

NUCLEAR INFORMATION AND RESOURCE SERVICE • CHESAPEAKE CLIMATE ACTION
NETWORK • CHESAPEAKE PHYSICIANS FOR SOCIAL RESPONSIBILITY
BEYOND NUCLEAR • CRABSHELL ALLIANCE • MARYLAND ENVIRONMENTAL HEALTH
NETWORK • PUBLIC CITIZEN • SUN DAY CAMPAIGN

September 7, 2018

Bob Sadzinski
Power Plant Siting Assessor
Power Plant Research Program
Maryland Department of Natural Resources
580 Taylor Avenue, Tawes State Office Building
Annapolis, MD 21401

Re: Draft Analysis of Implementing Zero Emissions Credits or Procurement Support for Nuclear Power

Dear Mr. Sadzinski,

Thank you for the opportunity to provide comment on the draft analysis presented on zero emissions credits or procurement support for nuclear power, which was presented at the August 29, 2018 meeting of the Renewable Portfolio Standard Work Group.

Nuclear Information and Resource Service, Chesapeake Climate Action Network, Chesapeake Physicians for Social Responsibility, Beyond Nuclear, Crabshell Alliance, Maryland Environmental Health Network, and Public Citizen, and SUN DAY Campaign oppose the implementation of a ZEC program or other subsidies for nuclear power in Maryland. It would be counterproductive to the purpose and success of the renewable portfolio standard (RPS) and other related energy and environmental policies, including and especially the Greenhouse Gas Reduction Act and Chesapeake Bay conservation and restoration programs. The draft analysis recognizes some of the problems with subsidies for nuclear power – including the enormous costs and environmental risks – and it makes a broad survey of nuclear subsidy programs that have been adopted in other states in recent years. However, the description of those programs is incomplete and, in a number of ways, inaccurate. It would be a mistake for Maryland to assume that the programs recently adopted in other states establish a legitimate precedent or good example for our state to follow.

About the Signatories to these Comments

Nuclear Information and Resource Service (NIRS) is a non-profit environmental organization headquartered in Takoma Park, Maryland. NIRS was founded in 1978 to provide independent information and analysis on nuclear power, radioactive waste, sustainable energy, and related environmental and energy issues. NIRS has substantial expertise and experience in the matters addressed in the draft analysis. Since 2014, we have monitored and been directly engaged in regulatory proceedings, rulemakings, and legislative proposals regarding Zero Emissions Credits (ZECs) and other forms of subsidies and pricing supports for nuclear power, at the state and federal levels. We offer the below comments to provide a richer and more complete understanding of the impacts and implications of the nuclear ZEC/procurement option (“nuclear subsidies”).

Chesapeake Climate Action Network (CCAN) is a regional nonprofit dedicated to promoting clean and safe energy solutions to climate change in Maryland, Virginia and DC.

Chesapeake Physicians for Social Responsibility (Chesapeake PSR) is an organization of 300 dues paying members and 1000 activists concerned about climate change and nuclear war as the two major public health crises of our time. We are the Maryland affiliate of National PSR. (PSR is part of two Nobel peace prize-winning organizations, International Physicians for the Prevention of Nuclear War and ICAN, International Campaign to Abolish Nuclear Weapons.)

Takoma Park, Maryland-based **Beyond Nuclear** aims to educate and activate the public about the connections between nuclear power and nuclear weapons and the need to abolish both to safeguard our future. Beyond Nuclear advocates for an energy future that is sustainable, benign and democratic. Beyond Nuclear was honored and privileged to serve as a member organization in the environmental coalition that successfully opposed the proposed but later cancelled Calvert Cliffs 3 atomic reactor on the Chesapeake Bay in Lusby, Maryland.

The Crabshell Alliance is a grassroots organization based in the Baltimore Area in the state of Maryland that promotes the use of safe, clean, and sustainable energy, actively opposes the use of nuclear power, and works to raise awareness of the dangers of nuclear waste.

The Maryland Environmental Health Network takes action to protect human health by addressing environmental policies and practices that shape the conditions for health in Maryland, through broad application of an equity lens and consistently raising the question of who is most harmed by pollution and environmental degradation.

Public Citizen is a national progressive consumer rights advocacy and public interest group based in Washington, D.C. Public Citizen has more than 10,000 members and activists in Maryland.

The SUN DAY Campaign is a non-profit research and educational organization founded in 1992 to aggressively promote sustainable energy technologies as cost-effective alternatives to nuclear power and fossil fuels.

Promotion of Nuclear Power is not Appropriate or Justifiable under the RPS

Subsidizing Calvert Cliffs would be utterly inconsistent and counterproductive to the purpose and intent of the RPS, due to its environmental and environmental justice impacts. Just as fossil fuel generation cannot be considered renewable or “clean energy” because it does not produce high-level radioactive waste, nuclear power is not a clean or safe source of energy, and proposing to subsidize it under the RPS is inappropriate and cannot be justified.

The Public Utilities Law § 7-702 states the intent of Maryland’s Renewable Energy Portfolio Standard (RPS):¹

- (a) It is the intent of the General Assembly to:
 - (1) recognize the economic, environmental, fuel diversity, and security benefits of renewable energy resources;

¹ <https://codes.findlaw.com/md/public-utilities/md-code-public-util-sect-7-702.html> (emphasis added)

- (2) establish a market for electricity from these resources in Maryland; and
 - (3) lower the cost to consumers of electricity produced from these resources.
- (b) The General Assembly finds that:
- (1) the benefits of electricity from renewable energy resources, including long-term decreased emissions, a healthier environment, increased energy security, and decreased reliance on and vulnerability from imported energy sources, accrue to the public at large; and
 - (2) electricity suppliers and consumers share an obligation to develop a minimum level of these resources in the electricity supply portfolio of the State.

The purpose of the RPS is, therefore, not only to decrease greenhouse gas emissions, but to recognize the environmental benefits of renewable energy broadly, lower the cost of renewables to consumers, create a healthier environment, and reduce reliance on imported energy sources. Promotion of nuclear power is counter to the environmental goals of the RPS law, and will have no beneficial impact on the cost of renewables. If anything, large sums of money to subsidize nuclear power would either result in slowing or limiting investment in renewables, thereby impeding cost reductions while raising overall energy costs to consumers. In addition, nuclear power is, inherently, an imported energy source. No uranium is produced, processed, or enriched in Maryland, and the U.S. imports the vast majority of uranium from other countries through a global market, principally Canada, Kazakhstan, Australia, Niger, and other countries.²

The routine operations of the Calvert Cliffs Nuclear Power Plant produce significant amounts of radioactive and toxic wastes, which harm the environment and are a risk to public health, including but not limited to:

- about 30 tons of nuclear waste each year, in the form of irradiated/spent nuclear fuel
- contaminated parts and equipment
- radiologically activated corrosion and wear products (“CRUD”)
- contaminated uniforms and radiation protection gear
- routine releases of radioactive gases and contaminated water
- leaks of tritium and other radioisotopes
- tritiated cooling water that is packaged and shipped to offsite management/disposal facilities

Calvert Cliffs also has severe impacts on Chesapeake Bay. The facility is far and away the largest single source of surface water withdrawals in Maryland. The reactors utilize a once-through cooling system which withdraws over 3 billion gallons of water per day, frequently accounting for more than half of all annual surface water appropriations by thermal generation sources.³ The reactors then discharge the superheated water back into the Chesapeake, a significant source of thermal pollution, which decreases oxygen levels in the bay and inflicts heat stress on aquatic species.

² World Nuclear Association. “World Uranium Mining Production.” <http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/mining-of-uranium/world-uranium-mining-production.aspx>

³ Maryland Department of Natural Resources. *Maryland Power Plants and the Environment (CEIR-18)*. <http://www.pprp.info/ceir18/HTML/Report-18-Chapter-4-2-1.html>

Furthermore, the consequences of a nuclear disaster at Calvert Cliffs would be devastating to the Chesapeake and the entire DMV region. More than seven years since the March 2011 Tohoku earthquake near Japan, more than 300 tons of contaminated water from the Fukushima Dai-Ichi nuclear site is still leaking into the Pacific Ocean each day. The potential for such an impact in the Chesapeake must be reduced and avoided.

In addition to these direct environmental impacts at the reactor site, Calvert Cliffs has a substantial environmental and greenhouse gas footprint, through the nuclear fuel chain and the reactors' lifecycle impacts. Uranium mining and processing to produce nuclear reactor fuel is heavily polluting and toxic, resulting in over 1,000 pounds of long-lived radioactive waste for each pound of enriched uranium reactor fuel.⁴ This "front-end" waste is in the form of uranium waste rock and mill tailings, as well as depleted uranium, which will be hazardously radioactive and toxic for millions of years. At 30 tons of nuclear fuel consumed each year, Calvert Cliffs is responsible for at least 30,000 more tons of uranium wastes each year. Uranium mining and milling are major environmental justice issues, in the U.S. and globally, as indigenous peoples and peoples of color are disproportionately targeted. Similarly, radioactive waste disposal sites are disproportionately located in indigenous lands and communities of color.

Subsidizing Calvert Cliffs Would be Wasteful, Harmful, and Counterproductive

Subsidies for nuclear power in Maryland would be extremely expensive, overshadowing other energy programs. Based on the nuclear subsidies recently adopted in New York, Illinois, and New Jersey, the direct costs to Maryland consumers would be at least \$148 million per year, and could be as much as \$290 million.⁵ Even at the low end, subsidies for one facility alone – Calvert Cliffs nuclear power plant – would be greater than the costs for the entire RPS in 2015.⁶

Such a program is unnecessary and would be counterproductive to Maryland's energy, economic, and environmental goals and policies. There are sound, practical reasons to expect that continuing to operate Calvert Cliffs will not be cost-effective, with or without subsidies, based on the industry's track record and current trends and conditions in the industry. At an average operational lifespan of 38 years, the U.S. nuclear fleet is the oldest in the world and reactors throughout the U.S. are nearing the age of retirement. Like all machines, nuclear reactors cannot operate forever, and due to the extraordinary conditions and stresses to which major components are exposed in a nuclear reactor and the high costs of repairs and replacement, maintenance costs can quickly become cost-prohibitive, even under cost-of-service utility regulation. Three of the six reactors that have retired since 2013 did so under such conditions, and a fourth was retired by an electric cooperative that determined the reactor was simply cost-

⁴ WISE Uranium. "Nuclear Fuel Material Balance Calculator." <http://www.wise-uranium.org/nfcm.html>

⁵ ZEC subsidy prices range from \$10/MWh in New Jersey, to \$16.50/MWh in Illinois, to \$19.53/MWh in New York (2019). Illinois' ZEC program includes a total consumer cost cap that reduces the effective price of ZECs to approximately \$10.30/MWh. Therefore, we conservatively assume a ZEC price in Maryland would be at least \$10/MWh. The base ZEC prices in New York and Illinois are based on estimates of the Social Cost of Carbon. If Maryland were to employ a similar value, the costs to consumers of nuclear subsidies could be far higher.

⁶ Public Service Commission of Maryland. "Renewable Portfolio Standard Report." January 2017.

<https://www.psc.state.md.us/wp-content/uploads/RPS-Report-2017.pdf>

prohibitive to continue operating, especially considering the lower costs of wind, energy efficiency, and other alternatives.⁷

There is no reason to expect that it will be technically or economically feasible for Calvert Cliffs to continue operating for the full sixty years of the reactors' operating licenses. In fact, no commercial nuclear reactor in the world has yet operated for 50 years before being retired, and nearly all have shut down much sooner than that. In fact, the oldest reactor in the U.S., the Oyster Creek reactor in New Jersey, is scheduled to retire this month, after nearly 49 years of operation. The two reactors at Calvert Cliffs are above the U.S. average in age, having been in operation for 41 and 43 years, respectively, with federal operating licenses expiring in 2034 and 2036. That said, there is no reason to expect that Exelon would retire Calvert Cliffs in the immediate future: the plant is still known to be profitable, due to higher wholesale market and capacity prices in the regional market. Also, Calvert Cliffs is contracted to PJM under its capacity performance market three years ahead, through mid-2021, so Maryland will always have at least three to four years advance notice before Exelon could retire either reactor. These conditions provide both PJM and Maryland with sufficient advance notice to evaluate the impacts of a decision to retire Calvert Cliffs, whenever that occurs, and to implement remedies for any impacts that may need to be addressed.

Rather than precipitously providing subsidies to operational nuclear generators, Maryland would be best served by energy planning that anticipates the eventual retirements of reactors. In order to be realistic, pragmatic, and cost-effective, such planning should incorporate contingencies for reactor closures prior to the expiration of their federal operating licenses. For example, such scenarios were evaluated in a report published by the Institute for Energy and Environmental Research in 2016, which studied the feasibility of meeting greenhouse gas emissions in line with Maryland's Greenhouse Gas Reduction Act targets and the Paris global climate agreement's goal of limiting average global temperature increases to 1.5C. The study found that, with proper planning, those goals can be met cost-effectively and equitably with a 100% renewable electricity sector, even if Calvert Cliffs were to retire before 2030.⁸

A good example is Pacific Gas & Electric's plan, announced in 2016, to close the Diablo Canyon nuclear power plant in California, rather than extend the reactors' operating licenses beyond the original forty years, as a result of forward system planning under the state's 50% by 2030 RPS.⁹ PG&E found that Diablo Canyon, which supplies about 20% of the utility's annual retail electricity sales, would become uneconomical to operate by the time the licenses expire in the

⁷ Omaha Public Power District. "Resource Planning Update." May 12, 2016.

http://www.oppdlistens.com/files/9014/6307/5823/May_Board_Presentation-final_SECURED.pdf

⁸ Makhijani, Arjun, Ph.D. "Prosperous, Renewable Maryland Roadmap For A Healthy, Economical, And Equitable Energy Future." November 2016. Institute for Energy and Environmental Research. <https://ieer.org/resource/energy-issues/prosperous-renewable-maryland-2016/>

⁹ Milton J. Bradley & Associates. "Joint Proposal for the Orderly Replacement of Diablo Canyon Power Plant with Energy Efficiency and Renewables." Report prepared for Pacific Gas & Electric. June 21, 2016.

https://www.pge.com/includes/docs/pdfs/safety/dcpp/MJBA_Report.pdf

- . Presentation prepared for Pacific Gas & Electric. June 21, 2016 (Updated July 8, 2016).

<https://www.pge.com/includes/docs/pdfs/safety/dcpp/MJBA.pdf>

Pacific Gas & Electric, et al. "Joint Proposal." June 20, 2016.

<https://www.pge.com/includes/docs/pdfs/safety/dcpp/JointProposal.pdf>

mid-2020s, because of transmission and distribution congestion. Due to nuclear power's generation profile – light-water reactors have very limited ramping and load-following capabilities and only operate economically at full power on a 24/7/365 basis – the continued operation of Diablo Canyon is too inflexible to accommodate the growth in renewable energy under the state's 50% RPS. PG&E determined that it would be more cost-effective to retire Diablo Canyon by 2025, while enhancing energy efficiency and renewable energy targets to achieve a 55% renewable portfolio by 2030, exceeding the statewide RPS.

Rather than imposing large costs on Maryland consumers to avoid local economic impacts, it would also be more cost-effective to invest in preparing for and mitigating the impacts of Calvert Cliffs' eventual closure on the workforce and local communities. NIRS and Alliance for a Green Economy evaluated what such a program would entail, using the case study of a nuclear power station in New York, and found that the costs would be far less than nuclear subsidies, while creating more jobs and supporting increased reductions in greenhouse gas emissions through expanded renewable energy and efficiency programs.¹⁰ Because fossil fuel generation will also be affected by increasing the RPS and reducing greenhouse gas emissions, it would be fair and prudent for Maryland to invest proactively in the economic resilience of communities and the workforce in both the nuclear and fossil fuel sectors. We urge DNR to consider such an option in the RPS review.

Other Nuclear Subsidy Programs are Wasteful and Counterproductive

Subsidizing aging reactors to prevent their retirement has already proven to be an extremely expensive proposition, with significant economic impacts, large opportunity costs, and little to no long-term benefit. For instance, under the state's Clean Energy Standard (CES), New York is providing subsidies to four nuclear reactors, with about 3,351 MW of generation capacity. The CES includes the Nuclear ZEC program separately and alongside a 50% by 2030 RPS. In the first year of the program, the total cost of ZECs was \$483 million, about 200 times more than the total cost of Tier 1 RECs. The New York PSC never considered alternatives to the nuclear subsidy, and assumed that the prices of ZECs would remain lower than the prices of RECs for the duration of the CES. However, that assumption has not borne out. The Tier 1 REC auction for compliance year 2018, the second year of the CES program, yielded REC prices (\$17.01/MWh) that are already lower than the ZEC price (\$17.48/MWh).¹¹ However, due to the pricing formula's use of the Social Cost of Carbon, ZEC prices are estimated to increase in 2019 to \$19.59/MWh, possibly widening the gap.

As noted in DNR's draft analysis, the total projected cost of the New York program is up to \$7.6 billion over 12 years (2017-2029). Based on NY PSC's projections, consumers will pay nearly four times as much to subsidize nuclear through 2029 than they would for Tier 1 REC through 2030. Yet, Tier 1 renewables will provide about 25% more generation in 2030 than the average annual nuclear generation in the years up to 2029, when the ZEC program ends, making the RPS

¹⁰ Azulay, Jessica, and Tim Judson. "Replacing FitzPatrick: How the Closure of a Nuclear Reactor Can Reduce Greenhouse Gasses and Radioactive Waste." Alliance for a Green Economy and Nuclear Information and Resource Service. October 2015. <https://www.nirs.org/fitzpatrick-reactor-can-be-replaced-with-clean-renewable-energy-at-a-lower-cost/#more-366>

¹¹ New York State Energy Research and Development Authority. "2018 Compliance Year - Clean Energy Standard." <https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/REC-and-ZEC-Purchasers/2018-Compliance-Year>

four times more cost-effective than ZECs under the CES.¹² Over the course of the program, Tier 1 renewables will provide about two-thirds (65%) as much total generation as subsidized nuclear reactors, making the RPS at least twice as cost effective at mitigating greenhouse gas emissions in the period up to 2030. Finally, because nuclear subsidies end in 2029, and two of the reactors' operating licenses expire in the same year, it is possible that none of the reactors will be available in 2030, when the state has a goal to reduce emissions by 40% from 1990 levels, meaning New York will still have to replace all of its nuclear generation in the critical climate timeframe after having spent billions of dollars subsidizing it.

Information on other state programs in DNR's draft analysis is equally incomplete. For instance, in New Jersey, while the total cost of nuclear subsidies is less than in New York, the consumer cost is substantially greater. Whereas the amount of subsidized nuclear generation in New York amounts to about 15% of total statewide sales, in New Jersey it is estimated to be about 40%. NY PSC estimates the average household cost of the nuclear subsidy to be about \$2/month, whereas in New Jersey, the residential consumer impact will be about \$2.80/month.¹³ For other classes of ratepayers – including commercial, industrial, and public sector – the costs will be far greater, potentially creating other adverse economic impacts.

The estimate provided for Connecticut is similarly incomplete. DNR should evaluate additional information on the Connecticut program, including a 2017 report published by Energyzt Advisors, LLC. The report evaluated the nuclear subsidy legislation, and concluded that, not only is the nuclear subsidy program not justified, it could prove extremely costly to consumers.¹⁴ The Millstone reactors in Connecticut are projected to remain profitable into the 2030s, and the reactors were committed to operate until at least 2022 due to both three-year-ahead capacity market contracts and forward price-hedges. In addition, because Millstone's owner, Dominion, only needs to bid for PPAs at a marginally lower price than competing renewable energy sources, the report estimates that the cost to consumers in above-market electricity costs could be up to \$330 million/year, or \$1.65 billion over a five-year power purchase agreement. Due to the smaller population in Connecticut than in New Jersey or New York, the consumer impact would be much greater: up to \$7.70/month at an average household electricity consumption of 700 kWh. The program could also create major barriers to renewable energy development in the state, by locking in long-term contracts for a large amount of nuclear generation without giving renewable energy developers adequate time to prepare projects to bid in the auction.

The estimates of market impacts provided by DNR for New York and Connecticut are highly speculative and unfounded. The figure of \$1.7 billion in cost savings in New York is based on an industry-funded report produced by the Brattle Group, which projected that wholesale market prices for electricity would increase substantially if the subsidized nuclear reactors were to retire. Brattle did not provide any explanation or data to substantiate that estimate. The report was based on an unfounded assumption that all 3,351 MW of nuclear capacity would retire at the

¹² Judson, Tim. "Too Big to Bailout: The Economic Costs of a National Nuclear Power Subsidy." Nuclear Information and Resource Service. November 2016. <https://www.nirs.org/big-bailout-economic-costs-national-nuclear-power-subsidy/#more-8718>

¹³ Based on average household electricity consumption of 8,386 kWh/year at the statutory ZEC charge of \$0.004/kWh. <http://www.njcleanenergy.com/main/about-njcep/general-energy-issues/general-energy-issues#Anchor-nje-2>

¹⁴ Energyzt Advisors, LLC. "Financial Assessment: Millstone Nuclear Power Plant." April 2017.

same time, and it did not address whether the projected market impacts would be sustained or only short-term. Regional Transmission Organizations (RTOs) and the competitive markets they regulate have proven adept at responding to price volatility in recent years, which has prevented unanticipated market conditions from creating sustained wholesale price increases.

Finally, in the chart of Strengths and Weaknesses, the staff includes a suggestion that Maryland might be required to subsidize reactors in other states, in addition to Calvert Cliffs. Such an expectation is unfounded:

- The legal challenges to state nuclear subsidies in federal court venues allege the Illinois and New York nuclear subsidies attempt to set preferential prices for nuclear power, infringing on federal authority to regulate prices in interstate power markets. The active arguments in those cases do not allege that subsidizing states' domestic reactors is discriminatory against reactors in other states, as DNR seems to infer.
- Most reactors in neighboring states are either already being subsidized, or are otherwise profitable. New Jersey just recently enacted a policy to subsidize three profitable reactors with about \$300 million/year in payments from ratepayers. Reactors in Virginia are operated under cost-of-service regulation by Dominion Energy. Reactors near to the Maryland market in Pennsylvania are still operating profitably, with the exception of the Three Mile Island unit 1 reactor, which Exelon plans to close next year. If Pennsylvania sees no need to subsidize its reactors, there is no reason why Maryland should.
- It has already been identified as a potential problem in the Maryland RPS that the inclusion of power generated from black liquor effectively subsidizes paper mills in other states that compete with the paper mill in Maryland, and contributes to air pollution in the region. If one of the rationales for subsidizing nuclear power is to protect jobs at Calvert Cliffs, then subsidizing reactors in other states would be similarly counterproductive.

For these reasons, we oppose including an option to subsidize nuclear power in the RPS review report to the legislature. We would be happy to provide any additional information DNR may require.

Sincerely,

Timothy Judson
Executive Director
Nuclear Information and Resource Service
6930 Carroll Avenue, Suite 340, Takoma Park, MD 20912
Phone: 301-270-6477 • Email: TimJ@nirs.org

Mike Tidwell
Chesapeake Climate Action Network
6930 Carroll Avenue, Suite 720, Takoma Park, MD 20912
Phone: 240-396-1981 • Email: mtidwell@chesapeakeclimate.org

Gwen DuBois
President
Chesapeake Physicians for Social Responsibility

325 East 25th Street, Baltimore, MD 21218
240-246-4492 • Email: bikenotbomb@gmail.com

Paul Gunter
Director, Reactor Oversight Project
Beyond Nuclear
6930 Carroll Avenue, Suite 400
Takoma Park, Maryland 20912
Phone: 301-523-0201 • Email: paul@beyondnuclear.org

Regina Minniss
Crabshell Alliance
Baltimore, Maryland
Phone: Email: rminniss@hotmail.com

Tamara Toles O'Laughlin
Executive Director
Maryland Environmental Health Network
2 East Read Street, 2nd Floor
Baltimore, MD 21202
Phone: 410-727-1205 • Email: tamara@mdehn.org

Allison Fisher
Outreach Director, Energy Program
Public Citizen
215 Pennsylvania Avenue, SE, Washington, D.C. 20003
Phone: (202) 546-4996 • Email: afisher@citizen.org

Ken Bossong
Executive Director
SUN-DAY Campaign
6930 Carroll Avenue, Suite 340, Takoma Park, MD 20912
Phone: 301-270-6477 • Email: kbossong@hotmail.com