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**From:** Jim Bryan <jimbryan@earthlink.net>  
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**Date:** Tue, Mar 1, 2005 3:26 PM  
**Subject:** North Anna EIS for ESP, JBryan comments

(685)

Dear Mr. Cushing and NRC Staff,

Thank you very much for the interesting and informative public meeting at Mineral, VA, on February 17, 2005.

I am attaching my comments in pdf format. Please notify me if they are received and can be opened.

Sincerely yours,

James A. Bryan, PhD

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Add = J. Cushing (JXC9)  
A. Williamson (ARWI)

## North Anna Environmental Impact Assessment for Proposed Reactors 3 & 4

I appreciate the opportunity to take part in this Environmental Impact Assessment, as part of determining the effects and the suitability of siting two additional nuclear reactors at the North Anna Power Station near my home in Central Virginia. For the past 36 years, an Environmental Impact Assessment has been required for major projects that will affect our environment: the requirement is that we should look at the reality of what we do, and its effects on our environment, as clearly as possible. Environmental Impact Assessments are at the heart of the National Environmental Policy Act of 1969, which was passed with strong bi-partisan support, and which became the basis for much of our environmental law and of environmental law world-wide. The environmental effects of our actions continue to deserve and require our attention. Nuclear reactors are important enough to deserve careful respect for reality.

I have a general comment about this Environmental Impact Assessment process, and three specific concerns about this Environmental Impact Statement for an Early Site Permit. All of my comments are intended to support this assessment process, which has become an important component of our democracy, or freedoms, and our security, as well as our environmental protection; and to help make this particular assessment more realistic.

My general comment is about the relevance of this Environmental Impact Statement for an Early Site Permit at the North Anna Site, since this is a new type of EIS and its purpose is not fully clear; and, if we accept the value of the assessment of the Early Site Permit, with the acceptability of this particular analysis.

Many issues needed in a complete EIA are deferred in this EIS for an Early Site Permit, and it is difficult for me to see the benefit of what appears to me to be an incomplete assessment. This Environmental Impact Statement for two additional reactors at North Anna is part of an "Early Site Permit" application, which represents a new approach to reactor approval, designed to streamline the permit process. As described in the guidelines for this new process, "an applicant for an ESP need not provide a detailed design of a reactor or reactors and the associated facilities but should provide sufficient bounding parameters and characteristics of the reactor or reactors and the associated facilities so that an assessment of site suitability can be made. Consequently, the ESP application may refer to a plant parameter envelope (PPE) as a surrogate for a nuclear power plant and its associated facilities." The Early Site Permit process is

intended to provide more efficient licensing, by “resolving certain safety and environmental issues before Dominion incurs the substantial additional time and expense of designing and seeking approval to construct such facilities at the site” (NUREG-1811 Executive Summary).

This Early Site Permit approach leaves a lot of unknowns that will have to be resolved in the future. Some features left unresolved in this early site permit application, which still need to be addressed before approval can reasonably be expected include:

- selection of reactor, and the selected reactor’s safety records in other sites if the design has been previously used;
- design of the dry cooling tower and its safety record, especially with aviation accidents or attack;
- design of the ultimate cooling sink, its proposed operation and safety testing;
- plan for storage, protection and transport of waste; and
- decommissioning impacts,

none of which have been considered at this stage. We are told that this is not an Environmental Impact Assessment for construction or operation, where such issues will be handled; this is only for approval of the site for two additional reactors.

Since Dominion Resources already has two operating nuclear reactors at the site, which have recently been re-licensed, it would seem that the major question this Environmental Impact Statement needs to answer is whether two additional reactors can be constructed and operated without undue risk to the health and safety of the public.

In other words, what are the compounding effects on safety and the environment of the proximity of other reactors? The description of the affected environment correctly emphasizes the presence of NAPS Units 1 and 2 on the site (paragraph 2-1); however the possible interactions between existing reactors with the proposed reactors do not appear to be addressed where they would need to be, for example in Chapter 5.10.1 Design-Basis Accidents, in Chapter 5.10.2 Severe Accidents; or Chapter 6, Fuel Cycle, Transportation and Commissioning, especially section 6.1.1.6 Radioactive Wastes. What, for example, will be the effect of these additional reactors on the safety of the two existing reactors? What is the comparative safety record of large and small clusters of reactors? What are the effects on safety, and on the concept of “defense in depth” of greater maximums of full power operation at a given site?

Neglecting to address the potential interaction-effects at this site in this Environmental Impact Statement raises the question of what has really been accomplished in this 724-page draft report, which could not have awaited a more complete proposal to be considered.

To look at the issue of appropriateness of this site for two additional reactors, attention must be focused on the potential increased likelihood of accident and magnitude of accident effects, and on additional management and containment problems in case of accident, both with multiple plants in proximity, and with increased capacity of production. I am sure that after 1979 the NRC must have analyzed the benefits to those who were working on the containment of the Three Mile Island Reactor II accident, in having Reactor I closed down for maintenance at the time of the partial core meltdown. Analysis of the effects of multiple reactors at the Browns Ferry nuclear station in 1975, as well as at Chernobyl and Mihama Reactor Number 3 in August of last summer would appear to be among the essential components of a thorough analysis of possible interaction effects, and the increased dangers of severe accident created by the clustering of **additional** reactors at the North Anna site.

In summary of my general concern for this Environmental Impact Assessment as a component of an Early Site Permit application, I believe an application concerned specifically and exclusively with the site and its relevance to future construction and operation permits cannot be accepted without thorough consideration of possible interaction effects in case of accidents.

My specific concerns with components of the Environmental Impact Statement are about I. the assessment of risks of severe accident in this draft EIS; II. the omission of the threats of terrorism in this assessment; and III. alternatives.

### **I. Risk of serious accidents**

Due to the subject of this 724-page Environmental Impact Statement, after I had read only part of it, I couldn't wait to see how it handled the risk of severe accidents. Before and especially since Three Mile Island, Chernobyl, the accidents in Japanese reactors and other less-reported accidents in the United States' reactors, bombers, nuclear experimental facilities, and nuclear submarines, and numerous reports of near accidents and cover-ups of safety failures, the ultimate safety of nuclear reactors has been a widespread concern of many Americans. I was

surprised to see a simplistic summary of the risk as “SMALL” (the Commission has determined that the probability-weighted consequences of severe accidents is SMALL for all 37 existing plants (10 CFR 51, Subpart B, Table B-1). 38 used for comparison purposes). In looking at the calculation for this estimate of “SMALL” danger, I saw that the NRC calculation is that a severe accident in a proposed new reactor would be less likely than one in a million years.

So I turned to Chapter 5.10.2, on Severe Accidents, to see how this analysis was made.

I know that the NRC has put great efforts into risk assessment, both in this North Anna Environmental Impact Assessment and as a major part of their analysis since the Three Mile Island accident. Much of this work, including the analysis in this Environmental Impact Assessment, is based on PRAs, or “probabilistic risk assessments”. You have based much of your important efforts at assessing the risk of serious accidents at the proposed reactors on the concept of PRA, and I quote from an NRC document, “The probabilities of accident sequences can be quantified. This allows the estimation of risk metrics such as the frequency of severe damage to the reactor core, the frequency of release of large amounts of radioactivity, and the probability of death of an individual living near the plant. Accident sequences can be ranked according to their contribution to risk.” (NRC response to UCS criticism of NRC risk assessment, at [www.nrc.gov/reading-rm/doc-collections/acrs/letters/2000/4761914.html](http://www.nrc.gov/reading-rm/doc-collections/acrs/letters/2000/4761914.html)). As I understand it, with the probabilistic risk assessment, you identify various risks, determine how likely each is to occur, and add the various risks together to get an overall picture of the risk of serious accident.

I am not an expert in risk assessments, or in statistics, or in nuclear reactors; but in the course of my scientific work, and in my work helping graduate students analyze and present their data, I have often observed data that doesn't make sense and analyses that just must be wrong. I tried to encourage my students then to open their eyes. I think it is a sound practice that if your data doesn't make sense, look at your data again. If your analysis does not fit with reality, take another look. Look for obvious mistakes. Re-examine your assumptions.

The assessment that a severe accident in the proposed reactors is likely in less than one in a million years needs re-examination.

It is widely recognized that the biggest problem with probabilistic risk assessments is when you overlook factors that are real and don't think of factors that prove to be important risks. For example, before the accident at Three Mile Island, no-one realized that there needed to

be some clear way to know when the pilot-operated relief valve for cooling water was open and cooling water was flowing away from the reactor, instead of toward it; no-one realized that the alarm system would set off so many flashing lights that the operators could not figure out what any of the lights meant; that no-one could know how much hydrogen gas had collected in the reactor, how much oxygen might become available there, and whether or not it was going to explode, for several very tense days. (J. Samuel Walker, Three Mile Island, University of California Press, 2004). None of many technical factors would have been included in a probabilistic risk assessment of Three Mile Island Reactor 2; they were risks, but no-one knew it.

But much more than a missing pressure gauge and unexpected challenges in cooling the reactor core, or unknown amounts of potentially explosive gas combinations, the major cause of all major nuclear accidents -- in Three Mile Island 2, at Chernobyl, in the fatal accidents in Japan in the Tokaimura fuel processing plant in 1999 and in the Mihama reactor number 3 in August of last summer, and in many other accidents -- the major, inescapable, clearly identified cause has been human error. Not only human error, but overlooking human error was identified in the post-core meltdown analysis of Three Mile Island Reactor 2 as a persistent pattern of both the NRC and the nuclear industry. Everyone who looked at that accident after it happened pointed out that human error AND overlooking the relevance of human error to reactor safety or danger, were THE main ingredients in the recipe for disaster; and everyone agreed that we should not overlook human error again. I believe the NRC developed a serious and systematic program of "Lessons learned" at that time.

Nevertheless, I can't find human error addressed directly as a factor in your Probabilistic Risk Assessment in this Environmental Impact Statement. Why human error would be left out of direct consideration in this analysis mystifies me. Human error and the inadequate attention paid to human error caused all of these serious accidents and stopped the nuclear industry in its tracks for 26 years. And now, here we go again, overlooking human error and lessons learned. What's wrong with us? It's often been said that we can't be sure of anything but death and taxes. We can also be sure of human error. Any system of risk analysis that overlooks human error is overlooking an important part of reality. Lack of attention to human error in the consideration of nuclear reactors is a threat to our security and a danger to our well-being.

In regard to severe accidents, I want to call your attention to an apparent flaw in the reasoning behind Table 5-20. Comparison of Environmental Risks from Severe Accidents.... Here, you

are making predictions of the frequency of severe accidents likely in new reactors by comparison to other reactors. The reactors you have selected to use for your comparison are "current plants undergoing operating license renewal." From the wording of this table and its footnote B, the American reactor with the most severe accident, and therefore the reactor most important to consider in this risk assessment, Three Mile Island Reactor # 2, has been excluded from your analysis. I hope you have not actually made this mistake in your analysis, and that, instead, you have simply mislabeled the table and mis-stated your criteria in footnote B.

In summary of my concerns about the potential safety impacts of the proposed plants, which seems to be the greatest potential environmental effect of additional reactors, it seems that the methods used to determine the possibility of severe accidents are simply not adequate to answer the most relevant questions, either in the short-term operation of the proposed reactors, or especially in respect to the long-term management of hazards created, either within the foreseeable future decades, or within the centuries and millennia over which the waste must be secured.

**II. Possibilities of terrorism.** I have a second concern about your considerations of the likelihood of severe accidents. Since we know that terrorists have scoped out American nuclear reactors for possible attack, and we know that reactors such as those already existing at North Anna or near New York City would probably have caused much more serious damage to our country than the attacks of September 11, we would be foolish not to consider the possibility of terrorism. So of course I looked in this Environmental Impact Statement to see how the threats of terrorist attack on nuclear facilities are handled. I read a lot of this 724 page EIS, and couldn't find any mention of terrorism. I did a computer search for terrorism within the document. I couldn't find any mention of terrorism. Did I miss something? Is it hidden somewhere?

I see that the risk assessment in this draft Environmental Impact Assessment is done in accordance with NUREG-1437, which was written in 1996. Are we still living without consideration of the possibility of terrorism? Part of NRC's job, much clarified after Three Mile Island, is to think ahead of problems with reactors, not wait until later and say "Oh, we didn't know the specifics. We had no clear warning." It is bizarre that our government was raising the possibility of terrorism every few days last summer and fall, and that now, somehow, this branch of our government, the NRC, seems to be completely overlooking terrorism as a danger to

nuclear reactors, with great potential impacts on the environment. We need attention to this reality. I am especially concerned by the vulnerability of the three cooling water intakes, which on your site diagrams are all located close together near the existing and proposed reactors.

If there is any situation where we need to pay attention to the threats of terrorism, it is with accumulations of radioactive materials at easily visible sites on American soil, especially near major urban targets like New York City and Washington, DC. The increase in risk resulting from the increase in high level nuclear waste on the site that would be caused by one or two additional reactors needs to be part of a realistic assessment of risk, and a realistic environmental impact assessment. Please include it in your next draft.

To summarize my concerns on the subjects of risk assessment for severe accidents and the dangers of terrorism, I would like to ask a question. Our government is heavily subsidizing the insurance on our nuclear reactors, because insurance companies will not insure these reactors without government subsidies, and without these subsidies, in free markets, the reactors would not operate. My question is this: what do the insurance companies know about the risk of these reactors that the NRC does not know, or is not including in its risk assessment?

### **III. Alternative sites and the no-action option.**

In respect to the no-action alternative (Chapter 8.1), at what point in this process, and for what reasons, could it be decided not to grant Dominion the authorization to construct and operate additional nuclear reactors at North Anna?

In respect to potential brownfield alternative sites (Chapter 8.3.3), not enough information is given to indicate that this option has been adequately explored. This concern is related to the concern I expressed earlier, about the comparative safety of clustering or dispersing potential future reactors.

### **Conclusion.**

I appreciate your careful consideration to many aspects of the likely environmental impacts of additional nuclear reactors at North Anna, and hope you will continue this assessment, especially as it regards long-term safety, which is certainly the most important environmental impact of nuclear reactors. This is a subject that requires careful attention to reality. It is too important for wishful thinking, for inadequate intelligence, or for political distortion of facts.



I came to the NRC meeting in Mineral undecided about my ultimate opinion about the desirability of additional reactors here. Part of respecting reality is respecting the fact that we need energy, and that most sources of energy are damaging to our environment in one way or another. I had never read as much about nuclear energy as I had in the past six weeks; and still I was uncertain. The meeting was informative and encouraging, in our present political climate and in the context of polarized attitudes towards nuclear reactors, in free exchange of many strongly held opinions. The next morning, thinking that I should quit reading and thinking about the proposed reactors and return to my own work in forestry, I got a much clearer insight into the cost-benefits of additional reactors.

Foresters have the unusual situation that one generation of trees may take several generations of foresters to grow: some of our most valuable tree species take 100 or 200 years to begin to reach maturity. In our society, we do not have a good record of growing long-rotation forests. Many of the slow-growing species that were most important in the Americas at the time of European arrival are now rare or commercially extinct. Long-leaf pine, for example, which covered large regions of the south, and would be extremely valuable now for its rot-resistant properties, has been extensively cut with little replacement, due largely to the patience required in growing it. Now, if I want to buy long-leaf pine lumber, I need to get recycled wood from warehouses or factories that are being torn down. Mahogany and American rosewood represent other valuable and important species requiring long rotations, and are threatened now by our inability to manage long rotations. Brazil was named for a tree that was so valuable it is now hard to find growing wild; now, before reaching extinction, it has come under the care of violin bow-makers who need the wood for making the bows, and who are now supporting nurseries and management of a tree that is needed for producing our music; but they are acting at the last minute, when it is almost too late. If we in our society cannot care successfully for trees that take one or two hundred years to grow, how are we going to care for nuclear waste over thousands of years?

Thus an issue deferred in the consideration of the environmental impacts for this Early Site Permit, the long-term management of wastes, re-emerges in my mind as a fundamental environmental issue that must be considered if we are going to be realistic. Without considering and largely solving this problem, a realistic consideration of likely environmental impacts must recommend the denial of a request for site permitting for additional reactors.

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