

January 16, 2015

**Randy Steffey**  
**Environmental Scientist**  
**Norfolk District, Corps of Engineers**  
**803 Front Street**  
**Norfolk, Virginia 23510-1096.**

**Re: NAO-2012-00080 / 13-V0408-James River**

**Comments of Waine P. Whittier, PE Relative to 230 kV Alternatives to Dominion's  
Proposed 500 kV James River Crossing**

Dear Mr. Steffey,

I was retained by Preservation Virginia to submit comments regarding feasible alternatives to be considered by the Army Corps in the permitting review process. This letter is intended to supplement my written and oral testimony that was sent to you under separate cover on September 24, 2013. Please consider the following comments in your review.

**History**

I was hired by James City County in October of 2012 to review Dominion's filing to the Virginia SCC for a Certificate of Public Convenience and Necessity to construct a 500 kV overhead transmission line crossing the James River and to also assess if there might be viable alternatives that would avoid that crossing. I presented pre-filed direct testimony in that case on December 7, 2012, answered discovery questions related to that testimony, presented oral testimony on April 15, 2013 and was cross examined on that same day. That pre-filed direct testimony and a transcript of my oral testimony were provided to the US Army Corps of Engineers with a cover letter from me dated September 24, 2013.

James City County's budget was quite limited, so the scope of my work did not allow complete analysis of the ideas that I presented. Nevertheless, I was able to perform enough analysis to determine that viable and cost effective alternatives to the 500 kV overhead James River crossing exist, and I provided enough information about those alternatives so that more detailed analyses could be performed by Dominion. Unfortunately, almost two years have gone by since my oral testimony and those ideas have not been seriously investigated. It appears that Dominion performed some load flow analyses of my ideas and saw that some NERC reliability violations still existed, looked at the additional rights-of-way that might be needed, developed a pessimistic construction schedule, and concluded that the ideas were not viable to meet their preferred construction deadlines. A better approach would have been to have proceeded with a philosophy of "What can be changed or added to these ideas to fix the few remaining problems?" As described in more detail below, all of the issues identified by Dominion are surmountable if effort is put into finding a solution other than Dominion's preferred 500kV overhead route.

### **Alternatives that Deserve Closer Consideration**

In my oral testimony presented on April 15, 2013, I described variations to two alternative transmission solutions presented in my December 7, 2012 pre-filed testimony. A brief description of those two variations follows.

#### ***Variation to Whittier Alternative A***

This alternative is a 230 kV under the river crossing from Surry to the peninsula, continuing on to Whealton without a substation at Skiffes Creek. Omitting the Skiffes Creek substation avoids several of the lower voltage violations seen in the area of Dominion's proposed Skiffes Creek Substation and delivers the power farther to the south where it is most needed. My cost estimates for this alternative at two different capacities, 750 MVA or 500 MVA, are shown in attached Whittier Exhibit A, which was also designated as Exhibit 69 in the Virginia SCC case. Those cost estimates are \$224 and \$192 million respectively.

#### ***Variation to Whittier Alternative C***

This alternative is a new 230 kV overhead line from Chuckatuck to Whealton crossing at the James River Bridge location. Also included is a new 500/230 kV transformer at Surry. My cost estimate for this alternative is shown in attached Whittier Exhibit B, which was also designated as Exhibit 71 in the Virginia SCC case. That cost estimate is \$102 million.

### **Dominion's Critique of the Whittier Alternatives**

The James City County budget did not afford me enough funds to completely develop these ideas, but I was able to perform enough analysis to demonstrate that they are viable and cost competitive. My suggestion was that Dominion should investigate these ideas further, perhaps adding some other minor improvements, rather than discarding them prematurely because they did not immediately eliminate all reliability criteria violations. For example, Dominion mentions reliability criteria violations that appear at 2016 load levels with these alternatives, but fails to state that the violations disappear when other transmission upgrades that Dominion has planned for the next several years are included. Those upgrades could be advanced a few years with the only additional costs being those associated with the time value of money for earlier construction.

In my oral testimony, I discussed some of the advantages of the 230 kV approach. The SCC Hearing Examiners' Report characterized that approach as piecemeal. That characterization is both incorrect and short-sighted. A 230kV approach to addressing this project's need is actually a very robust and flexible approach. If load growth is moderate, if other entities install their own generation, or if other technological advances decrease the demand for electricity, then the 230 kV approach will be adequate for a long time. A more aggressive approach to demand side management and customer generation alternatives could help assure this outcome. If, on the other hand, load were to grow such that even more power were needed on the peninsula, then the second 230 kV alternative could be added. Another big disadvantage of Dominion's 500 kV river crossing plan, a disadvantage that Dominion fails to address, is that the power system must be able to withstand an outage of that new line itself. With Dominion's 500 kV approach, it is likely that Dominion will want to bring another 500 kV line onto the peninsula so that the 500 kV becomes a looped system. This will result in additional negative environmental impacts and higher cost than the 230 kV approach.

## **Current Regulatory Background**

Environmental regulations require that some generating units serving the peninsula be shutdown or upgraded by April 2016. Dominion has shown that absent additional generation options, transmission improvements are needed when those units are shut down. There are avenues built into the regulations to allow for possible extensions through April 2017. Further extensions by Congress or other operation of law may occur. Additionally, if an option to address the peninsula's power needs is not put in place by the deadline, it would be unprecedented for Dominion to receive approval to power down these units. For these reasons, I did not limit my discussion that follows to options that can be completed by April 2016, and instead assumed that the shutdown of these units can be delayed as long as a viable plan is in place to achieve retirement of the units in a reasonable timeframe.

## **Recent Developments**

There is another development which Dominion is involved in that should be considered before moving ahead with this 500 kV overhead James River crossing. Dominion has announced plans to build a new natural gas pipeline with a 20 inch diameter spur into the Hampton Roads area. Here are a couple of quotes from their website at [www.dom.com/corporate/what-we-do/natural-gas/atlantic-coast-pipeline](http://www.dom.com/corporate/what-we-do/natural-gas/atlantic-coast-pipeline):

"Dominion, along with three other major U.S. energy companies – Duke Energy, Piedmont Natural Gas and AGL Resources — announced Sept. 2 the formation of a joint venture to build and own the proposed Atlantic Coast Pipeline."

"They are now coming together to help our economies take another step forward by bringing the benefits of additional supplies of clean, low-priced domestic natural gas to homes, businesses, manufacturers and power generators."

The website specifically mentions fueling power generators. The projected in-service-date of this pipeline is late 2018, about a year and a half later than the April 2017 shutdown date mentioned above. This gas line could be used to repower the closing generating stations or used to power new stations.

Another source of power generation to help offset the need for new transmission lines is the U.S. military. An October 21, 2014 article in the Wall Street Journal talks about the Pentagon's concerns about loss of power due to hackers, terrorists or natural disasters. Therefore, they are beginning to equip bases with their own power systems. An example highlighted in the article is the Marine Corps combat center in Twentynine Palms, California. The article states that engineers estimate that the base will be able to generate about 80% of its electricity needs.<sup>1</sup>

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<sup>1</sup> Given that Dominion has noted the needs of the military as part of the rationale for needing a 500kV solution, the military's impact on potentially reducing the power need should also be considered. Recent news about potential military personnel drawdowns should also be taken into account when considering the scale of the power need. See <http://wydaily.com/2015/01/09/u-s-army-looming-troop-drawdown-at-fort-eustis-to-significantly-affect-local-economy?cat=localnews/localnews/localnews/localnews/> (last accessed 1/14/15).

These developments suggest that, in addition to the 230 kV transmission solutions that I identified above, the use of additional generation should also be considered to help solve the reliability issues on the peninsula. If additional generation were found on the peninsula, the need for any additional transmission river crossing could be avoided. Such a plan is outlined below.

### **Integrated Reliability Plan**

An integrated plan that could be followed to minimize the needs for new transmission lines – both now and in the future – into the peninsula area could include steps to:

1. Strengthen Dominion's transmission supply to the peninsula through improvements to the existing 230 kV system.
2. Build new, or retrofit existing, generation sources utilizing Dominion's planned natural gas pipeline to the Hampton Roads area.
3. Promote the integration into the power grid of non-utility generation at commercial and military installations in the area. These could be integrated either on an emergency only basis, or as anytime sources of electricity.
4. Promote the integration of renewable energy sources such as solar or wind<sup>2</sup> from private, commercial, or industrial locations.
5. Decrease the demand for electricity through aggressive demand side management, including energy efficiency efforts.

An obvious appeal of this approach is that it preserves the beauty of the James River view sheds. However, it could also provide a more secure energy system, especially when considering catastrophic events, and could be done at a cost competitive with Dominion's 500 kV James River crossing. The challenge is how to transition to this view of the future. One possible transition plan is outlined here. Other parties, including Dominion, might offer improvements to this plan.

1. Begin the permitting and design processes for improvements to the existing 230 kV transmission system.
2. Pursue mechanisms to extend the shutdown date of the Yorktown units to allow greater planning time.
3. Approach commercial, industrial and military establishments in the region about what non-utility generation may already exist. Implement an interconnection plan for those facilities.
4. Initiate studies of special operational procedures or protection systems to implement in the event of the failure of critical electrical facilities.
5. Immediately implement demand side management programs in the area.

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<sup>2</sup> It is noteworthy that Dominion Resources (the parent company of the project proponent Dominion Virginia Power) is listed 30 out of 32 major utilities studied for their adoption of clean energy development as a part of their portfolio. Certainly there is room for improvement in Dominion's efforts in this area. See *Benchmarking Utility Clean Energy Deployment: 2014, Ranking 32 of the largest U.S. Investor-owned Electric Utilities on Renewable Energy & Energy Efficiency*, Ceres, 2014, pg. 6, available for download at: <http://www.ceres.org/resources/reports/benchmarking-utility-clean-energy-deployment-2014/view> (last accessed 1/14/15).

### **Actions that Dominion Can Take to Implement an Integrated Reliability Plan**

Some improvements to the 230 kV transmission system could be implemented relatively quickly. Those improvements that do not require new rights-of-way should be the fastest. Dominion should work with interested parties to reach stipulated agreements, so that the permitting process through the SCC can be streamlined. Design and equipment ordering could be done in parallel with the permitting process rather than in sequence to speed construction.

Dominion should contact and work with the military to facilitate the installation of its own generation in and around the Peninsula. Dominion should approach commercial and industrial sites that already have emergency generators in place. Rate incentives and technical assistance could be offered to encourage interconnection of these non-utility or back-up generators. Rate incentives and technical assistance could also be offered to encourage the integration of renewable energy sources such as solar or wind from private, commercial or industrial locations.

Dominion should also consider new ways to operate its system. Rather than posturing the system to automatically disconnect load after a first contingency event to be prepared for another contingency, special protection systems could be installed that would automatically disconnect load only if the second event occurred. Given that the primary reliability criteria violations are related to the possibility of these second event occurrences, this approach could solve the potential NERC reliability issues. This approach would prevent the rolling blackouts threatened by Dominion in advocating for their preferred alternative. Another option would be to install phase angle regulators on certain facilities that would otherwise overload after the second contingency. This could result in the automatic disconnection of some customers but avoid a cascading outage. Operating procedures could be developed to re-posture the system after a first contingency event to avoid disconnecting customers at that time, while at the same time configuring it so that a cascading event would not occur following a second contingency. This could involve a different generator dispatch, different voltage schedules, some line switching, or other measures. Keep in mind that the technology suggested here is not new or overly technically complex, and it could solve the reliability criteria violations identified by Dominion if properly applied.

There are other demand side management techniques that Dominion could use. Dominion should install and use smart meters to control specific uses, such as air conditioning, lighting or refrigeration, by its customers. This will result in much more effective demand side management than without that control option. Building efficiency improvements should be pursued aggressively. These efficiency efforts could reduce demand considerably and address any remaining reliability concerns.<sup>3</sup>

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<sup>3</sup> Dominion Resources has a poor track record of using energy efficiency programs. On page 19 of the Ceres report cited above, Dominion ranked 31 out of 32 energy companies in a list detailing companies' cumulative annual energy efficiency savings active in a given year. Dominion is behind in this area, and this is contributing to the need for additional power transmission.



## Summary

In closing, there are clear alternatives identified in this letter and in my previously submitted testimony that could satisfy the needs of this project and avoid the need to build the 500 kV line across the James River favored by Dominion. These options include:

- An under-river crossing with a 230 kV line.
- An overhead 230 kV crossing at the James River Bridge location, or elsewhere.
- Repowering old or building new power plants to power the peninsula using Dominion's proposed new natural gas pipeline.
- Negotiating with the military and other commercial or industrial customers to install new or interconnect existing back-up generators to the grid.
- Integration of renewable energy from wind or solar projects.
- Smart meters and demand-side management cutoff agreements to manage customer load.
- Modern technologies to control the power system to avoid cascading outages.

This is by no means an exhaustive list of alternatives. These alternatives are also cost competitive with Dominion's 500 kV proposal. The bottom line is that alternatives to Dominion's preferred 500 kV crossing exist, and should be further explored using a problem-solving mindset.

Thank you for considering my comments,



Wayne P. Whittier, PE  
Principal Power System Engineer  
RLC Engineering, LLC

**Variation to Alternative A – 230 kV under the river from Surry and then on to Whealton without a Skiffes Creek Substation**

**Construction Cost Estimates – Millions of Dollars**

Surry Substation	\$ 14.0	Allen Rebuttal Schedule 4 Page 1
750 MVA River Crossing	140.6	75% of 1000 MVA from Allen Rebuttal Schedule 4 Page 1
New Line to Whealton	46.4	Allen Rebuttal Schedule 4 Page 1
Rebuild Line 34 Ft Eustis to Lanexa 50% Credit	42.0 (21.0)	Note 1 Credit assumed for replacing old line
<u>Whealton Substation</u>	<u>2.0</u>	Allen Rebuttal Schedule 4 Page 1
<b>Subtotal for 750 MVA Capacity</b>	<b>\$ 224.0</b>	
Reduce River Crossing to 500 MVA	(46.9)	25% of 1000 MVA cost. Note 2
<u>Phase Angle Regulator</u>	<u>15.0</u>	Page 76 of Dominion Application Filing
<b>Total for 500 MVA Capacity</b>	<b>\$ 192.1</b>	

Note 1: Allen Rebuttal Schedule 4 Page 1 shows \$18.7 million for Line 34 (11.4 miles from Skiffes Creek to Yorktown). Ft. Eustis to Lanexa is 25.6 miles.  $25.6/11.4 \times \$18.7 = 42.0$

Note 2: A credit of 25% of the cost of 1000 MVA from Allen Rebuttal Schedule 4 Page 1 brings the net cost for 500 MVA down to \$93.7 million, or 50% of Mr. Allen's estimate for the cost of 1000 MVA.

## Whittier Exhibit B

### Variation to Alternative C – New 230 kV overhead line from Chuckatuck to Whealton crossing at the James River Bridge Location

#### Construction Cost Estimates – Millions of Dollars

Whealton Substation	\$ 2.0	Allen Rebuttal Schedule 4 Page 1
New line Whealton to river	4.0	2 miles at \$2 million per mile – Note 1
River Crossing	37.5	Allen Rebuttal Schedule 4 Page 3
New line river to Chuckatuck	12.0	6 miles at \$2 million per mile – Note 1
Chuckatuck Substation	2.0	Assumed same as Whealton above
New 500/230 kV Xfmr at Surry	20.0	Note 2
Rebuild Line 34 Grafton to Lanexa	49.0	Note 3
<u>50% Credit</u>	<u>(24.5)</u>	Credit assumed for replacing old line

**Total** **\$ 102.0**

Note 1: Dominion's estimate for wrecking and rebuilding line 34 is \$1.64 million per mile as shown in note 3. This was increased to \$2.0 million per mile for a new line due to possible need to increase right-of-way width.

Note 2: Assume same as transformer at Suffolk Substation shown in Allen Rebuttal Schedule 4 Page 1.

Note 3: Allen Rebuttal Schedule 4 Page 1 shows \$18.7 million for Line 34 (11.4 miles from Skiffes Creek to Yorktown).  $\$18.7 \text{ million} / 11.4 \text{ miles} = \$1.64 \text{ million/mile}$ . Grafton to Lanexa is 29.9 miles.  $\$1.64 \text{ million/mile} * 29.9 \text{ miles} = \$49.0 \text{ million}$ .