NUCLEAR ENERGY IN TRANSITION:

Decommissioning, Policy and Future Perspectives in the United States



Interview with Bruce Montgomery
Director of Decommissioning and Spent Fuel
at the U.S. Nuclear Energy Institute (NEI)

- This interview was conducted in the framework of the Franco-German research project CO_2 Inno[1], which examines pathways for industrial transition and decarbonization, including the challenges associated with nuclear decommissioning and site redevelopment.
- In this context, particular attention is given to international experience, especially in the United States, where a growing number of nuclear power plants are entering decommissioning phases.
- To explore these developments, we spoke with Mr. Bruce Montgomery, Director of Decommissioning and Spent Fuel at the U.S. Nuclear Energy Institute (NEI). With more than 45 years of experience in the nuclear sector, Mr. Montgomery provides insights into the current state of nuclear decommissioning in the United States, recent reactor shutdown trends, and the policy framework governing these processes.
- We thank Mr. Montgomery for sharing his expertise

A 2022 Congressional report[1] and several others prior to that, raised concerns about the long-term viability of the U.S. nuclear fleet, noting that many aging reactors struggle to remain economically competitive without government support. What were the underlying drivers of this situation, and how do public and institutional stakeholders assess the role and credibility of nuclear power as an energy source in 2025?
Well, yeah. I'd just say that the report is out of date, and the circumstances have changed significantly since it was written. In fact, the situation was already evolving even at the time the report was published.

As a result, none of the nuclear plants that were considered vulnerable in that report are still seen that way today. They're all still operating, and expectations are that they will continue to operate for a long time. In fact, three nuclear power plants that had already been permanently shut down and entered decommissioning are now in the process of being restarted.

Now, regarding those vulnerable plants, as the report itself notes, several states – like Illinois, New Jersey, Pennsylvania, and New York – took legislative action to keep those facilities online. These actions included financial support through ratepayer mechanisms or tax incentives, because the states recognized that if they wanted to meet their carbon reduction goals, they couldn't afford to lose their nuclear capacity.

In some cases, like in New Jersey and New York, it wasn't just about emissions, it was also about grid reliability. Those plants provided essential baseload power, and the states needed that electricity source to maintain system stability. So, the states stepped in.

1 Philip Brown & Michael Holt, "U.S. Nuclear Plant Shutdowns, State Interventions, and Policy Concerns", 07/02/2022, CRS (Congressional Research Service) R46820

Since then, federal policy, especially the Inflation Reduction Act (IRA) – has introduced substantial tax incentives for clean energy sources, including nuclear. That's further improved the economic outlook for existing plants and has even prompted industry-wide plans to increase output through power uprates – anywhere from 3 % to 10 %, depending on the plant. These uprates represent major capital investments.

On top of that, there's been growing interest in advanced technologies, like small modular reactors (SMRs), with some proposals aiming to build them on the sites of former coal plants. The Department of Energy has identified up to 200 former coal plant sites across the U.S. as potentially suitable for nuclear redevelopment.

And I would say that if more plants hadn't already entered accelerated decommissioning, we'd likely see even more of them now in the process of restarting. That's my view – that's what I believe would have happened. In a way, we've become victims of our own success when it comes to how efficiently we decommission plants.

We shut them down and immediately move into accelerated decommissioning: we remove the fuel from the spent fuel pool and begin dismantling the reactor vessel. A plant like the Kewaunee Nuclear Power Plant in Wisconsin would have been a great candidate for restart.

But within just a couple of years, we dismantled so much of that plant that restarting it was no longer viable. The same applies to Indian Point in New York.

The three plants that remained in decommissioning, but hadn't yet gone far into physical disassembly, are Palisades in Michigan, Three Mile Island Unit 1 in Pennsylvania, and Duane Arnold in Iowa. These are the ones now moving toward restart.

In fact, I'm leading a task force at the Nuclear Energy Institute, where our mission is to identify and resolve any regulatory or policy barriers that could stand in the way of those three stations. The goal is to make sure we clear a path so that, once the plants are physically ready, they can return to operation as soon as possible.

What drives the repurposing of decommissioned nuclear sites, and what does it mean for the future of U.S. nuclear energy?

The other development we're seeing is growing interest in repurposing sites that are either already decommissioned or currently undergoing decommissioning – like Kewaunee in Wisconsin and Oyster Creek in New Jersey – for new nuclear projects.

For example, Holtec has already announced plans to install its SMR-300 at the Oyster Creek site, and potentially two SMR-300s at Palisades. And just this morning, Energy Solutions Corporation announced they will be working with a consortium of companies in Wisconsin to place small modular reactors – or some form of advanced reactors – at the Kewaunee site.

So, that's the latest on what's happening in the U.S. regarding the future of decommissioned coal and nuclear sites. These sites are attractive for advanced nuclear projects because of the significant infrastructure already in place.

What's driving this trend isn't just the Inflation Reduction Act (IRA) and its incentives – but also the rapid growth in demand for reliable power to support data center expansion. Big tech companies are a major force here. A good example is the recent agreement between Microsoft and Constellation Energy tied to Three Mile Island Unit 1.

Many states are trying to attract data centers, but they know the key constraint is electricity supply. As a result, they're looking to nuclear – particularly in Tennessee, Texas, Michigan, Wyoming, Idaho, Utah, New York, New Jersey, and even Florida. South Carolina and North Carolina already have plans, and Virginia, a major hub for data centers, is seeking to expand.

In summary, this shift is changing the outlook for nuclear decommissioning. We don't expect any additional plants to shut down in the near future. The next wave of decommissionings likely won't happen until the 2050s or 2060s. That's largely because around 95 % of the current fleet is expected to apply for extended 80-year operating licenses from the NRC, and there are even early discussions about potential 100-year licenses.

A 100-year licenses?

Yes, and that's based on the fact that the current nuclear fleet is very well maintained – and it has to be. These plants run 24/7, 365 days a year. The aging management programs that were introduced as part of the original license renewals – from 40 to 60 years – have proven extremely valuable in helping us understand aging effects and the needs that come with them.

They've essentially guided where we should direct capital investments and maintenance upgrades to support the next 20-year operating extension. In the U.S., each license renewal is granted for 20 years, and every plant in the current fleet has already received its initial renewal.

Now, we expect that about 95 % of the fleet will apply for a second 20-year renewal, bringing their total operating life to 80 years. And, as I mentioned earlier, there are preliminary discussions around whether some of these plants might eventually be licensed for up to 100 years. I don't expect all of them to reach that

milestone – and we really don't know yet – but the conversations are beginning.

It speaks to the robust design and construction of these plants. They were built to last, and we've continually invested in upgrades and capital replacements to keep them operating safely and efficiently.

Looking ahead, over the next couple of decades, we anticipate a significant build-out of small modular reactors and advanced reactors – not only at existing plant sites but potentially at new greenfield locations as well.
An example of a greenfield site currently under development is in Kemmerer, Wyoming. It involves a Natrium reactor project sponsored by Bill Gates, and it's being built by a consortium of stakeholders.

This project includes power infrastructure upgrades and is located on the site of a former coal plant that is scheduled to be decommissioned in the next few years. The new nuclear facility is expected to replace the retiring coal plant [2].

We're likely to see more projects like this in Wyoming, Idaho, and Utah – states that have traditionally relied on coal but are now recognizing that the future energy mix no longer includes it. These states also possess uranium resources, making nuclear development a natural fit as they look to maintain firm power generation and support their local economies.

So, if I understand you correctly, the rapidly growing electricity demand from data centers and major tech companies is becoming one of the key pressures shaping current energy and nuclear policy. Is that a fair characterization of your point?
Yeah, that's definitely a big driver. And there are really two major forces that have converged in recent years.

First, under the Biden administration, the Inflation Reduction Act (IRA) focused heavily on reducing carbon emissions, pushing investments into solar, wind, and also nuclear energy. In fact, nuclear received significant tax credits and policy support right alongside solar and wind.

Then, more recently, we've seen a massive build-out of data centers, largely driven by AI and digital infrastructure. These developments have created a strong demand for resilient and reliable energy sources. And since solar and wind can't guarantee constant supply, tech companies have started showing serious interest in nuclear as a dependable base load solution.

At the same time, the Trump administration's approach to energy focused on domestic energy security and independence – what they called "energy dominance." While Trump has pushed for a return of coal (which hasn't materialized) and a continued role for natural gas, he also sees nuclear power as a strategic asset – both for domestic supply and for geopolitical competition, especially with China and Russia.

That's why we're seeing U.S. reactor designs being exported, with contracts already signed or in discussion with countries like Poland and potentially Bulgaria. The goal is to compete globally, not just with SMRs, but also with large-scale reactors like the AP1000 from Westinghouse, while companies like NuScale are also pushing their SMR Voyager designs internationally.

Domestically, there's a growing push – especially in the southeastern U.S. – to revive larger projects. For example, in South Carolina, the governor wants to restart work on Summer Units 2 and 3, which had previously been mothballed. And I wouldn't be surprised if we saw announcements for new large reactor builds within the next year or two.

Building on this discussion, I'd be interested in your perspective on how the United States addresses nuclear decommissioning, site repurposing, and long-term waste management, particularly in relation to the potential reuse of existing or former nuclear sites. How do you see these considerations shaping U.S. nuclear policy going forward?
Well, yeah. So, in the United States, we deal with two types of nuclear waste: low-level radioactive waste and high-level waste, which is essentially the used nuclear fuel left behind after a plant shuts down.

Fortunately, we have several licensed sites that can handle low-level radioactive waste in large volumes. We see no foreseeable constraints regarding its transportation, packaging, or disposal, as these sites are extensive and well-equipped.

We're also getting more efficient at decommissioning thanks to improved decontamination and waste segregation. Much of the material, now essentially non-radioactive, can be sent to disposal sites regulated by state authorities rather than requiring NRC licensing, which makes the process much more affordable.

2 Mr. Montgomery's concerns are echoed in several official and industry reports. Notably, the Nuclear Innovation Alliance's 2023 report, 'Resources for Coal Repowering with Nuclear Energy,' highlights growing interest in repurposing former coal plant sites for nuclear deployment.

While this discussion is gaining traction, important questions remain regarding safety, regulatory readiness, and the ability of the U.S. nuclear sector to deliver new projects at scale. Unlike recent large-scale nuclear developments in countries such as China and South Korea, the U.S. has yet to demonstrate the deployment of a new, modern nuclear facility under current market and regulatory conditions.

These developments may also point to structural constraints within the contemporary nuclear market, particularly in terms of financing capacity and the feasibility of long-term investment commitments in the near term.

So, in short, low-level waste is well-managed.

As for high-level waste – spent nuclear fuel – we've proven over decades that storing it on-site in dry storage casks is safe and viable. At most plants across the U.S., including sites I've worked at like Calvert Cliffs, all the spent fuel from over 50 years of operation is stored safely on-site in what amounts to a small parking lot.

This is true for decommissioned sites as well. Even after full dismantling, the presence of spent fuel in storage casks doesn't prevent site reuse. You can't build condos or golf courses next to spent fuel, sure – but these sites still have grid connections, community support, and skilled workforces, which makes them ideal for building new nuclear power plants, including advanced reactors.

So, in my view, spent fuel is not a constraint to redevelopment, and low-level waste certainly isn't either.

Regarding decommissioning policy, there's a key difference between the U.S. and many European countries. In the U.S., you don't need a separate license to decommission a plant. We simply modify the existing operating license – scaling down the security, emergency planning, and training requirements – and when decommissioning is complete, the license is terminated.

That's what allows us to restart plants like Palisades, Three Mile Island Unit 1, and Duane Arnold. They still retain their operating licenses, which we can simply upgrade back to operational status. That's much easier than applying for a brand-new license at a new site.

This stands in contrast to countries like Spain or Germany [3], where a plant needs to go through a complex and time-consuming process just to obtain a decommissioning license – and turning it back on would be even harder.

In the U.S., on the other hand, the restarts have been welcomed by local communities, businesses, and state governments. These plants were good neighbors and major employers, so people are glad to see them coming back.

Now, of course, there are exceptions – places like Massachusetts or Southern California – where communities are not supportive of nuclear power. It's unlikely we'd ever try to restart plants in those areas. But in general, we have a flexible and community-supported approach.

That's very interesting. Once a nuclear plant has been decommissioned, what are the typical pathways for reusing the site – for example, greenfield versus brownfield redevelopment? How are U.S. policymakers currently thinking about these options?
And, on a more personal note, have you ever been directly involved in repurposing a former nuclear facility – such as converting it for a new industrial use or another type of redevelopment?
If you look across the U.S., we've successfully decommissioned over a dozen commercial nuclear power plants. In many cases, the decommissioning is carried out in such a way that the site is ultimately released for unrestricted use, essentially returning it to Greenfield status – except for the small area where the independent spent fuel storage installation (ISFSI) remains.[4]

If you were to look at aerial photos of Maine Yankee, Yankee Rowe, or Connecticut Yankee, you'd see areas that look like parks. The land around the ISFSI often reverts to another owner, such as the local municipality or state. While these sites haven't yet been repurposed into something like a commercial or industrial facility, there are ongoing discussions – for example, if the site is coastal, it might be considered for recreational use or even a port.

Then there are other cases like La Crosse (Wisconsin) and Crystal River (Florida) – sites where the nuclear plant was co-located with fossil fuel generation. These are naturally Brownfield sites and will remain so. At Crystal River, there are still active gas and oil-fired generators, and La Crosse had coal-fired generation nearby.

Importantly, decisions about reuse are not federally mandated. It's not primarily about regulation or politics – it's mostly about what the owners want to do. If they want to install new reactors (as Holtec wants to do at Palisades and Oyster Creek), they can, provided they go through the proper regulatory process.

For example, Indian Point in New York, located on the Hudson River, is a site with great potential for generation, but local opposition is strong, so it's unclear what will happen there. Still, the default goal for all current decommissioning projects is unrestricted release, which means the land will be cleared to meet EPA and NRC standards for any future use – even if it ends up remaining industrial or undeveloped.

Based on what you described earlier, many U.S. decommissioning projects aim for a greenfield outcome. Are there notable examples where decommissioned

3 Editorial Note: In Germany, nuclear power plants (NPPs) have unlimited operating licenses, provided nuclear safety and security are maintained. The decommissioning license – although extensive and time-consuming – merely amends the operation license to allow activities such as dismantling vital safety-related components, which would otherwise be illegal under the standard operating license. More info here: https://www.bverwg.de/de/210121U7C4.19.0

4 Which is a very common scenario, we need to mention. U.S lacks a specific and proper facility for spent fuel like these that we have in Europe...

nuclear sites have instead been successfully reused – whether industrially, commercially, or otherwise?
Yes, the Satsop Power Plant is often cited as one of the best examples of how a former nuclear facility site can be repurposed – in that case, into a business and technology park. It was never fully operational, but the transformation was successful and shows the kind of potential such sites can have.

However, that case is more the exception than the rule. In most U.S. decommissioning projects, especially those that were fully operational for decades, very little infrastructure is left behind after dismantling. For example, at Zion in Illinois, the plant was completely taken down. What remains is a large, open lakefront area with just a transmission yard and a dry cask spent fuel storage facility.

The same applies to the so-called "three Yankees" – Maine Yankee, Connecticut Yankee, and Yankee Rowe. All of them have been returned to greenfield conditions, meaning the land is clean enough for any future use, although no major redevelopment has happened there yet. These sites are often described as "park-like," and while there are local discussions about their future use – such as recreational or conservation purposes – nothing permanent has been built.

At San Onofre in California, the site is being fully decommissioned, but since the land is owned by the U.S. Navy, the final use will be decided by the Navy. There's a good chance a synchronous condenser or grid-support infrastructure might remain, due to the location's importance in California's energy system. Still, the expectation is that most of the land will return to public coastal use – it's already popular with surfers.

Diablo Canyon in California represents a distinctive case. Prior to the decision to extend its operation, the owner had developed a comprehensive decommissioning and site-repurposing plan in coordination with the California Coastal Commission, state authorities, and local stakeholders. The plan included proposals to repurpose the intake structures for marina use, preserve selected buildings for public or recreational purposes, and improve public access to the coastal area. While these plans are currently on hold, the preparatory work remains in place should decommissioning proceed in the future. More broadly, the prevailing approach to nuclear decommissioning in the United States has been full dismantlement and remediation to unrestricted-use standards. In some cases, non-radioactive structures may be retained if they serve an identified future purpose, but such outcomes are typically driven by site owners and local communities rather than federal policy. Overall, greenfield restoration has been the dominant objective, rather than active redevelopment.

The La Crosse site illustrates a related dynamic, where decommissioning activities had to be closely coordinated with adjacent coal-fired infrastructure to avoid operational disruption. Taken together, these cases suggest that sites embedded within existing industrial settings have tended to remain brownfield, whereas fully remediated greenfield sites have generally not been repurposed to date.

To date, there are relatively few examples of former nuclear sites being redeveloped for entirely new uses. However, this may evolve over time as communities increasingly seek productive post-decommissioning uses for remediated land.

In the U.S. decommissioning process, which entity has primary responsibility for regulatory oversight and compliance – the licensee, federal regulators, or local authorities?
The responsibility for decommissioning lies primarily with the licensee and the U.S. Nuclear Regulatory Commission (NRC). The licensee develops and submits a decommissioning plan, and the NRC reviews, approves, and oversees its implementation in accordance with federal regulations.

While local communities, state authorities, and other stakeholders are encouraged to participate in the process, they do not have decision-making authority. However, we place strong emphasis on transparency. There are regular public meetings with community members, local politicians, and other interested parties to inform them about progress, upcoming activities, and any relevant developments.

States may, in some cases, impose more stringent standards than the NRC. For example, while the NRC may require a site to meet a 25 millirem per year radiological dose limit, a state may request 15 millirem – and typically, the licensee will comply with that stricter requirement.

That said, in certain states like Massachusetts and New York, state-level involvement has occasionally introduced delays or complications. Still, those situations are being managed within the framework of collaboration and compliance.

Thank you very much for your time and insights – this has been extremely valuable for our research. We'll follow up and keep you informed as the project progresses.
Wishing you all the best in your continued work. Take care and goodbye.



Interview conducted by

Paris Thasitis
Jurist & Intern at the CO_2 INNO Project/CNRS
pathasitis@gmail.com