

Illinois generates more electricity from nuclear power than any other state in the country and accounts for about 10% of national nuclear generation. The state hosts 11 operating nuclear reactors that account for about 50% of electricity generation in Illinois.

Although Illinois has unique statewide monitoring and inspection systems, many of the reactors have long-standing safety issues. The Nuclear Regulatory Commission (NRC), the federal agency that oversees the U.S. commercial nuclear fleet, is aware of safety shortfalls but has no plans to resolve them any time soon. As a result, Illinoisans are exposed to unnecessarily high risks from these plants.

Much is at stake for residents. While local and state officials can monitor the reactors they have no control over safety at the plants. Federal law grants that authority exclusively to the NRC. But local and state officials, as well as state residents, can take steps to compel the NRC to ensure adequate protection.



## Spent Fuel Storage Hazards

Spent fuel refers to nuclear fuel rods that have been removed from a reactor core after producing power. Today more than 8,000 metric tons of spent fuel is stored in Illinois. Nearly 90% of the spent fuel is stored in large pools of water called spent fuel pools, which are equipped with systems to cool the water that surrounds the hot fuel rods.

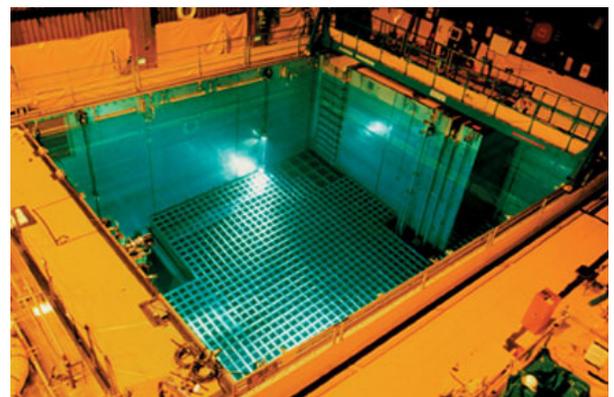
While concerns about nuclear power safety often focus on the fuel in the reactor core, spent fuel stored in pools also can be a major source of radioactivity during an accident. If water drains from the pool for even a few hours or the cooling system is interrupted for several days, the spent fuel could overheat and its cladding could break open, releasing radioactive material.

## Safer Storage of Spent Fuel

Plant owners can reduce the risks associated with spent fuel pools by removing older fuel from the pools and placing it in large containers called dry casks, which are made of steel and concrete and cooled by natural convection (*i.e.*, the “chimney effect”).

Although spent fuel is usually cool enough to be transferred to casks after about five years, many plants, including those in Illinois, allow their spent fuel pools to fill to near capacity and only transfer spent fuel to dry casks when extra storage space is needed. As a result, most pools contain many times as much fuel as the reactor cores themselves.

Spent Fuel Pool



Part of the fuel in the reactor core is moved to the spent fuel pool and replaced by fresh fuel every 18 to 24 months, so that the entire core is replaced every six years. Since spent fuel is cool enough to remove from the pool after five years, pools should not have more than a core's worth of fuel from each reactor at any time.

The safety and security risks associated with spent fuel can be reduced by transferring the fuel from pools to dry casks. The less fuel remaining in a pool, the longer it would take for the water to heat up and boil away if cooling is lost, thus giving workers more time to solve the problem and restore cooling. And if an accident did occur that led to a radioactive release, less would be emitted than if the pool were full. Unfortunately, the NRC has not required plant owners to transfer their spent fuel to dry casks.

### Spent Fuel in Illinois

Illinois has 11 operating reactors and three reactors that have been decommissioned. It has roughly 7,500 tons of spent fuel stored in pools at reactors sites and at the GE Morris storage site, which is located near the Dresden nuclear plant (Table 1).

In addition, more than 900 tons of spent fuel is stored in dry casks (approximately 550 tons at Dresden and 350 tons at Quad Cities). The remaining plants (Braidwood, Byron, Clinton, and LaSalle) are all scheduled to begin moving spent fuel to dry casks because their pools are reaching capacity.

The pools at all Illinois' nuclear plants contain significantly more fuel than is in the reactor cores and therefore pose a significant threat. Table 1 shows approximate amounts of spent fuel at each plant, and expresses the amount in the pools in terms of the number of cores that represents. That number should be no larger than the number of reactors at the plant.

All nuclear power plants in Illinois would benefit from moving spent fuel to dry casks, but Dresden, LaSalle, and Quad Cities would benefit the most. At these three plants, the spent fuel pool is located on the upper floor of the building surrounding the reactor. Its design is similar to four of the reactors at the Fukushima Daiichi nuclear facility in Japan. (The spent fuel pools at Byron, Braidwood, and Clinton are located below ground level.) The pool's elevated location increases risk because, if a hole or crack were to form in the wall or floor of the pool, water

**Spent Fuel Stored in Dry Casks**

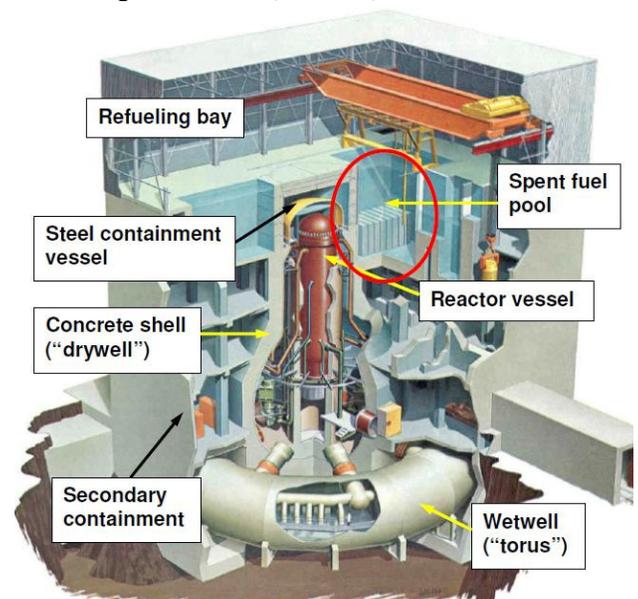


Reactors or Storage Area	Number of Reactors	Pool Storage (MT)	Pool Storage (Cores)	Dry Cask Storage (MT)
Braidwood 1,2	2	1,050	13	-
Byron 1,2	2	1,150	14	-
Clinton 1	1	450	4	-
Dresden 1	1	-	-	150
Dresden 2,3*	2	1,000	7	400
LaSalle 1,2	2	1,100	8	-
Quad Cities 1,2	2	1,050	8	350
Zion 1,2	2	1,020	12	-
GE Morris ISFSI	-	674	-	-
<b>Total</b>		<b>7,500</b>		<b>900</b>

\*Dresden 2 and 3 have their own pools, each of which can hold about 5 cores of fuel.

**Table 1:** This table shows the approximate amount of spent fuel currently stored in pools and dry casks at each plant in Illinois. The fourth column expresses the amount of spent fuel in the pools in terms of how many cores of material that represents. This number should be no larger than the number of reactors at the plant. Morris is a storage area (ISFSI) located near the Dresden plant.

**Fuel Storage at Dresden, LaSalle, and Quad Cities**



likely would drain more rapidly than from a similar hole in a below ground-level pool. Likewise, as the videos from the Fukushima accident demonstrated, refilling elevated spent fuel pools is more difficult than below ground-level pools. In the latter case, a hose can simply be run across level ground and its nozzle can be dropped into the pool.

## Seismic Hazards

Several decades ago, the U.S. government determined that the hazard posed by seismic activity – earthquakes – in the central and eastern parts of the country was greater than previously believed. Consequently, the NRC enacted regulations in 1996 that required new reactors built in these areas to be designed with protection against the greater hazard. But for the next decade the NRC did nothing about seismic protection at existing reactors operating in these areas.

In the summer of 2005, the NRC began examining the potential risk from reactors operating with less protection than necessary against the known seismic hazard. The NRC's studies identified the 27 most vulnerable reactors based on current information, two of which are Dresden units 2 and 3. The NRC has not required the known protection shortcomings to be resolved, even at the high risk reactors. As a result, Dresden remains at higher risk of damage from earthquakes than it could be.

## Known Solutions

The NRC knows that spent fuel stored in dry casks is safer and more secure than that stored in pools. Most of the spent fuel in Illinois is stored in pools, exposing citizens to unnecessarily high risk. **The NRC should require plants to move spent fuel to dry casks once it is cool enough to do so.**

Likewise, the NRC knows how to increase the safety of nuclear reactors against earthquakes. For example, its 1996 regulations require new reactors that are built in areas prone to earthquakes to use designs that have been developed to provide extra seismic protection. Moreover, several existing plants have built in structural modifications, such as better pipe supports, that increase the protection of the reactor against seismic activity. But the NRC has not required such modifications. **The NRC should require the reactors it identified as having high risk against earthquakes to increase their seismic protection.**

Only the NRC can compel reactor owners to address these known hazards. Local and state officials should write or call the NRC to urge the agency to resolve these known safety threats as quickly as possible. Illinois citizens can send letters to the editors of their local newspapers, their local and state officials, and the NRC to urge action on these issues.<sup>1</sup>

For additional information on these safety issues, and others, please check out UCS's Nuclear Power Information Tracker online at [http://www.ucsusa.org/nuclear\\_power/reactor-map/embedded-flash-map.html](http://www.ucsusa.org/nuclear_power/reactor-map/embedded-flash-map.html)

<sup>1</sup> Names and contact information for the NRC's Chairman and Commissioners is available online at <http://www.nrc.gov/about-nrc/organization/commfuncdesc.html>

You can find more information on nuclear power safety issues at: <http://www.ucsusa.org/nuclearpowertoolkit>

The Union of Concerned Scientists is the leading science-based nonprofit working for a healthy environment and a safer world.



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