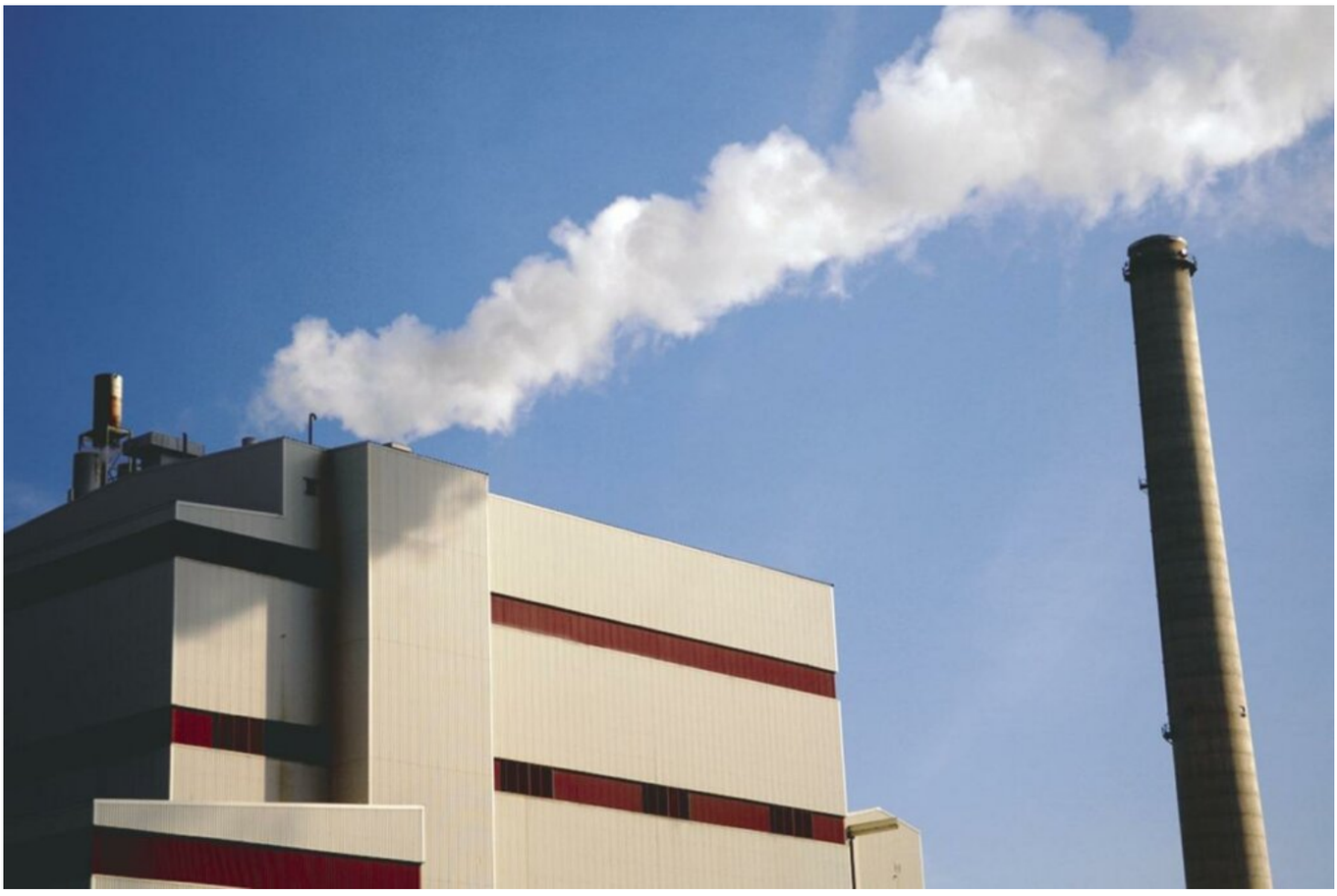
ENERGY + ENVIRONMENT

A hydrogen plant could rise near a former King George coal plant

Company looking at surrounding property for hydrogen, data centers

BY: **CHARLIE PAULLIN** - SEPTEMBER 15, 2022 12:05 AM



The coal-fired Birchwood Power Plant in King George was once being converted to a solar and storage facility. (Free Lance-Star)

Efforts to convert the site of a former coal plant in King George County into a solar and storage facility are being rerouted to develop the parcels surrounding it for an emerging power source: a hydrogen plant.

Clark Lemming, a Stafford-based land attorney representing Green Energy Ventures, LLC, told the Virginia Mercury Tuesday the company plans to submit a rezoning application to King George at the end of September for the four parcels surrounding the Birchwood Power Plant property.

The parcels, totaling about 230 acres, are currently zoned agricultural. Green Energy is asking them to be rezoned for industrial use.

Solar "requires acres and acres and acres to produce the same quantity of power that a much, much smaller hydrogen plant facility can produce," Lemming said.

While Lemming provided only limited details of the project, he said the hydrogen plant would support a data center campus on the properties while also producing additional power that would be available.

The efficiency of hydrogen plants has been debated. Hydrogen projects are classified based on the different ways they produce energy. Green hydrogen is generated by splitting water into hydrogen and oxygen using power solely from renewable sources. Blue hydrogen converts natural gas to hydrogen and carbon dioxide by using heat, steam and pressure. Gray hydrogen is made from fossil fuels and doesn't capture carbon emissions during production like blue hydrogen does.

Hydrogen power plants are in their infancy, with the only prior plans to produce electricity from hydrogen in Virginia linked to the now-canceled Chickahominy Power Station. The developer of that project, Balico, initially planned to fuel the facility solely through natural gas but later entered an agreement to design the plant so that it could be converted to use hydrogen.

In February, a U.S. Senate committee expressed bipartisan support for using hydrogen fuel in the U.S.

The potential hydrogen plant would come with an additional water treatment plant built by Green Energy Ventures and then conveyed to King George to supply not only the plant but also data centers and manufacturing facilities.

Water is in high demand for data centers, which use it in large quantities to cool their servers. As data centers continue to multiply in Northern Virginia, already the data center capital of the world, water usage needs to be watched, said Lemming. In King George, water could be withdrawn from the nearby Rappahannock River to supply the new treatment plant instead of relying on deep wells, he added.

The hydrogen plant proposal would not involve the property that contains the Birchwood Power Plant owned by Birchwood Power Partners, an affiliate of J-POWER USA, itself a subsidiary of Tokyo-headquartered power producer J-POWER.

The Birchwood Power Plant was a coal-fired power plant that produced energy for Dominion from November 1996 until it was deactivated in March of 2021. Plans then called for turning the plant's land into a solar and energy storage facility.

Green Energy Ventures initially reached out to Birchwood Power Partners with the hope of developing the site as a data center campus.

However, negotiations ran into difficulties, and in July, Green Energy Ventures filed a lawsuit in Richmond City Circuit Court claiming that Birchwood Power Partners had broken a confidentiality agreement the two had signed during negotiations for the purchase of the property.

Birchwood had disclosed "GEV's confidential information concerning the concept of developing a data center campus on the Birchwood Property to a competitor of GEV," Charlie Lee, an attorney representing Green Energy Ventures, wrote in the suit.

Green Energy Ventures claimed Birchwood then used that proprietary information to increase the market value of the land from $40 million to $150 million.

Court filings show the companies "entered into a settlement agreement" on Aug. 10, although the terms of the agreement were not available.

Lee confirmed by email that the "case is resolved and is being dismissed."

Green Energy Ventures was created as a subsidiary of Green Energy Partners, LLC, to develop the data center campus on the Birchwood plant property, but the latter has been dissolved and only the former remains, Lemming said.

Birchwood Power Partners has faced scrutiny from King George officials over its plans to rezone the former plant property, as reported by the Fredericksburg Free Lance Star.

King George County issued a special use permit in 1991 for the plant to be operated on the agriculturally zoned land, but no other uses were allowed as part of a proffered condition.

The process to remove the proffer is underway alongside an effort to rezone the land from agricultural to industrial, but the Board of Supervisors, which discussed initial plans to repurpose the property for solar, agreed to delay the rezoning at the request of Birchwood Power Partners at the end of last month.

Attempts to reach Birchwood attorney Ann Neil Cosby were unsuccessful.

King George County Administrator Christopher Hill declined to comment until the proposal is placed before the county, preferring not to respond to "speculation or rumors."

CHARLIE PAULLIN

Charles Paullin covers energy and environment for the Mercury. He previously worked for Northern Virginia Daily in the Northern Shenandoah Valley and for the New Britain Herald in central Connecticut. An Alexandria native, Charles graduated from the University of Hartford initially wanting to cover sports. He's received several Virginia Press Association awards for his coverage of crime, local government and state politics. Catch him in nature experiencing all the outdoors has to offer, and contact him at cpaullin@virginiamercury.com.

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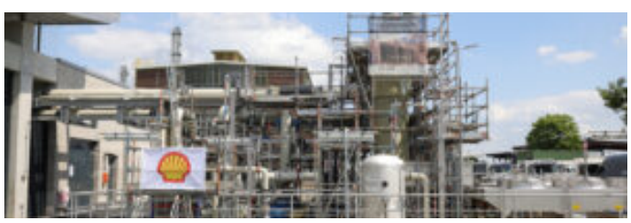

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Gov. Youngkin wants a small modular reactor. What exactly is that?

Newer form of nuclear technology comes with fuel, waste questions

BY: **CHARLIE PAULLIN** - NOVEMBER 7, 2022 12:04 AM

Dominion Energy's North Anna Nuclear Power Station in Louisa County. (Ned Oliver/Virginia Mercury)

Within the span of two months, Republican Gov. Glenn Youngkin made it clear he wants Virginia to be a leader in the use of nuclear technology, specifically by having a small modular reactor operational in Southwest Virginia within the next decade.

He first announced the new focus at the unveiling of his statewide energy plan, a document every Virginia governor is required by law to craft, in early October. He then leaned in on it by proposing a $10 million fund for energy innovation efforts, half of which would be devoted to the deployment of an SMR.

Critics of Youngkin's energy plan were quick to say small modular reactors are in their infancy compared to already deployable and scalable renewable energy technologies.

Nuclear generation has been around for decades, but SMRs are an emerging advanced form of the technology, with the first three expected to be deployed in different parts of the country by decade's end.

While Virginia has had two traditional nuclear plants in operation for years, the smaller nuclear reactors are unique in how they function and the fuel they use. However, many of the

concerns that come with nuclear technology — such as waste, operational requirements and costs — also accompany SMRs.

How do SMRs work?

SMRs are designed to be a "plug and play" form of nuclear generation in the sense that they can be manufactured at a factory and then installed at a site, according to an August report commissioned by the National Association of Regulatory Utility Commissioners.

Whereas many of the country's current large nuclear reactors were built to generate between 300 and over 1,000 megawatts, SMRs are intended to generate between 20 to 300 megawatts of power in a baseload capacity. There are also microreactors, generating between 1 and 20 megawatts of power, that are about 1% of the size of traditional reactor models.

Nuclear reactors generate heat through fission, or the slamming of atoms into one other. This process is carried out using fuel assemblies of rods filled with uranium pellets.

Uranium atoms can be split easily. When atoms split, radioactive isotopes are created. Uranium is commonly found in rocks all around the world, but the specific type used in nuclear energy production, U-235, is rare.

Once heat has been generated, it can be used to make steam that turns turbines to generate electricity primarily in two ways: through boiling-water reactors or pressurized water reactors. In the former, water is boiled to produce steam. In the latter, steam is produced by exchanging heat from a primary loop of water traveling through the core at high pressure to a second lower-pressure loop.

Traditional reactors use water for their processes, but advanced reactors like SMRs can use molten salt, liquid metals like sodium or lead, or gases like helium or carbon dioxide. These approaches allow them to operate at higher temperatures, with higher efficiency rates and potentially less radioactive waste.

Along with being more efficient than traditional nuclear, SMRs are being endorsed by the federal government because they offer certain safety features that don't require operators, according to Alice Caponiti, a deputy assistant secretary for the U.S. Department of Energy.

Where does the fuel come from?

SMRs run on an enriched form of uranium, a mineral that was once mined in the United States but is now sourced primarily internationally. In 2020, just over a quarter of uranium

purchases for U.S. reactors came from each of Canada and Kazakhstan, with an additional 19% from Russia, 13% from Australia and 9% from Uzbekistan, according to NARUC.

The Fukushima nuclear disaster in 2011 led to many new reactor projects being canceled, creating a global oversupply of uranium. Competing energy sources like natural gas and wind also caused several mining companies in the U.S. to permanently halt their operations.

Today, the U.S. has only two uranium mines operating in Wyoming, one mill operating in Utah and one enrichment plant operating in New Mexico. A conversion plant, which adapts the fuel for reactors, in Ohio is set to restart next year, NARUC found.

Whereas the current nuclear fleet relies on what's known as "low-enriched uranium," advanced reactors like SMRs rely on "high-assay low enriched uranium," or HALEU. This type of fuel has a higher concentration of uranium that allows reactors to operate more efficiently. Currently, Russia is the only country that has commercially available HALEU enrichment capabilities.

Once uranium pellets are stacked into rods that are bundled together to make a fuel assembly, trucks transport them to reactor sites where the assemblies stay in bins until needed, according to the U.S. Energy Information Administration. The uranium is only mildly radioactive at this point.

Dominion Energy, which operates Virginia's only two nuclear plants, said in its 2022 integrated resource plan that the company intends to add a small modular reactor to its fleet by 2032.

Scott Miller, manager of nuclear communications and media relations at Dominion, said that "all indications are that, right now, uranium for future SMRs will come from the same supply chain sources that provide uranium for the existing fleet."

The Virginia-headquartered Lightbridge is working to develop an advanced nuclear fuel source that can operate at a cooler temperature than standard fuel requires.

How is waste handled?

Nuclear fuel must be treated after use to safely allow radioactive decay and cooling.

That process begins by storing the fuel in water-cooled pools for about five to seven years, the NARUC report details. It's then transported to large concrete stainless steel containers for storage.

Because the U.S. doesn't have a permanent repository for used nuclear fuel, casks must be stored onsite. A video of Dominion energy nuclear processes shows the fuel being stored in large structures.

"Surry and North Anna have been storing their spent nuclear fuel for 50 years safely," Miller said.

A plan to store spent fuel permanently at Yucca Mountain in Nevada was halted due to state pushback.

"All of the fuel we've produced to date could fit on the size of a football field, three meters high," Caponiti said.

But while boosters tout SMRs' efficiencies, one research paper determined that the waste they create is "more voluminous and chemically/physically reactive" than that generated by traditional nuclear reactors.

A DOE spokesperson said work on a system for final disposal of the fuel and how to handle future spent SMR fuels is underway.

What will it take to get one SMR operational?

The federal government has contracted with three companies to get small modular reactors functioning by the end of the decade.

Those include a light water reactor by NuScale in Idaho, a sodium-cooled reactor by TerraPower in Wyoming and a gas-cooled reactor by X-Energy in Washington. All are expected to be operational by 2029.

According to a report by the Virginia Nuclear Energy Consortium, there are over 60 private-industry nuclear operations in the state working on engineering, manufacturing, security, staffing or infrastructure. One of those is Lynchburg-based BWX Technologies, which is involved with the building of a GE small modular reactor in Canada by the end of the decade.

How the company will be involved in reaching Youngkin's goal is unknown, president and CEO Rex Geveden said in an interview with the Mercury, as "there's been no reactor selected, no architecture, no technology type selection." But it will be in the supply chain somewhere, he added.

Despite those plans, Geoff Fettus, a nuclear, climate and clean energy program lawyer with the Natural Resources Defense Council, said he is skeptical an SMR can be operational in Virginia within a decade.

"We especially don't think it will be operational in a free market capacity this decade or maybe the next," Fettus said, considering competition with "cheaper, safer, faster, cleaner renewables."

How much do they cost?

NARUC estimated that capital costs of SMRs are cheaper than those for other advanced and conventional nuclear reactors, at about $5,969 per kilowatt per hour, compared to about $6,432 or $7,740, respectively.

Further, reusing retiring coal plants for SMRs can create savings, as nuclear requires far less acreage than solar or wind.

"Many new advanced nuclear reactor designs currently in development do not require water to cool the reactor and are, therefore, not bound by the access and availability of water from nearby rivers, lakes, or oceans," the NARUC report added.

However, while SMRs are more cost-effective than fossil fuel plants to operate, costs associated with recent projects in South Carolina, Georgia and Idaho have triggered concerns.

NuScale says it can generate power at $58 per megawatt-hour, but some estimate SMR power costs could reach $200 per megawatt-hour.

Geveden acknowledged that advanced reactor projects "may not be quite as cheap as wind and solar in the beginning, but it gets more competitive when you evaluate it over the life of the plant."

Still, Walton Shepherd, Virginia policy director with the NRDC, said SMR technology just isn't necessary.

"On the hottest summer day we still have an excess of 20% extra capacity beyond what we need," Shepherd said. "The notion that we need to go after this currently non-existent power technology to meet a need that has already been met, it's like building a Mars spaceship to drive down to the corner grocery store."

This story has been updated to correct the spelling of Alice Caponiti's name.

ENERGY + ENVIRONMENT

Dominion wants Wise County coal plant to stay as is

In nine-month economic viability report, utility defends continued operation of waste coal facility

BY: **CHARLIE PAULLIN** - NOVEMBER 23, 2022 12:03 AM

Virginia City Hybrid Energy Center in Wise County. (Sarah Vogelsong / Virginia Mercury)

A report by Dominion Energy finds the company's largely coal-fired Virginia City Hybrid Energy Center in Wise County is economically viable, but critics say it lacks substantial, in-depth analysis to support its claims that the plant's economic and environmental benefits justify continuing its current operations.

Dominion filed the 28-page report as part of a deal made earlier this year with the State Corporation Commission and the Sierra Club's Virginia chapter, which argued the plant should be closed next year. The company's own calculations, the chapter contended, found the plant's operations will cost ratepayers almost $500 million by 2030 while producing only 6.3% of the power it's capable of generating.

Under that deal, Dominion agreed to "complete an analysis of a possible pathway towards economic viability" for VCHEC "on a going-forward basis."

Dominion agrees to study viability of Wise power plant that's not producing much power

With a coal plant that's costing ratepayers millions but not producing much electricity, Dominion Energy has agreed to conduct an analysis of how it could make the Virginia City Hybrid Energy Center in Wise County economically viable in the future. "The company has acknowledged that the economics of the station are challenged at the moment," … Continue reading

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The report was required to consider scenarios in which the plant retired prior to 2045, the deadline for fossil fuel plant retirements under the Virginia Clean Economy Act, and analyze alternative uses for the site, including solar, wind and energy storage development. Additionally, it was required to include discussion of local economic impacts, system reliability, environmental justice and the social cost of carbon.

What resulted was a discussion of the plant's annual $156 million in economic benefits to Wise County, the environmental benefits of using coal waste as fuel and the potential siting of a battery storage facility or small modular nuclear reactor at the location.

"The facility's operations are currently economic, given present market conditions and high natural gas prices, and it has a path for economic operation through at least 2045," the report states. "The significant regional economic and environmental benefits which would be foregone in any early-retirement scenario also militate against early retirement."

But critics say the report fails to fully analyze the plant's possible uses, particularly in light of the recently passed Inflation Reduction Act and bipartisan infrastructure law, or grapple with the question of whether ratepayers, all of whom live outside Wise County, should be paying for the plant's benefits.

"We're pretty disappointed with it," said Evan Johns, a senior attorney with West Virginia-based Appalachian Mountain Advocates, which is representing the Sierra Club. "There are some obvious omissions from it."

In response to several questions from the Mercury about ratepayer impacts and plant operations, Dominion Energy spokesperson Jeremy Slayton provided a two-sentence statement.

"VCHEC plays an important role in providing our customers with reliable and affordable electricity," Slayton said. "Additionally, the station provides hundreds of jobs and significant contributions to the local economy in Southwest Virginia, while helping clean up millions of tons of waste coal, thereby improving environmental quality in the region."

Dominion defends ongoing operation

VCHEC began operations in July of 2012 and produces 610 megawatts of electricity using a combination of waste coal, waste wood and regular coal as fuel.

It was built after the General Assembly in 2004 passed a law declaring a plant fired with Virginia coal and located in the coalfield region of the state to be in the public interest. In 2007 the legislature amended the statute to allow Dominion to recover costs of the facility through a rider, or additional fee on customers' bills.

Today, VCHEC supports about 121 direct and 180 indirect jobs, according to Dominion's viability report. The plant further provides over $11 million in tax revenue to Wise County annually, regional property taxes and more than $3.5 million in charitable giving.

Beyond the dollars the plant pumps into the region, Dominion argues that it produces a range of environmental benefits. All wastewater discharged is treated on-site, boilers capture carbon and the facility cleans up the toxic byproduct of coal production known as gob coal.

Southwest Virginia has more than 100 million tons of gob, the report states. That waste can reach waterways, and natural oxidation in piles of gob releases methane and carbon dioxide, both of which contribute to climate change.

Legislation passed in 2022 directs the Department of Energy to submit a report to the General Assembly by next month on options for cleaning up gob piles, which Dominion contends can only be done permanently through VCHEC.

Additionally, with the rising costs of natural gas and oil, VCHEC's use of coal makes it an "important" part of Dominion's generation fleet that can be used in high-demand periods, the report argues.

If closed early, the company calculates VCHEC would cause Dominion customers losses of between $40.9 million and $158.8 million.

Overall, Dominion says it would need to recoup $1.8 billion from ratepayers to close VCHEC in 2026, $2.4 billion to close it in 2030 and $4.4 billion to close it in 2045. Customers would see steeper cost peaks if the plant were closed earlier: For residential customers, the rider would peak in 2024 at $7.80 for retirement in 2026, $5.35 for retirement in 2030 and $3.78 for retirement in 2045.

In analyzing potential alternative uses of the site, Dominion says onshore wind isn't viable, and only 6 megawatts of solar could be supported. But because the plant is not connected to Dominion's distribution system – Appalachian Power Company is the local transmission operator – there would be financial and technical challenges to connect it.

The company says a roughly 600 megawatt energy storage facility could be supported at the site, but placing such a facility at a location with greater power needs would be a better value to customers, and a battery storage facility would support fewer jobs.

Another option could be an SMR, which could produce up to 300 megawatts of power with fewer manufacturing requirements than a larger nuclear plant. But because the technology is not ready for deployment in the U.S. (the first aren't expected to come online until the end of the decade), such plans are speculative, the report states.

Gov. Youngkin wants a small modular reactor. What exactly is that?

Within the span of two months, Republican Gov. Glenn Youngkin made it clear he wants Virginia to be a leader in the use of nuclear technology, specifically by having a small modular reactor operational in Southwest Virginia within the next decade. He first announced the new focus at the unveiling of his statewide energy plan. Continue reading

Critics say report falls short

While developing state policy to create economic and environmental benefits for a region is one thing, said William Shobe, director of the Center for Economic and Policy Studies at the Weldon Cooper Center for Public Service at the University of Virginia, having Dominion customers foot the bill for them is another.

“There is no net gain from the state’s point of view by moving money from (outside the region) to Wise County through electricity rates,” Shobe said. “There seems to be an assumption in here that people across the state are responsible for cleaning up gob without thinking about what the cost is to people in the rest of the state.”

Furthermore, for the plant to produce those benefits, it “almost certainly” requires ratepayers to pay more than the value of the electricity generated by the plant to keep it open, Shobe said.

Use of VCHEC has been dropping: A recent filing by Dominion with the State Corporation Commission shows that the plant’s capacity factor, a measurement of the actual power a facility produces compared to how much it’s capable of producing, will peak in coming years at 15.5% in 2024 and then continue to decline to 6.33% in 2029.

“Electricity from VCHEC is simply too expensive most of the year for the plant to be dispatched. Other sources are cheaper,” Shobe said. “The state would need to subsidize the operation of the plant for it to run at a higher capacity factor.”

Johns said the report was also overly dismissive of other potential uses for the site

While he noted solar and wind may be difficult to develop at VCHEC, he said the report unnecessarily dismisses its battery storage potential and fails to consider benefits included in the Inflation Reduction Act. Those include incentives for clean energy projects for communities that have historically relied on coal mining, like those in Southwest Virginia. Additionally, funding is available from the bipartisan infrastructure law to address abandoned mine land recovery and finance programs to help alleviate the cost of fossil plant retirement.

“It’s just really disappointing to have all of these legislative provisions that affect a lot of the issues being looked at in this report and to just completely omit them,” Johns said.

Finally, he said, the report discusses the social cost of carbon in one fuel cost case, but not another. And it doesn’t clearly indicate where Dominion is sourcing its fuel for the burning of gob coal, which Johns said will likely get more expensive and less useful over time.

It just doesn’t have the “kind of discrepancies you like to see if you’re really trying to isolate variables [to] look at how a facility like VCHEC is expected to run under a wide array of scenarios,” he said.

CHARLIE PAULLIN

Charles Paullin covers energy and environment for the Mercury. He previously worked for Northern Virginia Daily in the Northern Shenandoah Valley and for the New Britain Herald in central Connecticut. An Alexandria native, Charles graduated from the University of Hartford initially wanting to cover sports. He's received several Virginia Press Association awards for his coverage of crime, local government and state politics. Catch him in nature experiencing all the outdoors has to offer, and contact him at cpaullin@virginiamercury.com.

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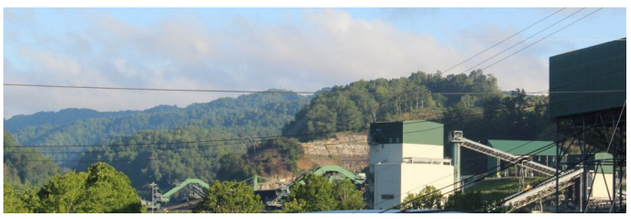

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