unit 3, lake levels would fall to or below 244 ft msl 1.1% of the time. ER § 5.2.2.2.

The ER fails to detail the water budget analysis for the lake levels if both Units 3 and 4 are built. ER § 5.2.2. However, in Section 3.4.1.3.3, Dominion states that with all four reactors, the lake level could be below 244 ft msl about 3% of the time. The

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<sup>21</sup> VDGIF, January 15, 2004 memo to VDEQ, page 2-3.

<sup>22</sup> VDEQ, January 15, 2004 memo to VDEQ, page 4.

<sup>23</sup> VDEQ, February 10, 2004 letter to Dominion, page 12;

Northern Virginia Regional Office (“NVRO”) of the VDEQ estimates that with the addition of both Units 3 and 4, the water level could decrease even further to 242 ft msl during drought conditions.<sup>24</sup> Dominion states that it could lower the shutdown elevation for the existing units to 242 ft msl. ER § 5.2.2.2. This is 6 ft lower than the level at which the lake contingency plan goes into effect, which means flows from the dam would be reduced to as low as 20 cfs.

Thus, the ER fails to adequately account for the impact of an additional unit or units on the river flow downstream.

**Contention 3.3.2: Impacts on Fish and Other Aquatic Life in Lake Anna and Downstream**

**Contention:** The ER does not adequately address the adverse impact of operating one or two additional reactors on fish and other aquatic life health in Lake Anna and the North Anna River. In particular, the ER does not adequately consider the four primary impacts of the proposed reactors to the fish and other aquatic life at Lake Anna and downstream: increased water temperature, impingement, entrainment, and downstream flow rates.<sup>25</sup> In addition, the ER does not address conflicts between Dominion’s proposals for water use and the requirements of the Clean Water Act (“CWA”) and its implementing regulations. Finally, the ER does not address the cumulative impacts of proposed Units 3 and 4 on the already-stressed aquatic systems in Lake Anna and the North Anna River.

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<sup>24</sup> NVRO, February 2004 memo to Ellie Irons (VDEQ).

<sup>25</sup> Impingement is the accumulation of fish and other aquatic life caught against the cooling water intake screen. Entrainment is the forced influx of aquatic life into the cooling system through the cooling water intake screen, resulting in the death of the aquatic life.



**Basis:**

**a. Background: fish and aquatic life in North Anna and downstream.** As background, Lake Anna is an important recreational fishing locale in Virginia. The most important species for recreational fishing at the lake include largemouth bass, striped bass, and black crappie. ER § 2.4.2.2.2. Since 1972, the VDGIF has stocked four non-native species in the lake, including striped bass, walleye, threadfin shad, and blueback herring. ER at 3-2-73.

The North Anna River downstream of the North Anna Dam is also used for recreational fishing, usually from shore or from small boats, such as canoes. ER § 2.4.2.3.2. The primary fishing species include largemouth bass, smallmouth bass, and redbreast sunfish. ER § 2.4.2.3.2.

**b. Thermal impacts.** In Section 5.3.1, the ER recognizes that adding an additional reactor or two will increase the lake temperature, but fails to fully acknowledge the impacts of the existing operations or to adequately assess the increased impacts of additional reactors on the health of fisheries on Lake Anna and downstream in the North Anna River with the addition of one or two new units. ER § 2.4.2 and § 5.3.2. In Section 2.4.2.2 of the ER, for instance, Dominion states that “Fisheries monitoring [by Virginia Power] over a recent six-year period (1995-2000) reveals a balanced reservoir fish community comprised of healthy populations of top-of-the-food-chain predators (e.g., largemouth bass and striped bass) and the forage species on which they feed ...” This assertion fails to acknowledge the significant stress that the NAPS has already

placed on fish in Lake Anna and the North Anna River, and is contradicted by the results of reviews conducted by the FWS in 2003 and the VDGIF in 2004.

Currently, stratification of Lake Anna, layers of different temperature water between the top and bottom of the lake, occurs infrequently and is weak, often less than 1.8 degrees Fahrenheit in the late summer and early fall.<sup>26</sup> Striped bass, one of the most thermally-sensitive fish species in the lake, prefer temperatures in the range of 65-70 degrees Fahrenheit and avoids temperatures in the range of 77-81 degrees Fahrenheit (ER Table 5.3-22). According to VDGIF, “Adult striped bass [in Lake Anna] grow slowly, exhibit reduced fitness (condition), and have low maximum sizes as a result of the marginal habitat conditions now present...”<sup>27</sup> VDEQ calls the current conditions at Lake Anna “a tenuous situation” for the health of the population.<sup>28</sup>

With the addition of one reactor with once-through cooling, the maximum daily surface temperature is expected to increase by 3.6 degrees Fahrenheit near the dam and 2.8 degrees near the intake pipe. ER at 3-5-46. The maximum daily surface temperature at the dam is expected to be 90 degrees for 13 % of the time, which is well above the preferred range for striped bass. ER at 3-5-46. With the existing reactors, a maximum daily surface temperature above 90 degrees at the dam is predicted 1% of the time. ER at 3-5-46.

Increasing the heat input into the lake will force the striped bass to move to the upper portion of the lake with cooler waters, at least in the summer and fall, which could further affect growth if the fish are not able to feed normally. Dominion states that

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<sup>26</sup> VDGIF, January 27, 2004 letter to Ellie Irons (VDEQ), page 3

<sup>27</sup> VDGIF, January 27, 2004 letter to Ellie Irons (VDEQ), page 3.

<sup>28</sup> VDEQ, February 10, 2004 letter to Dominion, page 5.

“Thermal impacts on striped bass would be moderate and could warrant mitigation.” ER § 5.3.2.2.2. However, according to VDGIF, “it is likely that even a small increase in reservoir water temperature would have a dramatic effect – further reducing the already limited habitat and perhaps jeopardizing the entire striped bass fishery.”<sup>29</sup>

In order to be eligible for a thermal variance from the state water quality standard for temperature under Section 316(a) of the CWA [33 U.S.C. 1326(a)], it must be shown that there will be no adverse impact. The CWA states in relevant part:

(a) Effluent limitations that will assure protection and propagation of balanced, indigenous population of shellfish, fish, and wildlife.

With respect to any point source otherwise subject to the provisions of section 1311 of this title or section 1316 of this title, whenever the owner or operator of any such source, after opportunity for public hearing, can demonstrate to the satisfaction of the Administrator (or, if appropriate, the State) that any effluent limitation proposed for the control of then thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the [protection] and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made.

*Id.* Considering the above documentation of existing impacts, it follows logically that doubling the number of units and coincident use and discharge of heated water, the impacts will increase as well. Such an opinion is also stated in the VDEQ and VDGIF comments. This would result in additional impacts that prevent the existence of a healthy and balanced population of aquatic communities as required by the CWA, and specifically prohibited by Section 316(a) of the act [33 U.S.C. 1326(a)]. While the current 316(a) thermal variance that is in place is questionable based on failure to achieve the requirements, clearly additional thermal pollution could not be permitted.

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<sup>29</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), page 3.

**c. Impingement and entrainment.** In Section 5.3.1.2.2 and Section 5.3.1.2.4, the ER recognizes that adding an additional reactor or two will increase the number of impinged and entrained fish, but fails to adequately consider adverse impacts of increased impingement and entrainment of fish and other aquatic life in the NAPS water intake system with the addition of one or two new units.

Increasing the water withdrawal for an additional reactor or two will increase the mortality of fish and other aquatic species in the lake due to impingement or entrainment. The current annual impingement from six “representative” species is estimated to be 182,440 fish per year, based on data collected from 1979 to 1983. ER § 5.3.1.2.1. Dominion calculated that the number of impinged fish would increase to 422,027 with an additional Unit 3 using once-through cooling system. ER § 5.3.1.2.1. This is a 230% increase from existing impingement levels, with more than two times as many impinged striped bass, which is the most important game species in the lake.<sup>30</sup> The number of impinged fish would increase further to 426,887 if both Unit 3 using once-through cooling system and Unit 4 using cooling towers with make-up water from the lake are built. ER § 5.3.1.2.1. The ER fails to discuss the size and age distributions of the impinged fish, which is important because these distributions affect the structure and viability of a population.

Dominion states that there would be “no significant impacts due to impingement” because “fish impinged most frequently are prolific, exhibit a high reproductive potential, and compensatory responses of the fish population [the capacity of a population to offset, to some extent, reductions in numbers caused by some disturbance] would occur to offset

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<sup>30</sup> VDGIF, January 27, 2004 letter to VDEQ, page 1.

losses due to impingement, and therefore would not require mitigation.” ER at 3-5-32.

This assertion is in conflict with the DGIF’s position that, even with improved technology on the intake system, the fish would not be expected to be fully protected.<sup>31</sup>

The current annual entrainment from five “representative” species is estimated to be about 149 million fish larvae per year, based on data collected from 1979 to 1983. ER § 5.3.1.2.3. Dominion calculated that the number of entrained fish larvae would increase to about 297 million per year with an additional Unit 3 using once-through cooling system. ER § 5.3.1.2.3. Over 63% of the entrained fish larvae would be gizzard shad, which are primary forage fish in the lake. The number of entrained fish larvae would increase further to over 300 million per year if both Unit 3 using once-through cooling system and Unit 4 using cooling towers with make-up water from the lake are built. ER § 5.3.1.2.3. According to the VDGIF, the number of entrained fish with 4 operating reactors would be 468 million annually, 63% of which would be the important forage species, gizzard shad.<sup>32</sup>

Dominion asserts that doubling the number of entrained fish larvae “would have a small impact on the fishery community and would not require mitigation.” ER at 3-5-38. Such an increase is in violation of Section 316(b) of the CWA [33 U.S.C. 1326(b)] that requires the use of best available technology, and prohibits such impacts as would result from the project as proposed.

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<sup>31</sup> VDGIF, January 27, 2004 letter to VDEQ, page 1.

<sup>32</sup> VDGIF, January 27, 2004 letter to VDEQ, page 1.

Review by VDGIF describes the current operation impacts as significant and failing to meet the minimum criteria of best available technology, which violates Section 316(b) [33 U.S.C. 1326(b)] of the CWA.<sup>33</sup>

Both FWS and VDGIF have suggested mitigation measures to address the impacts of the current operations of Units 1 and 2, which have not been taken by Dominion. The NAPS design currently includes an intake velocity of 0.7 feet per second ("FPS") with a 9.5 mm screen mesh. In response to the Final EIS for NAPS license renewal application, FWS recommended that the intake system entrance velocities should be less than or equal to 0.5 feet per second (FPS) with screen mesh no larger than 1 millimeter (mm).<sup>34</sup> VDGIF recommended that the intake criteria at NAPS should have a velocity of 0.25 FPS with a screen mesh of 1.0 mm screen mesh.<sup>35</sup> FWS also recommended a mesh screen with a spray wash system that removes fish and other aquatic life from the screens and returns them back to the lake.<sup>36</sup> The current system at NAPS discards the impinged biota. ER § 5.3.1.2.

**d. Reduced stream flow.** The ER fails to adequately evaluate the adverse impact of the increased frequency of reduced stream flow on the health of fish and other

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<sup>24</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), pages 1 and 2. Section 316(b) of the CWA [33 U.S.C. 1326(b)] provides that for cooling water intake structures:

Any standard established pursuant to section 1311 of this title or section 1316 of this title and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

<sup>34</sup> FWS, February 4, 2003 letter to NRC, page 2.

<sup>35</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), page 1.

<sup>36</sup> FWS, February 4, 2003 letter to NRC, page 2.

aquatic species downstream of the Lake Anna Dam with the addition of one or two new units.

Dominion asserts that “the North Anna River continues to support a healthy, well-balanced community of aquatic organisms.” ER at 3-2-80. This claim is contradicted by the state and FWS analyses. Downstream of the dam, current minimum flows from the North Anna Dam (20 cfs) are inadequate for a healthy aquatic habitat. According to the VDEQ, the current evaporation rate and withdrawal for the existing two reactors reduce the flow of the North Anna River downstream of the dam to 10% or less “much of the time.”<sup>37</sup> Adding an additional unit would increase the frequency and duration of low flow on the North Anna River downstream of the dam, potentially impacting spring spawning. According to the FWS, “the reduction in river flow from Lake Anna during the Spring spawning migration may limit the range of anadromous and riverine species of fish in the river.”<sup>38</sup> The ER fails to address the question of increased frequency of reduced flow and the impact on spawning. The VDEQ recommends in-stream analysis of usable habitat to determine the impact to fish, including indigenous fish species, in the North Anna River.<sup>39</sup>

The VDEQ and VDGIF concluded that the addition of the new units would result in significant adverse impacts to an already stressed fishery both in the lake and in the river downstream of the dam. Such impacts would be from the increase in temperature and increase frequency of the already inadequate minimum flows.

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<sup>37</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 3.

<sup>38</sup> FWS, November 7, 2001 letter to NRC, page 3.

<sup>39</sup> VDEQ, February 10, 2004 letter to Dominion, page 13/

The ER also fails to address the question of aquatic species passage through North Anna Dam. In its reviews of the NAPS relicensing application, the FWS expressed concern about the adverse impacts to the aquatic species, including the distribution of native fish and mussels, in the North Anna River due to lack of passage through the dam and diminished flows.<sup>40</sup> The FWS comments in 2003 further discuss adverse impacts of North Anna Dam regarding the blockage of anadromous, catadromous, and native fish, and the adverse impact to mussels from the lack of passage of host fish at the dam.<sup>41</sup>

Failure to provide for a healthy fish and aquatic habitat as the result of the operation of a regulated activity is in violation of the CWA, which requires that permits can only be issued to allow for activities that protect the environment. *See* CWA implementing regulation 40 C.F.R. § 122.44(d), which requires that conditions of National Pollution Discharge Elimination System permits (and in this case, the VPDES permits) must include requirements that protect water quality standards (which includes stream uses such as fisheries and recreation). 40 C.F.R. § 122.4(a) also prohibits permits that do not provide for compliance with the CWA. A new intake structure for Units 3 and 4 would be built with the proposed new reactors. ER § 1.1.4. 40 C.F.R. 122.4(i) prohibits permits to a new source or discharger (which the expansion would be) if the discharge from its construction or operation will cause or contribute to violations of water quality standards. The NAPS operates under the CWA permit program, and it would be in conflict to allow for additional impacts through such a permit. The ER should address this conflict.

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<sup>40</sup> FWS, November 7, 2001 letter to NRC, pages 2, 3, 4, and 8.

<sup>41</sup> FWS, February 4, 2003 letter to NRC, page 2.



### **Contention 3.3.3: Impacts on Public and Classified Uses of Lake Anna**

**Contention:** The ER does not contain a complete or adequate assessment of the potential impacts of the proposed expansion of the NAPS on water-based recreational uses of Lake Anna and on homeowners who live around the lake.

**Basis:**

**a. Background: Recreational Use of Lake Anna.** Lake Anna is an important recreational boating, fishing, and swimming area in Virginia. There are 6 marinas and 7 public landings with ramps on the lake, in addition to numerous private docks. ER Table 2.5-26. Most of the estimated 43,000 people who fish in Lake Anna each year access the lake by boat from commercial ramps or via Lake Anna State Park.<sup>42</sup> DGIF estimates that there are 10-15 times more recreational boats on Lake Anna than fishing boats.<sup>43</sup>

Virginia Power and Dominion own the land within the NAPS site boundary, as well as all of the land under Lake Anna, up to the high-water mark (255 ft msl). ER § 2.2.1.1. There are permanent and vacation homes bordering the lake. The total number of people living around the lake is not specified in the ER, but it does infer that 500 people live along the WHTF. ER Table 2.5-17. The public must get permission from Virginia Power to build docks or other recreational structures that enable access to the lake. The larger section of the lake is open to public boaters, but only private boaters are permitted access to the WHTF. ER § 2.2.1.1.

**b. Impacts of reduced lake levels on recreation.** The ER fails to adequately evaluate the adverse impact of reduced lake levels on water-based recreational uses of Lake Anna and on homeowners who live around the lake. In Section 5.1.1.1, Dominion

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<sup>42</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), page 2.

<sup>43</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), page 2.

concludes that “The expected increase in discharge water volume and the small increase in temperature at the discharge point of the WHTF due to operation of the new units would not significantly impact the current or future recreational uses of the lake.” However in Section 5.2.2.2, the ER states that “The additional drawdown that occurs during drought years with an added Unit 3 could adversely affect the recreational use.” ER at 3-5-14.

According to the VDEQ, regardless of a drought, the decreased water level necessary for additional units “would adversely affect lake access, and local economic conditions in the process.”<sup>44</sup> The VDEQ criticizes the ER for failing to analyze fully the impact of the increased drawdowns on water-based recreational activities on Lake Anna.<sup>45</sup>

As discussed in Contention 3.2.1, one or two additional units on Lake Anna would reduce lake levels due to increased water withdrawals from the lake, especially in the summer and fall when demand for power and evaporation are higher. This was evidenced during the 2002 drought when the lake level dropped to 245.1 ft msl. According to the VDEQ, boats could not be launched from most ramps when the water level was this low.<sup>46</sup>

Permitting use of the public waters so as to adversely impact recreational uses is in conflict with the stated goals and policy of the CWA (CWA Section 101 [33 U.S.C. 1251]) and its regulations (40 C.F.R. § 122.44 (d)) and the associated state law (State

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<sup>44</sup> VDEQ, February 10, 2004 letter to Dominion, page 11.

<sup>45</sup> VDEQ, January 15, 2004 memo to Ellie Irons (VDEQ), page 5.

<sup>46</sup> VDGIF, January 27, 2004 memo to Ellie Irons (VDEQ), page 2.

Water Control Law § 62.1-44.2 and § 62.1-44.15:5.<sup>47</sup> The ER should address this conflict.

**c. Conflict between private and public use of Lake Anna.** Moreover, the ER fails to address the conflict between using Lake Anna to cool the new reactor units and providing public access to the lake as a navigable waterway. The public (except homeowners along the WHTF) is not allowed full access the WHTF portion of the lake. ER § 2.2.1.1. The three dikes, which were built to contain the WHTF, restrict access to otherwise navigable waters, and create what is in effect private use of a public resource. Dominion uses a significant portion of the public waters of Lake Anna for its waste treatment unit for thermally polluted water. Declaring such waters to be private is in conflict with the Section 101 of the CWA, 33 U.S.C. 1251, and the Virginia State Water Control Law § 62.1-11.<sup>48</sup> >. While the lake was created primarily to provide a source of cooling water for the NAPS, the CWA states that all navigable waters are protected for the public for all legitimate uses. *See* CWA Sections 101, 303 and 402 and related regulations including 40 C.F.R. § 130.3. There are named and unnamed flowing streams that lead into the WHTF that are clearly public waters and become part of Lake Anna.

Under the CWA, all waters must be given classified uses and those uses are protected through permits and other programs. If NAPS is expanded, there will be severe impacts that interfere with the legitimate and protect uses of boating and fishing, beyond what has already been experienced. When a state is delegated the administration of the

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<sup>47</sup> The statute can be found on the web at <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+TOC6201000>.

<sup>48</sup> The statute is available at <http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+62.1-11>.

CWA and its permit programs, the state must have the equivalent provisions in its act and state standards. The ER fails to address this conflict with the CWA.

**Contention 3.4: Failure to Provide Adequate Consideration of Alternatives for Cooling Units 3 and 4**

**Contention:** The ER fails to satisfy 10 C.F.R. § 51.45(b)(3) because it fails to consider alternatives to the use of Lake Anna water for cooling Units 3 and 4, as well as the no-action alternative.

**Basis:** As described in Contentions 3.2.1, 3.2.2, and 3.2.3 above, use of Lake Anna water to provide cooling water for Units 3 and 4 is likely to have significant impacts on fish and other aquatic life, as well as recreation on Lake Anna and downstream waters. Such impacts can be avoided by not adding Units 3 and 4 to the North Anna operation (no-action alternative), or potentially by implementing alternatives that would mitigate the impacts of the proposed operation.

Alternate technologies to avoid in-stream treatment have not been adequately described in the ER. For example, the ER does not evaluate any alternatives for Unit 3 other than a once-through cooling system. Additionally, in accordance with NEPA, the no-action alternative of no additional in-stream treatment and no expansion of NAPS must be considered. The ER states that “This subject [No-Action Alternative] is not addressed in the ESP application.” (ER § 9.1).

Consideration of alternatives for using Lake Anna to cool Units 3 and 4 is also required by CWA regulations at 40 C.F.R. § 125.3(f), which prohibit in-stream treatment methods, except in very limited cases, and only after certain required demonstrations have been made including the lack of alternative technologies. Further, the CWA states

that the impoundment or storage of water "...shall not be provided as a substitute for adequate treatment or other methods of controlling waste at the source" CWA Section 102(b)(1).

**III. CONCLUSION**

For the foregoing reasons, the ASLB should admit Petitioners' contentions.  
Respectfully submitted,

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