Committee: Economic Matters
Testimony on: HB505 "Empowering New Energy Resources and Green Initiatives Toward a Zero–Emission (ENERGIZE) Maryland Act"
Position: Unfavorable
Hearing Date: February 21, 2025

The Chesapeake Chapter of Physicians for Social Responsibility (CPSR) submits this testimony in opposition to HB505. We appreciate the Administration's urgency in moving Maryland away from climate disrupting fossil fuel-generated electricity. We also acknowledge the Maryland Energy Administration's conclusion that we have fallen far behind our targets for development of clean renewable energy.

However, as an organization focused on addressing major threats to human health and well-being, we cannot agree with the basic proposition of this bill: that the response should be turning our focus and support to the development of new nuclear energy, and specifically to Small Modular Reactors (SMRs).

This disagreement is based on one fundamental reality:

While nuclear energy does not emit greenhouse gases, it is <u>not</u> clean.

Nuclear energy generates a unique category of waste – in the form of "spent fuel" – that represents both present and generational danger to human and environmental health. Fissionable material (fuel) is removed from a nuclear reactor when it can no longer sustain the chain reaction that is the source of the reactor's thermal energy. It is then stored, initially in cooling tanks, and then in concrete-surrounded "dry casks." However, although it cannot sustain the reactor's chain reaction, spent fuel is highly radioactive – during a nuclear reactor's operation, several dangerous isotopes actually **increase** in quantity due to fission reactions, neutron capture, and radioactive decay.[1]

Spent fuel is extremely hazardous to human health both now and for centuries:

- In recently unloaded spent fuel, highly radioactive isotopes including Cesium-137 and Americium-241 create intense radiation that can penetrate the body and destroy DNA, especially the fast-replicating cells in the intestinal tract and bone marrow (red and white blood cells and immunity producing cells), as well as the nervous system – this is "Acute Radiation Sickness" (ARS).
  - **A person exposed to 500 milligrams of such spent fuel – the equivalent size of one Extra Strength Tylenol - for 30 seconds at 1 meter will develop severe ARS and has a 50 percent chance of dying even with intensive care.**
  - **If exposed for twice that amount – the equivalent of two Extra Strength Tylenols – for 30 seconds at 1 meter, a person will die within hours or days regardless of treatment.**

    (The 30-year half-life of Cesium-137 means that these outcomes could take about a minute of exposure today to spent fuel generated in 1995, instead of 30 seconds.)
- Spent fuel also contains longer duration isotopes that are also deadly. In addition to Americium-241, these include Technetium-99 and Plutonium-239. These are readily absorbed if released as particles and inhaled, or if they enter the food chain; they are retained in the body, and have severe long-term health effects including cancer.
  - **The half-life of Americium-241 is <u>432 years</u>.**
  - **The half-life of Plutonium-239 is <u>24,100 years</u>.**
  - **The half-life of Technetium-99 is <u>211,000 years</u>.**

Because it is extremely hazardous, spent fuel is kept at the reactor sites where it's generated.

[1] International Atomic Energy Agency (IAEA), Technical Reports Series No. 462: Nuclear Fuel Cycle Information System

- At Calvert Cliffs, between one-third and half of the spent fuel is stored in pools that require cooling[2] because the spent fuel generates heat – loss of power would cause evaporation and exposure of the highly radioactive spent fuel (Calvert Cliffs has backup systems for power loss – however, loss of power at the Fukushima Daiichi Plant was one source of radiation release). The remainder is stored in longer-term steel and concrete encased "Dry Cask Storage."[2]
- In 50-plus years, the U.S. government and nuclear industry have not been able to develop a convincingly safe "permanent" nuclear waste storage location (Nevadans rejected Yucca Mountain).

As a result, Maryland already has an estimated 1,420 metric tons (about 1,565 tons) of radioactive spent fuel generated since the Calvert Cliffs reactors began operating in 1975 and 1977.[3]

While U.S. nuclear plants have a good record of safety, including in onsite spent fuel management, there have been accidents. In the U.S. alone, there have been several events of leakage from spent fuel pools (in New York, Connecticut, and New Jersey) resulting in radioactive isotope contamination of ground water. In 2011, the nuclear plant at Fort Calhoun, Nebraska - which was designed to withstand a "500-year flood" on the Missouri River – was actually flooded and had to be shut down.

Even without an accident, growing concern is being raised about radioactive Tritium leaks from damaged subsurface pipes and from spent fuel pools.[4] Tritium is another product of the nuclear reactor and is contained in spent fuel. It is readily soluble in water and is present in the water of spent fuel storage pools, and leaks have also resulted in contamination of ground water. Although Tritium is less radioactive than isotopes like Cesium-137, it is readily absorbed by humans and concentrated in the body, causing DNA damage; rapidly developing cell structures like fetuses are at highest risk.[5]

- Since the 1990s, 43 out of 61 nuclear power sites in the U.S. have had significant Tritium leaks that contaminated groundwater in excess of federal drinking water limits. The most recent leak occurred in November, 2022, involving 400,000 gallons of Tritium-contaminated water from the Monticello nuclear station in Minnesota. The leak was kept from the public for several months. When the operator could not stop the leak, it was forced to shut down the reactor to fix and replace piping. By this time, Tritium reached the groundwater that enters the Mississippi River.[5]

Spent fuel storage is also considered a potential target for terrorist attack, including the sort of aerial drone attack being widely seen in the Ukraine conflict. The release of radioactive material from such an attack would affect large numbers of people and render a large area uninhabitable.

Perhaps most importantly, the unimaginably long lifespan of this large and growing amount of dangerous nuclear waste – stretching thousands of years into the future - is a thoughtless and harmful legacy to the generations who follow us. We have experienced remarkable change since the first colonists of Maryland – led by a Calvert – arrived only 400 years ago. No civilization has lasted 24,000 years. Considering just the unpredictability of our present political situation, none of us can say with certainty what forces and even what information will determine the interaction of future inhabitants with this deadly inheritance.

Sadly, we have accepted the legislature's need to support further extension of Calvert Cliffs' operation. But it makes no sense to consider adding more nuclear to our energy mix – especially having multiple SMRs scattered around the state. The only SMR design currently approved (NuScale) is the same basic category of reactor as Calvert Cliffs – Light Water. This means they would generate the same types of spent fuel waste, and have to do the same onsite storage. While HB505 does include a Nuclear Regulatory Commission compliant waste management plan, the problem is that this waste management would be in multiple locations, which can only increase the risk of an adverse event.

We ask the legislature to be wise in considering these concerns, and for realism:

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[2] U.S. Dept. of Energy, Office of Nuclear Energy; *Spent Nuclear Fuel and Reprocessing Waste Inventory*, November 2022
[3] Nuclear Decommissioning Collaborative; Calvert Cliffs 1&2 https://decommissioningcollaborative.org/calvert-cliffs-1-2/
[4] https://hsph.harvard.edu/news/studies-to-examine-health-risks-of-new-england-nuclear-power-plants/
[5] https://lucian.uchicago.edu/blogs/atomicage/2023/06/26/exploring-tritiums-danger-a-book-review-by-robert-alvarez-via-the-bulletin-of-atomic-scientists/

- Since this urgent push for new nuclear is substantially being driven by the plans to build Data Centers with large electricity demand, consider that:
  - Just the three large data centers planned for Frederick, Prince George's, and Montgomery Counties have total projected electricity capacity needs of between 3,520 and 4,767 Megawatts (MW). (Calvert Cliffs total capacity is 1,800 MW.)
  - Building a 300 MW SMR at Calvert Cliffs would meet less than 10 percent of this requirement.
  - With an average proposed SMR size of 50 to 80 MW, meeting the remaining need for just these three centers will require between 40 and 90 SMRs.
  - Each of these hypothetical SMRs will represent a potential radioactive accident.

- Considering the difficulties of siting 2 to 5 MW solar projects, siting any large number of SMRs will be an extraordinary challenge.

- As many others will point out – despite the optimism of the Nuclear Industry presentation – an SMR has not yet been successfully built in the U.S.
  - The one serious attempt to build a NuScale SMR – the "Carbon Free Power" Project in Idaho – was abandoned after the cost rose from $3.6 billion to $9.3 billion.
  - All recent nuclear projects in the U.S. were delayed and finally abandoned except for the two-reactor Vogtle project in Georgia – which ended up taking 14 years instead of the planned 7 and cost $37 billion instead of the planned $14 billion.
  - Some SMR plans involve substantially increased uranium fuel concentration – up to 20 percent fissionable material, from the usual 3-5 percent – which would substantially increase the risk of any accident and create more dangerous on-site waste.[6]

Unfortunately, HB505 does not reflect such realism.

- Despite the unique characteristics of nuclear power, HB505 treats it like other construction.
  - Subsection 7-1203(4)(III) requires "an analysis of the anticipated environmental benefits, health benefits, and environmental impacts of the project to the citizens of the state," but entirely ignores the consideration of risk, especially the health risk discussed above.
- The Community Benefit Agreements specified in Subsection 7-1206 include appropriate fair labor principles, training and apprenticeships, preference for local and U.S.-derived materials and manufactured goods, dispute management, and more – but miss the important dimension of community voice in development of these complex projects, including consideration of their unique risks.
- The long timeline for development of SMRs – if it actually happens – doesn't match the much shorter timeline of proposed data center development. An SMR built in 5 – or more likely 10 – years wouldn't solve the demand problem we're facing now.

The greatest cost of this preference for nuclear may be the opportunity cost.

By convincing ourselves that our need for affordable and clean energy development will be met by SMRs – despite them having proven to be highly expensive and whose existence would be a long time distant – we take our eye off the ball… expanding the real clean renewable energy development we have committed to, which is feasible to build and much less expensive.

In opposing HB505, we entreat the legislature to take a step back and take a broader look at the key issues of overall planning of our energy sector and of the appropriate approach to Data Center development – including study of their energy requirements – by passing the Energy Resource and Planning Act (HB1037) and the Data Center Impact and Analysis Act (HB270).

We ask also that the legislature continue removing the constraints and designing the effective and affordable incentives that will advance that clean renewable energy we have envisioned, by passing the Abundant Affordable Clean Energy Act (HB398), the Renewable Energy Certainty Act (HB1036), and the Affordable Grid Act (HB1225).

With those positive recommendations, we recommend an unfavorable report on HB505.

[6] https://www.energy.gov/nnsa/articles/nnsa-administrator-jill-hruby-issues-statement-understanding-and-assessing-risks

Respectfully,

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