CONTINUING PUBLIC HEALTH, SAFETY, AND ENVIRONMENTAL THREATS FROM THE ATLANTIC COAST PIPELINE PIPE COATING

WILLIAM F. LIMPERT

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NC WARN

BUILDING PEOPLE POWER FOR ENERGY & CLIMATE JUSTICE

WILLIAM F. LIMPERT was a water pollution inspection and enforcement regulator with the Maryland Department of Environment from 1982 until 2010. Formerly a property owner on the proposed route of the Atlantic Coast Pipeline in Bath County, Virginia, he now resides in Maryland.

NC WARN is a 32-year-old, member-based nonprofit tackling the climate crisis – and other hazards posed by electricity generation – by watch-dogging Duke Energy practices and building people power for climate and energy justice through a swift North Carolina transition to renewable and affordable power generation and energy efficiency. *www.ncwarn.org*. 919-416-5077.

THIS REPORT was filed by NC WARN with the Federal Energy Regulatory Commission on July 2, prior to the July 5th cancellation of the Atlantic Coast Pipeline project by Duke Energy and Dominion Energy. Because many of the problems raised in the report are not resolved by the ACP cancellation, and because many of them also apply to the Mountain Valley Pipeline Southgate, NC WARN submitted the report to NC DEQ Secretary Michael Regan on July 16th, calling for an investigation into the failure of federal agencies to protect the public.

COVER IMAGE: *Construction on the Atlantic Coast Pipeline had begun in Northampton County, but has now been cancelled. Left behind are public health and safety concerns about the coatings used to protect the pipes. (Lisa Sorg, The Progressive Pulse)*

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ABSTRACT

The pipes for Atlantic Coast Pipeline (ACP) are coated with 3M Scotchkote Fusion Bonded Epoxy 6233 (coating). The coating is used to reduce pipe corrosion.[1]

The coating presents significant threats to the public health, public safety, and the environment.

The coating contains numerous carcinogenic, mutagenic, and toxic substances that could leach out, blow off stored pipes, or otherwise discharge into our environment. These substances could result in negative impacts to the health and safety of residents in proximity to the pipeline, or locations where pipes are stored. They could also result in harm to the environment and wildlife, including harm to endangered species.

These potential negative impacts have not been adequately assessed. A coating study commissioned by the ACP that was submitted to FERC last summer used poor methodology, contaminated sampling equipment, and misstated an earlier study. The ACP study concluded that the coating does not threaten the public health or the environment. This conclusion is not reliable given the multiple failures in the study.

The coating degrades when exposed to ultraviolet light (UV) in sunlight. The pipes for the ACP have been exposed to sunlight for four years at this time. This is longer than the manufacturer's recommendations, and much longer than experts' recommendations. There is evidence that most of the ACP pipes contained degraded coating as of the fall of 2017.

Pipe corrosion and failure, due to degraded, thinned, and compromised coating threatens a catastrophic explosion if the ACP is constructed with these degraded pipes and becomes operational.

PUBLIC HEALTH RISKS

The Material Safety Data Sheet (MSDS) for the coating lists substances of concern, and their potential negative impacts to human health and the environment. Quartz Silica, silica crystals, and titanium dioxide are listed as known or possible carcinogens. Silica is a carcinogen by inhalation. Eight substances are listed that can cause acute toxicity. Four substances are listed with some positive data for germ cell mutagenicity. Target organ toxicity for repeated exposure to some substances lists multiple organs and systems that could be negatively impacted.[2]

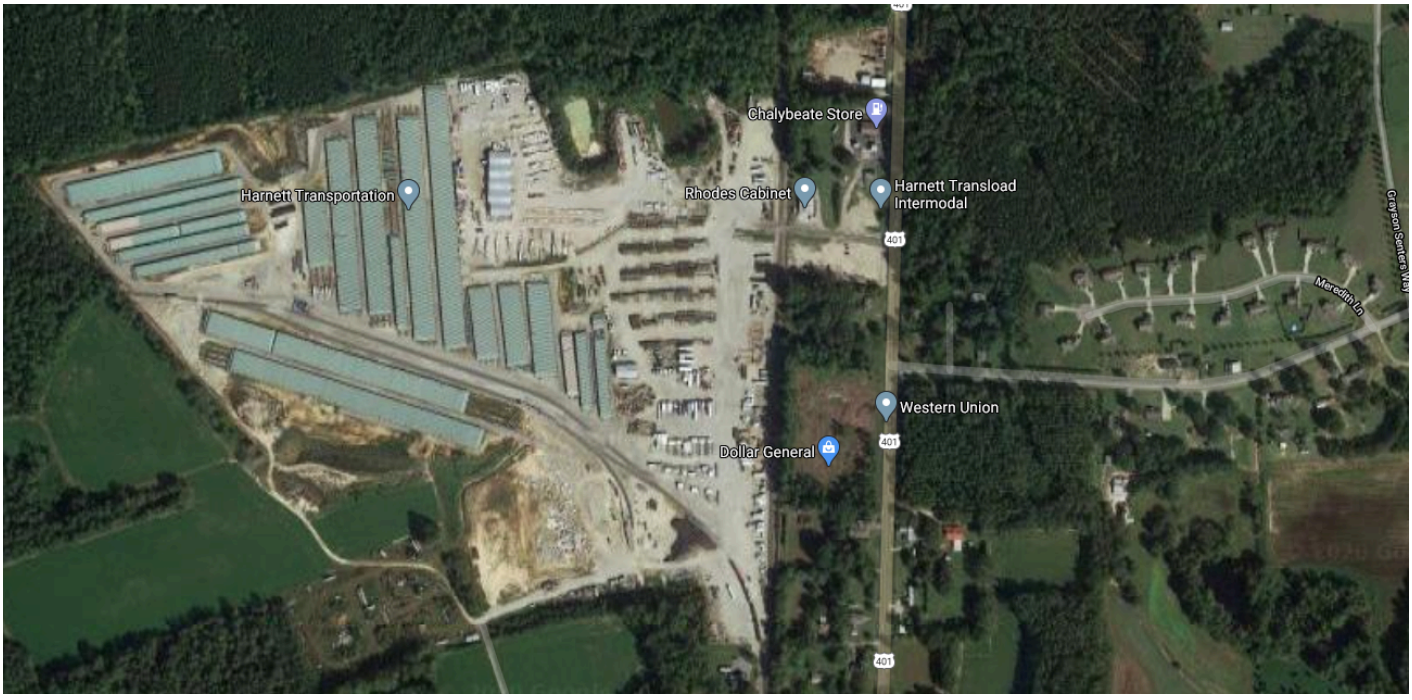
Coating manufacturer 3M advises in position papers that they have not performed leachate tests on the coating, that UV coating degradation occurs at a rate of 0.375 to 1.5 mil per year, and that degradation occurs more quickly in higher temperatures, higher humidity, and wetter conditions.

3M states that UV coating degradation produces products that will be toxic to aquatic life.[3]

3M lists recommended actions to prevent UV coating degradation and states that degraded coating is a loose surface material that can be removed by wind, blowing particulate matter, rain, or tidal splash.[4]

3M recommends that UV degraded coating not be intentionally removed from the pipes, so that underlying intact coating will not be exposed to further UV degradation.[5]

Degraded coating can occur in large volumes. A typical 42-inch diameter, 40-foot-long pipe for the ACP with just 3 mil of degrading coating on the UV exposed top half contains 47.5 cubic inches of degraded coating. This is in addition to what may leach out from or abrade off of the remaining nondegraded coating.



Dominion Energy and Duke Energy are storing acres of pipe in open sunlight at sites in six communities, close to homes and public buildings. This storage yard is in Fuquay Varina, N.C. (Google Earth)

The same pipe, unprotected in storage, would expose that volume of degraded coating to the weather. Since the degraded coating is loose and powdery it could easily become airborne and be inhaled by persons downwind. Since the degraded coating may contain silica, a carcinogen by inhalation, this is the most immediate public health concern.

The coating could also easily be removed by rain and ice, and flow into nearby waterbodies, or enter the groundwater.

If the degraded coating remained on the pipe it would place that volume of degraded coating in the ground during construction, where it could enter the groundwater, and drinking water supplies. This is an immediate public health concern where pipe has already been placed in the ground. The intact coating presents threats to the public health and the environment as well.

The Virginia Department of Health (VDH) and the Virginia Department of Environmental Quality (DEQ) sent a letter to FERC on March 21, 2019 advising that epoxy resins similar to this coating can leach out carcinogens benzene and styrene, and other chemicals that have negative health impacts. They requested information on the possible public health and environmental impacts from the coating.[6] FERC has not responded in writing to VDH and DEQ.

Leached and/or degraded coating could enter drinking water supplies. Private drinking water wells and springs would be most susceptible, especially in karst areas where underground voids enable rapid and long-distance transport of subsurface pollutants. The ACP route includes 71 miles through karst terrain[7] and most of that is through rural areas where private wells and springs are used for drinking water.

Retired Cambridge University professor and pipe coating expert Paul Davies has stated that he would expect the degrading epoxy material on pipes in storage yards to become airborne and be carried downwind from a stack of pipe left out in the sun. He further stated that he would be concerned for his health if he thought he was breathing UV damaged epoxy dust on a near continuous basis, even if the concentration in the air was extremely small. He went on to say that he would want to avoid living in a home downwind from a stack of unprotected, weathering, fusion-bonded epoxy-coated pipe.[8]

Large pipe storage yards are located in Morgantown, West Virginia; Culpeper, Bealton, and Clarksville, Virginia; and Plymouth and Fuquay Varina, North Carolina.[9] In total, they contain approximately 80,000 pipes. They are in close proximity to housing developments, public buildings, churches, shopping malls, golf courses, and major water bodies.

Acres of ACP pipe in a storage yard just outside of Culpeper, VA. (Allegheny-Blue Ridge Alliance)

Persons living near these storage yards are most at risk at this time, as are persons working in, and frequenting nearby buildings and facilities. They are and have been at risk of inhaling wind-borne degraded coating, which may contain silica. They are and have been at risk of ingesting degraded coating, especially if they use a private well for their drinking water. Aquatic species in the adjacent Roanoke and Monongahela Rivers, as well as smaller water bodies are at risk. Persons who eat fish from these water bodies may also be at risk.

Smaller contractor yards where pipes will be kept are planned for other locations if the ACP moves forward.[10]

FERC REQUESTED COATING ANALYSIS

On July 3, 2019 FERC requested that the ACP submit information regarding the possible threats to public health and the environment from the coating.[11] The ACP provided reports to FERC on July 22, 2019, and August 23, 2019.[12,13] These reports included data by NSF and Tox Strategies, which are private companies. Both reports stated that there were no significant health or environmental threats from the coating.

My review of the reports revealed that they used poor methodology, and poor sampling methods to arrive at unreliable conclusions. Report shortcomings leading to unreliable conclusions include, but are not limited to the following:

- The ACP Tox Strategies report failed to test for silica in the degraded coating, based on an unfounded argument, contrary to 3M position papers, that the loose powdery degraded coating will not become airborne. Silica is a carcinogen by inhalation.[14] It may become airborne, inhaled by persons, and cause cancer.
- The ACP Tox Strategies report sampling wipes were contaminated.
- The ACP Tox Strategies report sampling locations excluded the tops of the pipes at the top of the pipe stack, where UV degradation is most intense.
- The ACP Tox Strategies report soil sampling was not completed in a nearby off-site area to compare on and off-site findings. Instead, on site soil sampling results were compared to the state average concentrations.
- The ACP Tox Strategies report misstates information from a referenced Cetiner et al. study, by incorrectly stating coating thickness loss from that study. It also incorrectly compared degradation rates from that study, which was completed in a cold dry climate in Grovedale, northern Alberta, Canada, and North Dakota, where degradation would be slower, to hotter, more humid, and wetter conditions found in the mid-Atlantic and Southeast U.S. ACP storage locations, where degradation would be faster.

The ACP Tox Strategies report states that Cetiner found 1-2 mils of loss, “which indicates that the total quantity of dust available to be released to air from the exposed pipes is extremely limited.”

The Cetiner report indicates that loss of 1-2 mils of coating was observed after only 16-21 months of UV exposure.

Grovedale, Alberta has an average annual temperature of 36.2°F with 18.5 inches of precipitation per year. Plymouth, North Carolina has an average annual temperature of 62.0°F with 52 inches of rain per year.

The ACP pipes have been exposed to UV degradation for 4 years, not 16-21 months, and they have been exposed to a much hotter, much more humid, and much wetter climate than the pipes in the Cetiner study.

Based on 3M's statement of 0.375 mil to 1.5 mil loss per year, the ACP pipes could have losses of 1.5 mil to 6 mil at this time. As shown above, just 3 mil of degraded material on the top half of a 40-foot section of 42-inch pipe computes to 47.5 cubic inches of degraded coating. This is not an "extremely limited" quantity as stated in the ACP report by Tox Strategies, given the approximately 80,000 pipes stored in these yards, and the large size of the pipes.

The ACP NSF tests and certification for 3M Scotchkote Fusion Bonded Epoxy 6233W do not apply to 3M Scotchkote Fusion Bonded Epoxy 6233, in part, due to the UV damage to the coating, the abrasive actions of weather during storage, and from the ground after installation.

I wrote to FERC with my report review findings on September 16, 2019.[15] I asked FERC to hire an independent contractor and consult with the U.S. Department of Health and Human Services (US DHHS), and the U.S. Environmental Protection Agency (EPA) to review the ACP reports, and complete independent studies on the potential health and environmental threats from the coating.

The North Carolina Department of Health and Human Services (NC DHHS) wrote to FERC on October 25, 2019. They also stated concerns about possible public health impacts from the coating and criticized the methodology and reliability of the Tox Strategies report. They asked that FERC require the ACP to provide more information, including information that was not included in the ACP reports.[16]

The epoxy coating is usually applied in the factory, but sometimes the pipes are painted in the field. (watershedcouncil.org)

FERC POSITION ON PUBLIC HEALTH AND ENVIRONMENTAL THREATS FROM THE COATING

FERC asked the EPA, and the Pipeline and Hazardous Materials Safety Administration (PHMSA) to consult with them on the coating issues in the fall of 2019.[17] FERC advised me that they would not consult with the U.S. Department of Health and Human Services, despite the public health issues that had been raised. FERC later advised that neither EPA nor PHMSA have responded to or consulted with FERC on these concerns.

FERC has failed to fully assess public health and environmental concerns regarding the coating, failed to reject the flawed ACP reports, and failed to respond in writing to the

public health and environmental concerns from VDH, DEQ, and NC DHHS.

FERC's failure to adequately respond to these concerns may already be negatively impacting the health of persons in proximity to the pipe storage yards, in proximity to other pipes on the ground, and in proximity to where pipe has already been placed in the ground. The environment in these locations may be negatively impacted as well.

ACTIONS NEEDED TO PROTECT THE PUBLIC HEALTH

- ACP should be required to cover all pipe to prevent the inhalation of air borne degraded coating, or whitewash the pipe, or apply a UV resistant material to the pipe as recommended by 3M to prevent further UV degradation for any pipes that will not be covered.
- FERC should respond in writing to VDH, DEQ, and NCDHHS, and satisfactorily address the issues they raised.
- ACP should be required to remove all degraded coating from the pipes prior to placing pipe in the ground, and safely dispose of it in accordance with applicable regulations.
- FERC should require further information and further testing from the ACP.
- FERC should have a qualified independent agency evaluate the risk to public health from the coating, including, but not limited to, sampling for silica in UV degraded coating material, conducting air, soil, and water sampling near ACP pipe yards and where pipes are currently placed in the ground.
- ACP should be required to conduct pre- and post-pipeline construction sampling of private drinking water wells and springs for coating constituents, and provide the owners with free health screening, treatment and clean water if they have been exposed to toxic substances from the coating.
- Should further tests reveal silica or other toxins in the degraded coating, ACP should be required to provide free health screening and treatment for residents in proximity to pipe storage yards.

PUBLIC SAFETY RISKS

FERC is responsible for public safety for the ACP under the National Environmental Policy Act (NEPA), and FERC's approval of the ACP route. FERC's approved route is fraught with public safety risks.

The FERC-approved route traverses extreme slopes. It includes over 160 miles where a significant landslide threat exists, and over 120 miles where a high incidence of landslides has already occurred. ACP construction would exacerbate landslide risks.[18] In fact, numerous landslides have already occurred in just the first few miles of ACP construction in West Virginia.[19]

PHMSA is well aware of the public safety risks from constructing natural gas pipelines on steep slopes. In 2019 PHMSA issued Advisory Bulletin ADB-2019-2. This document listed a large number of recent pipeline incidents where landslides and land movement damaged pipe and resulted in explosions and pollution. It suggested but did not require pipeline

operators to take specific actions to prevent further incidents.

Even more recently, the FERC-approved Mountain Valley Pipeline, which is being constructed on steep slopes similar to the ACP, caused a landslide that forced two families to leave their homes, and another slide that actually moved the location of the pipe.

The FERC-approved route also includes 71 miles of karst terrain where sinkhole development and land subsidence threaten the integrity of the pipe.[20]

Degraded pipe coating and pipe coating that has lost its flexibility due to excessive UV exposure leaves the pipe more prone to corrosion and subsequent failure. Thinned coating due to degradation leaves the coating more prone to perforation during handling, placement in the trench, backfilling, and land movement, especially in steep areas. Loss of coating flexibility can result in the coating disadhering from the pipes during the large number of pipe bending operations that would have to be made due to the extremely rugged FERC approved route, and also from earth movement forces after the pipe is in the ground.

Pipe coating inspection results, obtained through a PHMSA FOIA request, revealed that most of the pipes contained degraded coating in the fall of 2017. Please note that this is in direct contradiction to an earlier letter that I received from PHMSA which stated that no coating degradation was found during the fall 2017 inspections.[21] The FOIA request also revealed that no inspections or testing was conducted for UV induced loss of coating flexibility.

Duke Energy and Dominion Energy chose a route prone to landslides, which increases the risk of a high-pressure gas leak and explosion – especially when the pipe's anti-corrosion coating is degraded. Several landslides occurred on the author's property and in Virginia's Little Valley in 2015 during a four-inch rain event, all within several hundred feet of the proposed ACP. Duke and Dominion's consultant claimed the largest of these landslides was only a minor hazard, without ever inspecting the slide. (William Limpert)

It is very important that the pipe coating is not damaged, and that it is in a safe condition to withstand the threat to pipe integrity and subsequent risks of catastrophic explosions that are inherent in the extreme terrain of the FERC-approved route.

The ACP would transport up to 1.5 billion cubic feet of natural gas per day. Natural gas is primarily methane, a highly explosive gas. The gas would be transported at a pressure of up to 1,440 pounds per square inch. Most of the pipe is 42 inches in diameter with walls approximately 5/8 inches thick.[22] Steel for the pipe was sourced from South Korea and the United States.[23] The ACP has an option to increase the flow of gas to 2.0 billion cubic feet per day if they so choose.[24] This would further increase the pressure.

The zone of incineration, or impact radius, for most of the ACP, where instant death would

occur in a pipeline explosion, is 1,100 feet in all directions from the point of the explosion. The evacuation zone for most of the ACP, which must be vacated in minutes to avoid death or serious injury in a pipeline incident is 0.7 miles in all directions from the point of the explosion. At over 600 miles in length, the ACP would have a total evacuation zone at least half the size of the state of Rhode Island, putting a large number of people at risk.

I asked FERC how many people live or work in these areas. FERC advised that they don't know because they don't go into that level of detail.[25] FERC does not require that anyone other than owners of property directly impacted by the pipeline be notified. So, many people who are not directly impacted by the pipeline but would still be in harm's way from a pipeline explosion, were not notified or given the opportunity to become intervenors and legally challenge FERC's decisions regarding the ACP.

REDUCED SAFETY REQUIREMENTS

PHMSA regulations allow for reduced safety standards for pipelines in rural areas due to fewer structures in proximity to the pipeline than in more populated areas.[26] Almost all of the ACP is located in a Class 1 "reduced safety area."[27] Reduced safety standards include thinner pipe walls, less stringent hydrostatic testing to determine the extent of leakage, fewer welding inspections, fewer post construction pipeline inspections, and more widely spaced segregating valve stations, increasing the amount of gas that would ignite in an explosion.[28] Many persons in rural areas would have their only egress in a pipeline emergency blocked by the pipe.

INCIDENCE OF ACCIDENTS

Five catastrophic pipeline explosions have occurred in nearby states in the past two years. Two of these occurred on pipes that were newly installed. An ACP explosion would dwarf these recent explosions since the ACP would be much larger and would carry a much larger volume of gas. On average, a significant gas pipeline accident that involves death, hospitalization, significant property damage, or significant pollution occurs once per week in our country.[29]

(photo by porschegroupltd.com)

DEGRADING PIPE COATING

Corrosion of pipes is a leading cause of pipeline explosions, and accounts for 18 percent of all pipeline incidents.[30] The pipes for the ACP have now been stored in the sun for four years, well beyond the manufacturer's recommendations.[31] A pipe coating trade association recommended that pipes with this coating be stored no more than 6 months in the sun without protection from UV damage.[32] PHMSA inspector Joe Klesin stated that one year of storage in the sun is acceptable, but two years of storage in the sun is unacceptable.[33]

PHMSA public liaison Ian Woods advised on July 9, 2019 that the ACP had not taken actions suggested by coating manufacturer 3M

to protect the coating from UV degradation.[34] Nevertheless, a FOIA request showed that inspections by an ACP contractor found that most of the ACP pipes in all three states were showing degrading coating in the fall of 2017.[35] PHMSA will not release further coating inspection results without another FOIA request.[36] I filed that request on March 23, 2020 but have not received the requested records.

The previously mentioned Cetiner study[37] found a significant loss in coating flexibility after just several months of UV exposure. This resulted in the coating failing a standard flexibility test in both storage locations. Loss of coating flexibility can cause the coating to disadhere from the pipe, especially when the pipe is bent in the field. The pipe for the ACP would be bent in the field in very many locations due to the extreme topography of the FERC-approved ACP route.

ACP COATING SAFETY RECORD

The ACP has already had safety issues with pipe coating in just the first few miles of pipeline construction in West Virginia. The ACP was given a warning notice from PHMSA for December 11 and 12, 2018 inspection findings, which revealed that the ACP was placing pipe in rock lined ditches, with large rocks above the pipe, both of which could puncture the coating.[38] Please note that no fines were issued, and the PHMSA warning notice was sent more than 7 months after the violations were discovered. Additionally, the ACP was forced to remove many sections of pipe due to coating anomalies that were discovered by an electrical test after the pipe was placed in the ground. This occurred despite regulations that require that the coating be visually inspected prior to placement in the trench and backfilling the trench.[39]

The large explosive potential of the ACP, the degraded coating, the reduced safety standards, and the coating safety issues that have arisen in early ACP construction indicate an increased safety risk for people living, working, attending school, or otherwise occupying the incineration zone and the evacuation zone of this pipeline.

ACTIONS NEEDED TO PROTECT PUBLIC SAFETY

Stop further placement of pipe into the ground until the following are completed:

- FERC should notify all residents, schools, hospitals, and commercial locations that are within the blast radius and evacuation zones of the threat from a pipeline explosion.
- FERC should conduct a scoping period of sufficent length to allow these persons an opportunity to comment on public safety issues.
- ACP should cover all pipe, whitewash the pipe, or re-coat the pipe with UV resistant coating per 3M recommendations to prevent further UV coating degradation.
- FERC should have an independent expert inspect all pipe, and discard, repurpose, or repair all pipe that is not safe.

- FERC should increase independent inspections of all ACP construction.

CONCLUSION

The ACP has failed to protect the pipe coating from UV degradation and failed to provide reliable information to FERC and the public regarding the threats to public health, public safety, and the environment from the coating.

FERC has failed to act on the unreliable coating report from the ACP.

FERC has not adequately assessed the threats to public health, public safety, and the environment from coating issues, and has failed to advise VDH, DEQ, NC DHHS, and the public in writing of concerns they raised in letters to FERC.

FERC and the ACP are responsible for negative public health, public safety, and environmental impacts from the coating.

FERC and the ACP must take actions as specified above to protect the public health, public safety, and the environment.

ENDNOTES

[1] Letter from Robert Burrough, PHMSA, to William Limpert, 6/1/18
[2] 3M Safety Data Sheet, 7/25/19
[3] Material Declaration on 3M EMD Products sold in the USA, September 19, 2018
[4] 3M Technical Brief UV Protection of Coated Line Pipe, 2009
[5] Ibid.
[6] Letter signed by M. Norman Oliver and David K. Paylor, 6/21/19
[7] FERC ACP Environmental Impact Statement
[8] Paul Davies e-mail to William Limpert, 9/4/19
[9] From PHMSA FOIA request, pipe coating inspection reports
[10] See note 7.
[11] David Swearingen, FERC letter to Matthew Bley, Dominion Energy, 7/3/19
[12] Salud Astru, Dominion Energy to FERC Secretary Kimberley Bose, 7/22/19
[13] Matthew Bley, Dominion Energy to FERC Secretary Kimberley Bose, 8/23/19
[14] NIH National Cancer Institute, 2/1/19
[15] William Limpert to FERC Secretary Kimberley Bose, 9/16/19
[16] Virginia Guidry, NCDHHS to FERC Secretary Kimberley Bose, 10/25/19
[17] FERC 12/11/19 e-mail to William Limpert referencing 11/4/19 FERC e-mail to USEPA
[18] See note 7.
[19] FERC environmental inspection reports
[20] See note 7.
[21] June 1, 2018 letter from Robert Burrough, PHMSA
[22] See note 7.
[23] See note 21.
[24] See note 7.

[25] Telephone conversation with FERC'S Kevin Bowman, c. 2016
[26] 49CFR 192,5
[27] See note 7.
[28] See note 26.
[29] PHMSA Pipeline Incidents 2000-2019
https://www.google.com/search?q=PHMSA+Causes+of+Pipeline+Failure&oq=PHMSA+Causes+of+Pipeline+Failure&aqs=chrome..69i57j69i64.13701j0j7&sourceid=chrome&ie=UTF-8
[30] PHMSA Pipeline Failure Causes, revised 9/24/28
https://primis.phmsa.dot.gov/comm/FactSheets/FSCorrosion.htm?nocache=9090
[31] June 1, 2018 letter from Robert Burrough, PHMSA
[32] NAPCA Bulletin 12-78-04
[33] Joe Klesin comments to William Limpert and Gary Robinson, October 2017
[34] E-mail from Ian Woods, PHMSA to William Limpert, 7/9/19
[35] ACP pipe coating analysis KTA-Tator, Inc., 2017
[36] E-mail from Ian Woods, PHMSA to William Limpert, 3/30/20
[37] Cetiner, et al, 2001, Oil and Gas Journal
[38] Letter from Robert Burrough, PHMSA to Brian Sheppard, Dominion July 25, 2019
[39] 49 CFR 192.461(c)