

## SMNR “MYTH-TAKES”

### SMALL MODULAR NUCLEAR REACTORS “CLOSE UP”

Final version -- April 26, 2023

A bill to repeal Illinois' 1987 nuclear reactor construction moratorium – [SB76](#) -- was passed by the Illinois Senate in the closing days of the recent legislative session. During the so-called floor “debate”, NEIS heard numerous errors and misrepresentations used by bill advocates to justify its passage. The debate diverted discussion away from the moratorium's actual topic – high-level radioactive waste – and instead turned the debate and passage of the bill into a *de facto* trade show advocating so-called “small modular nuclear reactors” – SMNRs. Therefore, we set about to correct the record of misinformation displayed in the Senate.

The House will be asked to take up this bill when it returns to conclude the Spring session. NEIS urges House members **to vote to OPPOSE the repeal of the moratorium**, which has served to help minimize the amount of high-level radioactive wastes piling up in Illinois, awaiting construction of a final federal disposal facility.

Daily for the next week, NEIS will send out a short, bullet-point document correcting some of the “myth-takes” perpetrated about SMNRs. Feel free to contact us for clarifications or more information.

#### “MYTH”-TAKE #1: IT'S A “MORATORIUM,” NOT A “BAN”:

- Over and over during House and Senate Committee hearings we heard bill sponsors Sen. Sue Rezin (SB76) and Rep. Mark Walker (HB1079) and others use the term “ban” to describe the Illinois Nuclear Construction Moratorium – often referring to a “ban on new nuclear.” That is *false*.
- A “ban” is: “legal or formal prohibition” (Webster); a “moratorium is: “a waiting period set by an authority.” The latter is a *temporary, conditional* activity. This is an important distinction.
- Once the temporary condition of the Illinois Moratorium is met – the temporary, conditional “ban” will be over. That condition is clearly spelled out in the law: “...until the Director of the Illinois Environmental Protection Agency finds that the United States Government, through its authorized agency, has identified and approved a demonstrable technology or means for the disposal of high level nuclear waste, or until such construction has been specifically approved by a statute enacted by the General Assembly.”
- Bill proponents make it seem that the Moratorium – and those who advocate for retaining it -- are somehow “anti-nuclear,” and standing in the way of “progress.” It is neither; it is PRO-safety. Therefore, those who advocate for keeping the Moratorium are PRO-safety.
- In LAW, words – even simple ones -- have very specific meanings which will mandate defined actions. Therefore to distort the discussion with sloppy language either represents a profound ignorance of the issue; or a deliberate attempt to distort or manipulate the debate.

#### “MYTH”-TAKE #2: THE MORATORIUM IS ABOUT RADIOACTIVE WASTE, NOT ABOUT SMNRS:

- In both the House and Senate Committee, and in Sen. Rezin’s floor presentation to the Senate upon voting, the issue of high-level radioactive wastes (HLRW) – the CORE PURPOSE for the Moratorium -- was either ignored, or casually dismissed as not a problem.
- The current generation of Illinois reactors has produced ~11,000+ tons of high-level radioactive waste (spent-fuel rods) with no national disposal facility in operation. Each year they will add ~220-330 tons to the inventory.
- SMNRs will add even more (HLRW) to this inventory – again, with no place to go for disposal. *This is the very scenario the Moratorium was designed to prevent.*
- [Recent calculations](#) indicate that SMNRs will actually produce MORE radioactive waste per unit of energy delivered than the current generation of reactors do – by a factor of 2 to 30 times as much. [Source: *Nuclear waste from small modular reactors*, Proceedings of the National Academy of Sciences, May 31, 2022.]
- “Storage” of HLRW is not the same as “disposal,” according to federal law. The Illinois Moratorium is about disposal. Sen. Rezin’s recent remarks about HLRW storage in Illinois being safely done are therefore irrelevant (although comforting).

### “MYTH”-TAKE #3: WHAT DO SMNRs HAVE IN COMMON WITH UNICORNS?

- Neither exist in the real world. Today. And for the foreseeable future.
- Because of this rather embarrassing and inconvenient characteristic, some have conjectured that the “M” in SMNR stands for “mythical.” Others have referred to SMNRs as “small modular nuclear PowerPoint reactors.”
- Of the many [proposed SMNR designs](#), only one has been approved by the federal NRC – the [NuScale US600](#). It has since been modified by the company, triggering further review by the NRC. NuScale itself admits that under the best of circumstance, the FIRST (and only) proof-of-concept reactor will not be ready until December 2029.
- Assuming the design works (and there is no guarantee of this), commercialization of large numbers of these reactors will not take place until the 2030s.
- Thus, any talk of SMNRs being job generators, climate change fighters, tax base sources, and grid reliability enhancers TODAY or even SOON is imaginary. None of these will occur until the 2030s, and only if the reactor design works.

### “MYTH”-TAKE #4: SMNRs, MICRO-NUKES AND MINI-NUKES ARE NOT THE SAME THING:

- Once again, proponents like Sen. Rezin and many of the witnesses and supporters used these terms interchangeably. They are **NOT** the same thing:
  - Common understanding and usage today defines SMNRs as nuclear reactors capable of producing 300 mega-watts (mW) of power, or less. (See: [U.S. NRC](#))
  - Micro-nukes refer to SMNRs which will produce up to roughly 100 mW of power.
  - Mini-nukes are usually thought of as producing 20 mW or below; and are not considered “power reactors,” but rather research/test reactors. They are licensed by the Nuclear Regulatory Commission (NRC) differently than power reactors. Further, the Illinois Moratorium does NOT apply to them; and the ICC does not have to issue a certificate of necessity for their construction..

- Sen. Rezin’s original, unamended version of SB76 defined an upper limit for SMNRs of 350 mW, displaying an ignorance or disregard of this limit description.
- The mini-nuke test/research reactor being proposed by the [University of Illinois at Urbana/Champaign](#) would not be negatively affected by the continuation of the Moratorium.

**“MYTH”-TAKE #5 SMNRs -- “IT’S THE JOBS, STUPID!” -- OR IS IT?**

- If legislators were felines, “jobs” would be catnip. “Jobs” are used as the first-line persuasive excuse to do – pretty much anything a legislator proposes.
- Not all jobs are created equal. Nor are all jobs desirable. The fact that prisons create construction and guard jobs does not argue for more crime. We do not hear anyone clamoring to build the Wuhon Institute of Virology West here in Illinois. So, can we agree that the “jobs” argument does have logical and practical limits?
- The economics of SMNRs are predicated on *reducing costs by reducing personnel* (fewer plant operators; few to zero security guards) *and safety features* that might generate jobs (e.g., construction of containment structures, which SMNR vendors propose to eliminate).
- Without reasonably calculated targets guaranteed by firm contracts, and penalties for failure to achieve them, jobs estimates are useless and untrustworthy sales pitches.
- The number of Illinois jobs already provided by renewable energy (22,999, end of 2021) and energy efficiency (82,592, end of 2021) far exceed the number of current nuclear power jobs (3,726 as of 2022). Their numbers are reliably verified by history and current reality. No such reliable figures exist for the non-existent SMNRs; it’s all speculation.
- On the very day that the Illinois Senate Public Utilities Committee passed SB76 out of committee, Swift Current Energy’s [Double Black Diamond Solar project](#) was launched in Illinois. It has the following attributes:
  - It’s an 800 MW solar project, 2.7 times larger than the largest SMNR reactor is proposed to be;
  - It will take 14 months to complete, and be ready for use in the Fall of 2024;
  - During construction it will create 435 construction jobs;
  - It is expected to generate \$100 million in tax revenue for Sangamon and Morgan counties;
  - It will produce 100% clean, green energy; and ZERO radioactive waste;
  - It will use only U.S.-made modules, hardware and electrical components;
  - It is working in partnership with local unions to train new workers for the solar construction industry;
  - IT WILL DO ALL OF THIS NOW, AND BY 2024 – NOT IN THE MID-2030s, like SMNRs
- WHATEVER HAS ALREADY HAPPENED, MUST THEREFORE BE POSSIBLE -- If this can be done once, in the present, using presently available materials and proven technology, without having to gamble on unproven, theoretical technology, the process can be replicated many times before the first SMNR even lights up. This should be an attractive, real-world, presently available investment opportunity for the State to pitch.

**“MYTH”-TAKE #6: SMALLER IS NOT NECESSARILY SAFER**

- On April 7, Gov. Pritzker reportedly stated, “*These [SMNRs] are smaller, less prone to an accident, more likely for us to be able to maintain them for a long period of time....*” This is not necessarily true.

- A report done by the Union of Concerned Scientists in March of 2021 titled, [“Advanced isn’t Always Better.”](#) examines in great detail the unique safety issues for many of the proposed advanced reactors – issues that are different from today’s reactors, but still significant.
- Many SMNR designs are being proposed with 1.) no safety containments (to save money); 2.) reduced or eliminated emergency planning zones (to save money) ; 3.) reduced operating staffs (to save money); 4.) fewer to no armed security forces (to save money). These alleged improved safety claims are all based purely on theoretical conjecture, and -- to save money.
- All technology goes through a predictable pattern of failure known as the “bathtub curve,” meaning that one can expect larger numbers of systems to fail or not perform as planned at the very beginning (working out the ‘bugs’) and very end (old age wear and tear on components) of a system’s life. This means that even if the SMNR design(s) work, one can expect less-than optimal performance during the initial start-up period.
- In her floor speech before passage of SB76, Sen. Rezin made the claim that, “Regarding safety [of the current operating reactors in Illinois]...we have had ‘zero’ instances,” as if that had any bearing on the actual safety and performance of as yet non-existent SMNRs. Worse though – this is simply false. There have been significant issues that have occurred at the Braidwood and Dresden reactors in her district:
  - *“Exelon’s Braidwood facility in Illinois—leaked more than 6 million gal of radioactive cooling water from a faulty discharge pipe over a nine-year period, beginning in 1996. Although the plant owner knew of the leaks and fixed the pipe, it underestimated the significance of the leaks and failed to monitor them or to take remedial action. The owner did not report the full extent of the leaks to NRC or to the public until late 2005 after tritium was found in an off-site private well.”* [Source: [Chemical & Engineering News](#), June 26, 2006]
  - *“A 2014 incident at Exelon’s Dresden facility in Grundy County involved the release of about 500,000 gallons of highly radioactive water. Contamination was later found in the plant’s sewer lines and miles away in the city sewage treatment plant at Morris.*
  - *“Another leak was discovered in 2007 at the Quad Cities plant in Cordova. It took eight months to plug and led to groundwater radiation readings up to 375 times higher than that allowed under federal safe drinking water standards.”*
  - *Since 2007, there have been **at least 35 reported leaks, spills or other accidental releases** in Illinois of water contaminated with radioactive tritium, a byproduct of nuclear power production and a carcinogen at high levels, a Better Government Association review of federal and state records shows.* [Source: [Radioactive Water Leaks From Illinois Nuclear Plants](#), Better Government Assn., Nov. 17, 2017]

## **MYTH-TAKE #7: CORRECTIONS, FALLACIES, ILLOGIC, RED HERRINGS, AND – WHEN REALITY OVERTAKES LEGISLATIVE FANTASIES**

In this final installment of the Series, NEIS examines the many incorrect, false and illogical rationalizations made by pro-nuclear advocates to repeal Illinois’ nuclear construction moratorium and promote SMNRs. Additionally, several real-world events which have occurred further illustrate the faulty reasoning used during Committee and Senate floor discussions (there was no true “debate”), demonstrating why the Moratorium should not be repealed.

### **I. Absurd, illogical, incorrect and false statements made by Repeal advocates:**

These are actual statements (sometimes shortened or paraphrased) made by Repeal advocates during House and Senate Public Utilities Committee meetings, and during the Senate floor vote:

1.) “We need to repeal the Moratorium because...”

- ***It will “jumpstart the discussion” about SMNRs:***

**RESPONSE:**

- The Moratorium is still in effect; yet the Legislature has held no fewer than 5 hearings and floor discussions on the matter. It does not seem that the Moratorium has inhibited discussion in any way.
- Since this issue first came about in late 2021, we are aware that discussions and presentations among vendors, entrepreneurs, academic institutions and government agents have taken place in Illinois. The Moratorium again has done nothing to prevent ample discussion from occurring.
- Therefore, its repeal is irrelevant to this point.

- ***“We’ve learned how to store radioactive wastes better...”***

**RESPONSE:**

- The Moratorium is not about “**storing**” radioactive wastes, safely or otherwise. It is about **disposal** of radioactive wastes, done as promised and enshrined in law by the Federal Government in 1982. That is the reasonable and responsible expectation to have before allowing new reactors to make *even more* radioactive wastes.
- We are grateful that Constellation (et al) are capable of storing radioactive waste “safely.” If they didn’t, this discussion would be about repealing nuclear power completely, not about repealing the construction Moratorium.

- ***“We need nuclear to prevent power shortages predicted for 2030 in PJM and MISO reports, and to improve system reliability...”***

**RESPONSE:**

- SMNRs will not be available in quantity much before the mid-2030s. Please explain how non-existent reactors will prevent energy shortages, or improve system reliability by 2030.
- Renewables DO exist, and can help lessen these concerns – if built. If you need more power, intelligent planning suggests we start building renewables that already exist **now**, instead of waiting for the 2030s to see **IF** SMNRs **might** work.

- ***“We need nuclear power as a ‘bridge’ fuel until renewables are ‘ready’...”***

**RESPONSE:**

- **FACT:** nationwide, renewables cumulatively have provided more electricity than nuclear power for the past two years.
- **FACT:** In 2022 solar and wind combined produced 14.85% of the nation’s electricity; nuclear power produced ~19%. All renewables together produced 22.58% of electrical generation.
- **FACT:** Nuclear power growth is currently flat to negative. In 2022 solar grew by 24.14%; wind grew by 14.97%. Further continued growth is predicted by the U.S. Energy Information Agency (EIA).
- It would seem that 1.) renewables are quite ‘ready,’ *if you build them*; and 2.) by comparison, **nuclear power is a “bridge” to nowhere.**

- ***“SMNRs can provide jobs...tax base support....investment opportunities...”***

**RESPONSE:**

- This is true. But so do prisons. This does not argue for more crime.
- To keep costs down, SMNRs are being marketed as not needing many operator jobs or security personnel on site; certainly fewer than today’s reactors use.

- The number of Illinois jobs already provided by renewable energy (22,999, end of 2021) and energy efficiency (82,592, end of 2021) far exceed the number of current nuclear power jobs (3,726 as of 2022). SMNRs will account for fewer.
- Illinois clean power investments in 2022 generated \$63.5 million in taxes. At that rate, and assuming no further renewables growth (which is absurd; see below), by the time SMNRs are “ready” in the 2030s, clean power could potentially provide anywhere from \$445 to \$655 in tax base benefits.
- Invest in what you *need*, not in myths. There is nothing stopping Illinois from attracting investment in technologies that *already exist* – e.g., solar and wind – and are *nascent and/or needed* – energy storage and transmission upgrades.

- **“Nuclear power actually helps with environmental justice by reducing air pollution....”**

**RESPONSE:**

- So do renewables and energy efficiency.
- The [White House Environmental Justice Advisory Council states](#) that nuclear power is an “*example(s) of the types of projects that will not benefit a community.*”
- Uranium mining and processing on Indigenous lands in the U.S. and around the world are examples of egregious environmental racism.
- Indigenous and other BIPOC communities historically (Utah, Nevada) and currently (West Texas, New Mexico) have been the targets for establishing high-level radioactive waste dumps and disposal sites.
- The environmental justice community largely rejected the funding for nuclear power found in the Infrastructure Act and the IRA in 2021/22.

## 2.) Red herrings and irrelevancies:

- **Nuclear power has a small land footprint...**

**RESPONSE:**

- What does nuclear plant footprint size have to do with preserving the Moratorium, which deals with high-level radioactive waste disposal?
- Crops can and are being grown under photovoltaic arrays ([agri-voltaics](#)) on solar farms. Grazing can and does take place on wind farms, as does crop production.
- We have never seen crops grown nor sheep grazing on nuclear power plant sites.

- **“Stacking all high-level radwaste in the U.S. would fill a football field 40 feet high.”**

**RESPONSE:**

- An interesting image – but *irrelevant* to the disposal of high-level radioactive waste. Volume is irrelevant; it’s the radiation content and how long the waste will remain a hazard – tens to hundreds of thousands of years -- that is important.
- If they could actually do this, then why would we need Yucca Mountain in Nevada?
- Try it, and you will create a lethal neutron and fission criticality reaction worse than what occurred at [Tokaimura, Japan](#) in 1999.
- When we first heard this trope used in the 1990s, the height was only 10 feet. Seems the problem is worsening.

## II. “On this day, while the Senate and the Senate/House Public Utilities Committees were mortgaging Illinois Energy Future...”:



Reality has quite a sense of humor at times, or maybe just a wicked sense of irony. On the days that the House and Senate Public Utilities Committees and full Senate were voting and making the above outlandish statements, Real Life was out to prove them wrong:

**March 9, 2023:**

- **Senate Energy and Public Utilities Committee** Vote 15-1 to pass SB76

**March 19, 2023:**

- **Intergovernmental Panel on Climate Change (IPCC) Report, March 19, 2023**
  - "Nuclear power and carbon capture and storage (CCS) each have **just 10% of the potential** of wind and solar [to reduce greenhouse gas effects], and **at far higher cost.**" [see chart, p. 28, [SYNTHESIS REPORT OF THE IPCC SIXTH ASSESSMENT REPORT \(AR6\) Summary for Policymakers](#)]
  - Conclusions are based on 175 studies, signed off by all of the world's governments,
  - "Solar and wind power are by far the best option, with the potential to cut a staggering 8bn tonnes from annual CO2 emissions by 2030. That is equivalent to the combined emissions of the US and European Union today. Even more startling is that most of that potential can be achieved at lower cost than just continuing with today's electricity systems." [SOURCE: [here](#)]
  - "What struck me especially was that wind and solar was so big," Prof Kornelis Blok, at Delft University of Technology in the Netherlands, told me this week. Blok, who led the work on the chart, identified the winners: "The big five are wind, solar, energy efficiency, stopping deforestation and reducing methane emissions." [SOURCE: [here](#)]
  - Just as important as the winners in this analysis are **the losers. Nuclear power and carbon capture and storage (CCS) each have just 10% of the potential of wind and solar, and at far higher cost.** [SOURCE: [here](#)]
- **CONCLUSION:** Legislators – your duty is clear if you are serious about fighting climate disaster, both worldwide and in Illinois. Our energy future rests with available sources like wind and solar, not with mythical SMNRs or carbon capture and storage.

**March 30, 2023:**

- **Full Senate votes** to approve SB76, 39-13
- **Swift Current Energy's [Double Black Diamond solar project](#)** construction begun in Sangamon and Morgan counties, Illinois:
  - 800 MW(dc) solar facility, powered by 1.6 million solar panels manufactured in the US (addresses need for more power in MISO, and "buy American")
  - In operation by late 2024, 14 month construction period (addresses urgent reliability and grid issue)
  - 435 construction workers; apprenticeship, as well as diversity, equity, and inclusion hiring goals, facilitated by local unions for carpenters, laborers, operators, electricians, and crew leads. (addressed jobs issue)
  - expected to bring \$100 million in tax revenue to Sangamon and Morgan counties over lifetime (addresses tax base and community benefits issue)
  - **it will produce ZERO radioactive wastes over its lifetime.**
- **"Arithmetic is not an opinion."** – energy analyst Amory Lovins:

- 4-5 of these facilities could be built between now and when the first proof-of-concept SMNR is expected to be operating in December, 2029.
- 4-5 facilities could generate 3,200 – 4,000 MW of electricity, addressing both the MISO need for more power and grid reliability issues
- If Illinois is looking for “investors,” this seems like a sure bet that can and will materialize faster than the hypothetical SMNRs.

#### April 15, 2023:

**Germany** – the world’s 4<sup>th</sup> largest economy, closes its last three nuclear reactors:

- “Germany’s final three [nuclear power plants](#) close their doors.”
- **“The position of the German government is clear: nuclear power is not green. Nor is it sustainable,”** Steffi Lemke, Germany’s Federal Minister for the Environment and Consumer Protection.
- Germany gets [44% of it’s electricity from renewables](#). Before their closure, nuclear provided 6%.
- For a time, Germany will rely more on gas and coal to make up the difference. *“Germany has pledged to close its last coal-fired power station no later than 2038, with a 2030 deadline in some areas. It’s aiming for 80% of electricity to come from renewables by the end of this decade.”* [SOURCE: [here](#)]
- The difference between Germany and Illinois is – the German’s **have a plan** for decarbonization, and are **sticking to it**.

#### Apr 18, 2023:

**House Public Utilities Committee** votes 20-1 to move bill

#### **LaSalle-1 reactor equipment failure incident:**

- *“...the single train low pressure core spray system was inoperable. Due to this inoperability, the system was in a condition that could have prevented the fulfillment of a safety function...”* -- namely, the emergency core cooling system might not have functioned when needed. [SOURCE: U.S. NRC]
- *“There was no impact on the health and safety of the public or plant personnel.”* This time.
- Sen. Sue Rezin gave testimony that “Regarding safety [of the current operating reactors in Illinois]...we have had ‘zero’ instances,” in all the years Illinois nuclear plants have been operating. She and her legislative colleagues forgot these:
  - *“Exelon’s Braidwood facility in Illinois—leaked more than 6 million gal of radioactive cooling water from a faulty discharge pipe over a nine-year period, beginning in 1996. Although the plant owner knew of the leaks and fixed the pipe, it underestimated the significance of the leaks and failed to monitor them or to take remedial action. The owner did not report the full extent of the leaks to NRC or to the public until late 2005 after tritium was found in an off-site private well.”* [Source: [Chemical & Engineering News](#), June 26, 2006]
  - *“A 2014 incident at Exelon’s Dresden facility in Grundy County involved the release of about 500,000 gallons of highly radioactive water. Contamination was later found in the plant’s sewer lines and miles away in the city sewage treatment plant at Morris. “Another leak was discovered in 2007 at the Quad Cities plant in Cordova. It took eight months to plug and led to groundwater radiation readings up to 375 times higher than that allowed under federal safe drinking water standards.”*



- *Since 2007, there have been **at least 35 reported leaks, spills or other accidental releases** in Illinois of water contaminated with radioactive tritium, a byproduct of nuclear power production and a carcinogen at high levels, a Better Government Association review of federal and state records shows. [Source: [Radioactive Water Leaks From Illinois Nuclear Plants](#), Better Government Assn., Nov. 17, 2017]*
  - Illinois is like the legendary construction worker who fell off the Sears Tower while it was being built. As he passed each floor on the way down he'd call out to his fellow workers, "*So far, so good!*"
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Today, on the 37<sup>th</sup> anniversary of the Chernobyl nuclear disaster in Ukraine, NEIS concludes its [SMNR "MYTH-TAKES" SMALL MODULAR NUCLEAR REACTORS "CLOSE UP"](#) series. We have attempted to provide documented professional information and conclusions totally lacking in the House and Senate committee hearings and floor votes thus far. That paucity of information and understanding might not be so bad if the Legislature was deciding the state arachnid. It's not – *it's deciding the energy future of Illinois*, with effects that will resonate for decades and generations to come. The choices made now go far beyond satisfying utility profits, union jobs, and political trades. They're about what the energy future of Illinois will be, which will affect the economy, the environment, and the quality of life in Illinois – and our role in addressing the climate crisis. Please keep these comments in mind when you cast your vote on SB76.