ENERGIZE Maryland Presentation

SB 0434 HB 0505

Mr. Chairmen, Members of the Committee, thank you for this opportunity to speak.

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I have been closely following advances in nuclear energy technology for about six years now, but claim no specific expertise. I have simply been looking for the best strategy to halt, then reverse, climate change.

This is the right bill and this is the right time for it. Period.

It will help us create the clean energy we need to meet, then surpass our 2035 goal of 100% clean electricity. We should then be able to use this experience to decarbonize the remainder of our economy.

We should all know that we will have some hard work to do to make it work to reach our clean energy goals. Right now, the general public broadly supports nuclear energy. However, but, a combination of not-in-my-backyardism and misguided nuclear opposition will make getting this done harder than it needs to be. We need to be prepared to educate the general public as we move forward.

That said, I have faith that non-fossil fuel aligned folks will come around if we give them the facts. Sadly, we cannot wait for them to lead us. It is up to us to lead them.

Both unfortunately and fortunately we have the opportunity to do so now. This bill goes a long way to resolving one and should be helpful in solving the other.

We have two crises. We have a grid crisis and we have a longer term climate crisis. As Winston Churchill said, "Never let a good crisis go to waste."

The grid crisis is beginning to hit people in the wallets right now. Further climate change will continue to drive inflation upward. The Abundant Affordable Clean Energy Act will help with, but not likely be a long-range solution to that. It does provide necessary back-up energy, and quickly.

The bottom line for this is that batteries have a short discharge period, maybe four hours or so. We need steady, reliable energy for cold, windless days. So, batteries will help. They

just are not a permanent solution. So, already steps are being taken to solve the short-term grid problem. Pass that AACE bill and claim that victory.

The ENERGIZE Maryland Act is far and away the best proposal for solving the long-range problem. 3000MWe of clean nuclear energy will absolutely solve the grid problem. The trick is to start planning and building for it now. The bigger trick is to convince people it is a crisis. We'll need a plan to get the news media to cover salt-water intrusion on Bay shore crops and towns as well as urban and industrial flooding on both sides of the Bay.

Once people see the crisis, they will begin to look for answers. Then, we can have the conversations we need with them about nuclear energy. One odd point to add to this. The typical small modular reactor will be approximately the same size as the 1MWe batteries proposed by the AACE bill. This will give us the opportunity to put them in lots of places and to show people that the new reactors are not the eyesore they are envisioning.

So, when we create a Clean Energy Department, we need some folks in it that can do a few things. 1. Explain new nuclear energy technologies to folks; pick the best ones for Maryland; and 3. help businesses cut deals to bring nuclear energy technology here.

Everything else in my package is just information we should be able to use on how to move this forward.

I have three basic points to make.

A. **We should do this.** We have problems with both grid stability and clean energy production we need to address. Nuclear is far and away the best option.
B. **We should do this right**. We need a small staff to help us evaluate our nuclear energy options. We also need that staff to help us answer questions about nuclear energy to a largely misinformed public.
C. **There is likely an easier way to do this** than we have been considering. This bill would allow that way forward.

A We have grid and clean energy production problems. You all already know this. The Abundant Affordable Clean Energy Act will take initial steps to solve this. It is not likely a perfect solution as 1MW size batteries usually run at full power for about 4 hours. Thus, if we have a two or three day renewable energy drought, we'll need a lot more batteries than initially proposed. But, it is still a good step in the right direction. Adding nuclear energy to the clean energy portfolio is another good step.

What it neither does is provide sufficient, Affordable Clean Energy. This bill could make that final leap. It could do so by targeting the most reliable clean energy technologies.

B. There are a lot of nuclear energy options. We'll need a small staff of, probably three to five to pull all of the options together for legislative an executive review. We'll need expertise in nuclear energy technology. We'll need someone who can broker deals with nuclear energy companies, and most likely, between the State, the nuclear energy companies and A-I and data center companies. We'll need an outreach officer to explain all of this to general public. We'll need a skilled office/communications technology person.

C. Given that Maryland is committed to clean energy, it is unlikely we can get long-term investment in natural gas. What business will want to invest in something that likely will be phased out within the decade?

D. If we get started soon, there will be a lot of options. Otherwise, we'll likely have to wait in line behind more aggressive bidders. But, getting to the head of the line is doable. It is likely more easily done than people realize.

A Why nuclear? We Need to be Able to Answer this.

The short answer here is that it is reliable, greenhouse gas emissions free, safe, and uses far less resources than other energy options, including renewables.

https://www.nei.org/CorporateSite/media/filefolder/resources/fact-sheets/state-fact-sheets/Maryland-State-Fact-Sheet.pdf

But, what is holding everyone up is some fear of the technology itself and some fear of costs. We will need to address the fear questions up-front. Thus, we'll need our own in-house experts.

General overview of potential nuclear energy resources

1. Nuclear is safest energy source.

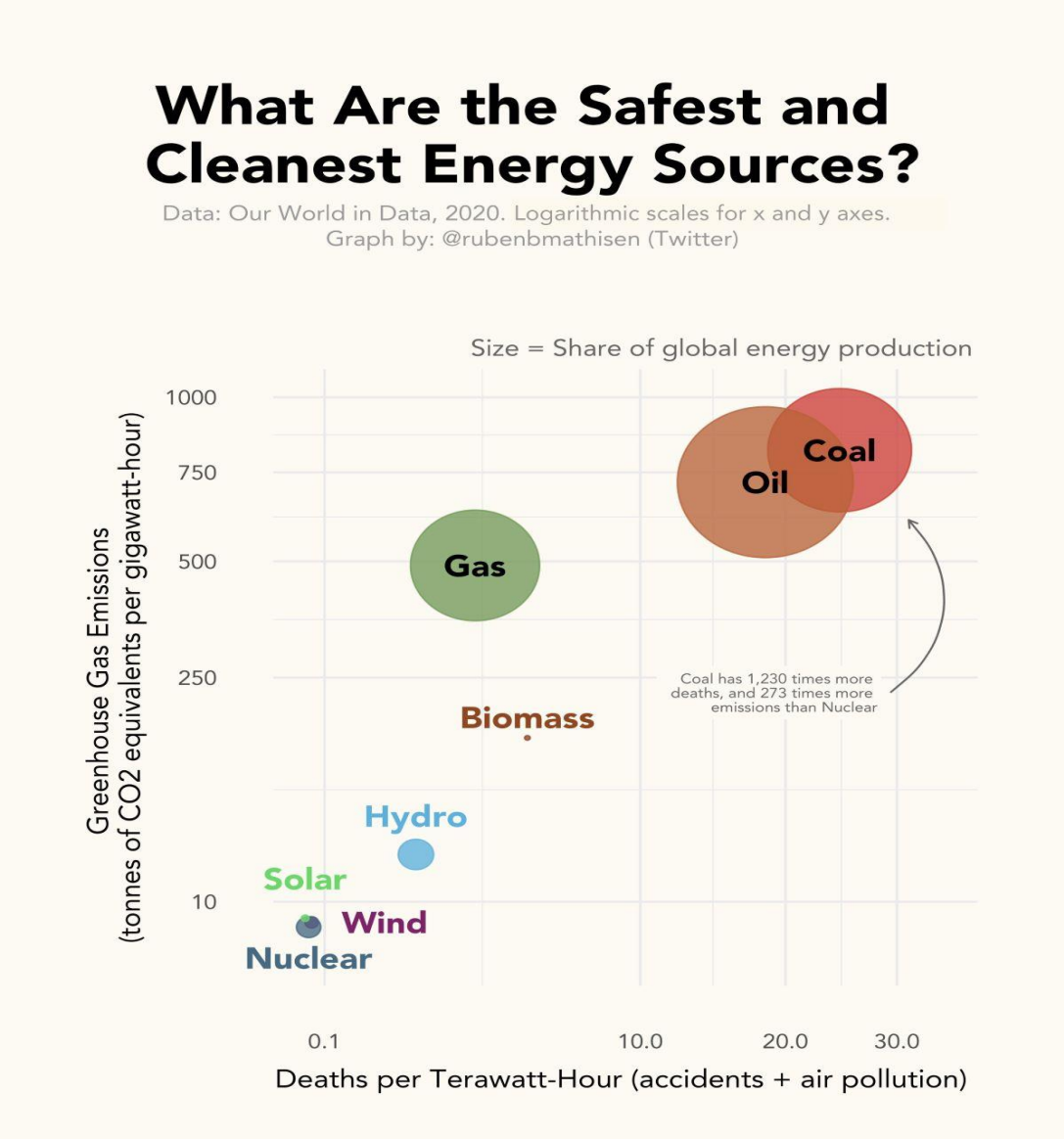
2. That includes the accidents at Chernobyl, ThreeMile Island and Fukushima.

   A. The Chernoble disaster was in 1986. Approximately 43 people died as a result of that disaster. The disaster caused by primarily by human error. https://world-nuclear.org/information-library/safety-and-security/safety-of-plants/chernobyl-accident#:~:text=The%20Chernobyl%20accident%20in%201986,result%20of%20acute%20radiation%20syndrome.

   B. No one was sickened from the Three Mile Island meltdown in 1979. They are trying to re-open the second reactor now. They could only do this if the radiation from the melt-down had already been contained. Three Mile Island accident | 1979, Pennsylvania, US | Britannica

   C. in 2011 Fukushima was a major disaster, but the main damage was not done by the damage to the reactor. It is now estimated that four workers eventually died from radiation-related exposure. Another 15,000+ died as the result of the tsunami and related evacuations from the tsunami-prone area. There simply should not have been a large community built in that area. That said, had the reactor been built to specifications, there would not have been a meltdown despite the tsunami.

Japan confirms first Fukushima worker death from radiation



Nuclear Waste is already safely stored.

There have been no documented cases of illness or death related to nuclear waste.

[Who's Afraid of Nuclear Waste?]

Further, We can now reuse nuclear waste and gain approximately 20 times the energy from the waste than we were able to obtain using older nuclear technologies. Literally, 95% of the nuclear energy in the original fuel is still available for use.

There is enough of this safely stored nuclear waste to power the U.S. for at least two centuries. Maryland, alone has enough to power our grid for about 400 years.

https://www.bing.com/images/search?view=detailV2&ccid=5YPy338%2B&id=00268728199BCF5674D8A60C6187D623C1734401&thid=OIP.5YPy338-NCPcxZ64DEciIAHaFf&mediaurl=http

The U.S. is not the leader in this technology, but is moving rapidly to be one of the leaders. The CANDU reactor out of Canada can already do this. The ARC 100 and

Canadian Reactors that Re-use Nuclear Waste. 7.5 minutes.

https://www.youtube.com/watch?v=3u44skO-nMo

These are not the only nuclear waste burning reactors, but the fact that there already are solutions and that there are more solutions on the way, should allay any concerns about nuclear wastes going forward.

The U.S. is catching up on this but is still a bit behind.

Several U.S. companies are working on technology to **recycle nuclear waste and turn it into energy**[12345]. These companies include Oklo, TerraPower, Orano, and SHINE Technologies.

https://oklo.com/fuel-recycling/default.aspx

As you already know, Curio, a commercial nuclear waste recycling plant, plans to recycle **4,000 metric tons of high-level radioactive waste a year**[1]. In the future, it will be able to reprocess all 86,000 metric tons of U.S.-generated nuclear waste[2].

Nuclear Energy can be available quickly.

There are a number of N.R.C. approved reactors that could be ordered today and built, likely within this decade.

BWRX 1000 or BWRX 300	GE-Hitachi
AP 1000 or AP 300	Westinghouse
Candu 1000	Candu Corporation
NuScale 100	NuScale Energy

There are lots of coming options, most of which are Gen IV SMR's that do not use water as a coolant. Texas alone is coordinating a campus to house four of these.

Four SMR developers aim to build reactors at Texas A&M University site

https://www.world-nuclear-news.org/articles/four-smr-developers-aim-to-build-reactors-at-texas-am-university-site

Locally, X-Energy also is creating new Gen IV energy options.

The D.O.E.'s own Marvel reactor should come on-line this year.

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The bottom line here is that once re-use of spent nuclear fuel (nuclear waste) becomes widespread, there is no need to worry about any build-up of the nuclear waste stockpile. Further, so-called nuclear waste will become a major component of our uranium source.

Finally, one option I feel obliged to ask you to consider, even if it is not immediately available in the U.S. is that of thorium breeder reactors. They likely will not be available in the U.S. until the mid-2030's. But we should keep an eye on it, nonetheless. This is particularly true because most of Maryland's energy needs are not electrical. We still need to address transportation, manufacturing and agricultural energy needs.

Thorium as a game changer.

https://www.youtube.com/watch?v=HMv5c32XXoE

What is thorium?

Thorium vs Uranium Exploring the Future of Nuclear Energy Sources - A Sustainable Pathway to a Low-Carbon Future

Why not uranium?

Less than 1% of uranium is usable uranium 235. This means that while technically, thorium is three times as available as uranium in the earth's crust, for practical purposes, it is 3000 times more available for use in nuclear energy creation

Nuclear Fuel Facts: Uranium | Department of Energy

The U.S. Has tested and is now now producing thorium fuels. https://www.globenewswire.com/news-release/2024/11/12/2979394/0/en/Clean-Core-Achieves-Historic-Burnup-Milestone-with-its-Thorium-Fuel-at-US-National-Lab.html

Going Forward: While Maryland needs nuclear energy to power its grid, the bigger need is for heat for industrial, transportation or other uses. As we evaluate nuclear energy for our grid needs, we should keep this in mind. Some nuclear energy technologies are better than others for creating heat.

B. A Small Staff to Evaluate Options.

The short answer here is you need to pick someone you trust to help explain this to you so you and your constituents. Thus, within the Clean Energy Office there needs to be a clean energy department.They will need to be able to explain how various nuclear energy technologies will work, why they are safe, why they are needed, and which are the best, most affordable options. They will also have to be good at crafting deals to entice nuclear energy companies to build in Maryland soon. Finally, because many Marylanders are somewhat fearful of nuclear energy, it will be very useful to have expertise available to give them clear information as soon as they demand it.

C. A good, and likely available option.

We need to start with the fact that we need more energy for our grid and that that energy must be clean. Below, is a way to begin this. First, I am going to refer you to a presentation on the molten salt test reactor at Abilene Christian University by the chair of that program and by the CEO of Natura Resources.

Proof that I am not just blowing smoke.

Molten Salt Reactors - NEXT test Reactor & Natura Resource.

https://www.youtube.com/watch?v=HMv5c32XXoE

The bottom line here is that big energy users are offering up to 3.5 times the going rate for energy. We can use this to our advantage. Here is how, and this is also the answer to how we get reactors built more quickly and less expensively. It also explains the need for a deal-cutter in our Nuclear Energy office. I have included the video below, because I am primarily an environmental guy, not a nuclear energy guy. I thought you all might like to see some proof I am not making all of this up.

Say, Microsoft wants to build an A-I Center in or near Maryland in the PJM region. Say, at its peak energy use, it can use 920MWe. On Average, though, it uses only 700MWe. Now, reactors are NOT going to be manufactured in every distinct size. Most reactor designers will have one production model, some maybe two Most likely the Small reactor will be either 100MWe or 300MWe. It they also have a micro reactor, likely it will not produce more than 10MWe.

Microsoft, though, will want to ensure that it has enough energy. They will need at least enough electricity available for their maximum use. So, say they purchase 10 100 MWe reactors This would mean that at minimum, there would be an excess of electricity of 90MWe, but on average, an excess of 300MWe. Maryland, or PJM could purchase the excess at market price.

Could a deal be cut to ensure that Microsoft's excess 300MWe energy is available during peak Maryland use periods? It is certainly possible. One of the advantages of nuclear is that it can load-follow.

Further, 85MWe from a nuclear plant would be far more useful than 85MWe from battery storage, as it could provide energy through the duration of any energy drought. I am not suggesting not to build a short-term battery back-up system. But the emphasis there should be on fulfilling just a short-term need.

Say several large users have similar deals with nuclear plant, but have differing high and low energy use patterns. Suddenly our grid electricity shortage looks far less ominous. Plus, if we still need extra clean energy, we will already be familiar with the best available options.

As an important side point, we are in now positioned to train a new generation of nuclear energy leaders. Both the University of Maryland and Morgan State University now have nuclear engineering programs. This should put Maryland at the forefront of efforts to diversify the energy industry...if we help these programs move forward.

Summary: The Energize Maryland Act provides a great starting point for Maryland to enter the new nuclear age quickly, safely, and efficiently. The longer we wait to start, the further behind we will fall on our clean energy goals.

To get the best deals and to create the least emissions, need to start now. Please, pass this bill. Pass it quickly, Move to the front of the clean energy line.