Is loss of electricity a risk for spent nuclear fuel?

The usual plan for spent nuclear fuel in the United States is to transfer it to a cooling pool and then after some time to transfer it to dry cask storage. Eventually, the plan is to move it to a permanent storage site, although no such site is available. The proposed Yucca Mountain nuclear repository is currently off the table, and no other site is seriously being discussed.

My concern is that **ability to maintain electrical supply to spent fuel pools** is a risk that no one has been paying much attention to, when looking at security of spent fuel. We have just now been witnessing the problems that are occurring in Japan, when electricity was cut off from reactors at the Fukushima Daiichi plant. The spent-fuel cooling pond has been a particular problem, because of the large amount of spent fuel in the pool, the need to keep pumping water into the pools, and the need to circulate the water in the pools. In the United States, we now have about 55,000 tons of spent fuel in spent fuel pools. This is the equivalent of 25 or 30 years of spent fuel, assuming current fuel use is2,200 tons a year.

When a person reads about what perils the spent fuel pools are safe from, such as from this document from the US Nuclear Regulatory Commission, it talks about the pools being inside very thick steel-reinforced concrete walls with stainless steel liners located inside protected areas, and that they would be safe from impact by an aircraft or other object. The article doesn't talk about electricity interruption as being an issue. The impression one gets from the way other perils are described, though, is that any electrical interruption is expected to be brief (hours or days), and easily handled through backup supply, or perhaps through electricity generated by the plant itself.

It seems to me that at some point, this assumption of electricity continuing to be available is likely to be false.

We have lived with electricity being available nearly everywhere for a long time, and assume that this will continue to be the case. But if we stop to think about the situation, at some point, the benefits of fossil fuels will largely cease to be with us. We may continue to have hydroelectric electricity in some places, as long as the parts continue to function in our current equipment, but at some point even this will start to fail.

We don't know how far away the end of universal electricity is, but we do know that anything that cannot go on forever, won't. We don't know precisely what will cause the end of electricity availability in a particular area. It could be failure of the financial

system, and inability to pay employees. Or it could be political uprising. Or it could be lack of oil to run diesel trains to transfer coal to electrical generating plants. Or it could be unavailability of necessary parts, because of some problem elsewhere in the world. We are now hearing about disruption of automobile production because of the unavailability of certain Japanese parts. It is not too hard to imagine something similar happening to parts needed to maintain the electrical system.
If we know that electricity will cease to be available in adequate supply in, say, 2100, then it seems to me that we need to phase out all spent fuel cooling pools prior to that date. Alternatively, if spent fuel pools could be made to be completely independent of electricity through some sort of passive system, this might also be a solution. But I question whether a passive system could be made sufficiently passive that 10 years later, it would still have enough water in it, and this water would still be adequately circulating, so that it could adequately perform its functions.

We know that at some point, the license of any particular nuclear plant will cease to be renewed, so it will have to depend on electricity generated elsewhere (or through diesel generators) to keep the water in its spent rod fuel pools circulating and the water pumps operating. As long as our current system of universal electricity is operating, this shouldn't be a problem. But if electricity isn't available in the area, and long-term use of diesel generators can't be made to work as a back-up, it seems like we could again be experiencing problems with badly overheating spent fuel, and radiation spreading over large areas. If there is a possibility of this happening, it seems to me that somehow the plants need to be closed, and the spent fuel pools eliminated before we lose our ability to use electricity to operate the spent-fuel pools.

The problem I see is that we don't know when a loss of electricity will take place. We have just seen an example of a tsunami taking out electricity (and even backup electricity) at a facility in Japan, so it is possible for a loss of electricity to happen even now. If there is even a possibility of loss of electricity 10 or 20 years from now, it would seem like it would make sense to start getting rid of fuel in spent fuel pools, and maybe even closing nuclear reactors down, so as to not keep generating more nuclear waste that we really have no plans for.

The problem with closing nuclear plants down is that, by itself, could lead to serious electricity shortages in areas where nuclear energy is a significant share of the total. This would include the US East Coast (30% to 35% of total electricity), France (75% to 80% of electricity), and Japan (25% to 30% of electricity).

How about options like wind and solar? I don't see these as providing the kind of electricity needed to keep water circulating in spent fuel cooling pools for years at a time. Any such system would need backup batteries, or some similar system for maintaining electrical supply, around the clock. The system would last only as long as the part that wears out first, and can't be replaced–probably the battery, but in the case of wind generated electricity, it might be something like replacement of the gear box. Furthermore, a system such as this would need to be planned out well in advance.

I don't think anyone is even thinking about the issue of loss of availability of electrical generation and its impact on our ability to maintain spent nuclear fuel pools. Everyone assumes that we will continue to have our current system forever. We know that this cannot be true, but I doubt that anyone is willing to face this issue and plan for it.

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