



---

# Discussion of Nuclear Waste Management

*NARUC 2007 Summer Meetings*

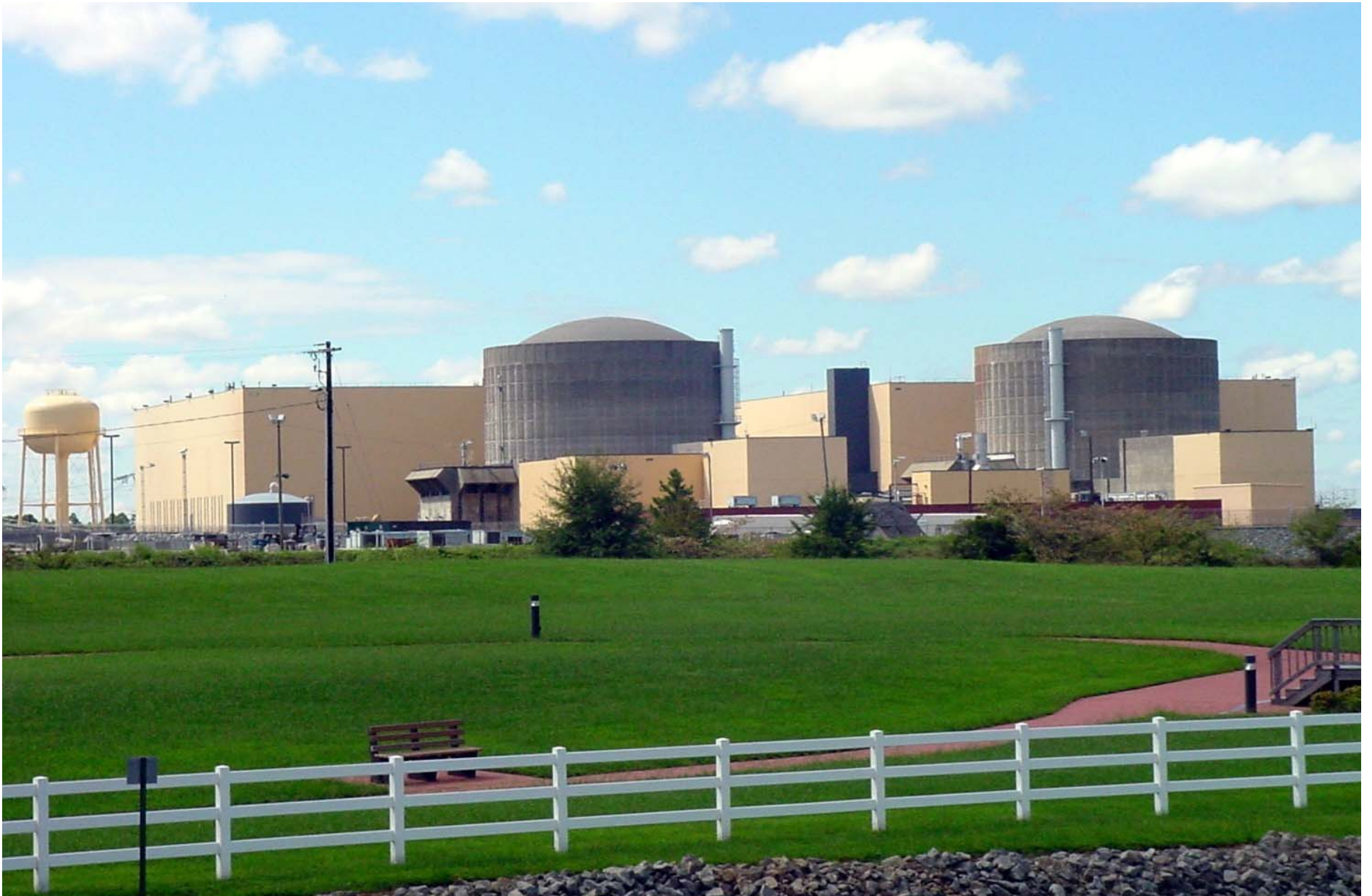
*SUBCOMMITTEE ON NUCLEAR ISSUES – WASTE DISPOSAL*

July 17, 2007

---

Brew Barron  
Group Executive and  
Chief Nuclear Officer

# McGuire Nuclear Station

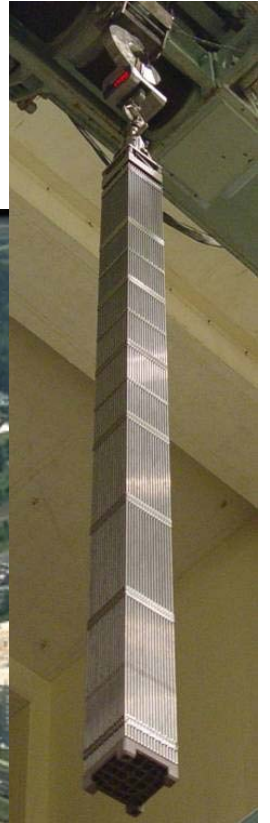
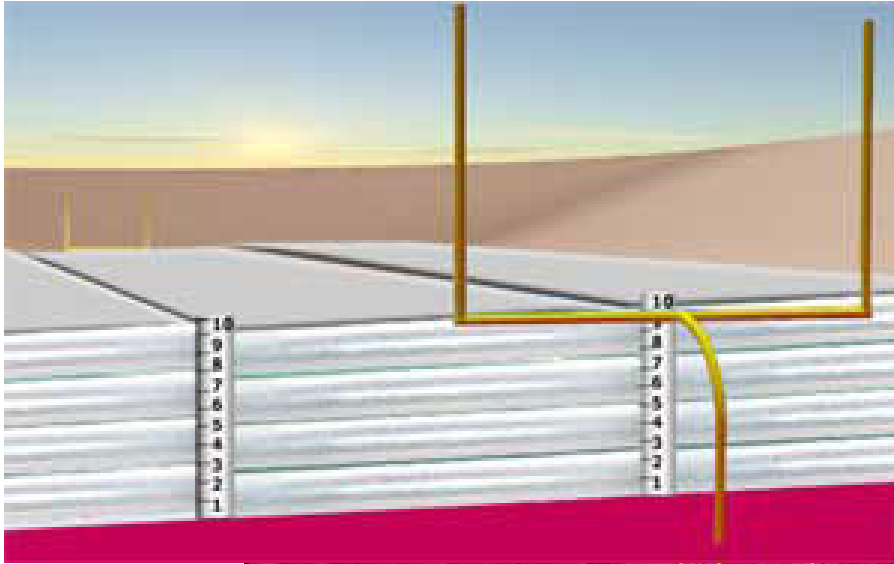


# McGuire Dry Cask Storage

---



# U.S. Used Fuel Inventory





# Oconee Nuclear Station – Dry Storage

---



Speaker: Brew Barron, Duke Energy Group Executive and Chief Nuclear Officer  
Conference: NARUC 2007 Summer Meeting  
Date: July 17, 2007  
Location: New York N.Y.  
Sponsor: NARUC Subcommittee on Nuclear Issues – Waste Disposal

## **Discussion of Nuclear Waste Management**

Thank you for your invitation to speak with you today. My subject is nuclear waste, and you represent key stakeholders in this long-standing discussion.

In North Carolina and South Carolina, nearly half of the electricity consumed by Duke Energy Carolinas customers comes from nuclear power. In 2006 the more precise value was 47%. Our two units at McGuire Nuclear Station, seen here, generated more than 19 billion kilowatt-hours of electricity in 2006. This slide is a picture of the used fuel storage casks at McGuire. One cask contains 32 used fuel assemblies from operation of the station. The assemblies in this single cask represent about the same amount of electric production that would have been produced by 15,000 train car loads of coal. It is all safely contained in that white cask, and is a clear picture of the contribution that emissions-free nuclear energy offers in the climate change debate.

Here is a picture of a regulation football field. If all of the used fuel assemblies currently in storage in pools and storage containers around this country were stacked neatly on the playing surface of that field, it would not reach the level of the top of the goal posts.

When discharged from a reactor, used fuel assemblies like the ones you see in this picture contain uranium and plutonium that can be recovered and recycled, along with fission products, called high-level nuclear waste. They also contain very radioactive metals that comprise the structural components of the assembly such as the tubing materials and mechanical end-fittings – these parts are sometimes referred to as the “hulls”. Countries in Europe and Asia have chosen to recycle used fuel, reusing the fuel materials and just disposing of the wastes.

The next picture you see is a ten dollar roll of quarters – something I am sure you have all seen before. In 2006, with our air conditioners in the summer and heat pumps in the winter, the average Duke Energy Carolinas residential customer used 13,600 kw-hr of electricity. If recycling were adopted in the U.S., it would take each of our residential electric customers eight years of electricity usage to produce an equivalent volume of high-level nuclear waste the size of this roll of quarters. That includes not only the radioactive wastes produced from fission, but also the irradiated structural components of the fuel assemblies (the tubing material, end fittings and other hardware), and the molten glass used to solidify the final waste product. That is eight years of electric consumption in the Carolinas to produce a waste volume the size of a roll of quarters.

Nuclear power in the U.S. does not have a used fuel problem; nuclear power has a used fuel **management** problem.

Utilities have demonstrated that used fuel is very manageable, but we, collectively as a country, have failed to manage it effectively. Today, we are still debating whether this used fuel should be treated as “waste” or a resource.

There is an array of options for used fuel management. Direct disposal is one option. When you can reasonably define the volume of used fuel to be disposed, and that volume is not too large, then direct disposal may be the optimum choice. For a country with a nuclear program the size of Finland for example, where their fifth reactor is now under construction, direct disposal appears to make a lot of sense.

In the 1980s in the U.S., when it appeared that roughly 100 nuclear units would be built while nearly another 100 had been cancelled, direct disposal looked very attractive. No one really believed that more units would be built, nor did they anticipate those built would operate past their 40-year licenses. And the lack of significant commercial nuclear power programs worldwide, coupled with the availability of surplus uranium from Cold War weapons programs, helped keep the market price of nuclear fuel very reasonable and stable.

Today, we recognize the end of nuclear power for electricity production is not in sight, and we need to consider some of the other options that are available for used fuel management. Recycling of used fuel assemblies into fuel made from mixed oxides and fuel from recovered uranium is another option and needs a fresh look. France and other European countries are doing it very successfully now. And, Japan is very close to full

implementation of nuclear fuel recycling. Uranium prices are unnaturally high today, but if you assume they will settle out at \$100 per pound, then there is an estimated \$250 billion dollars in fissile materials contained in the used fuel assemblies stored in the U.S. today. This is enough to power the entire fleet of U.S. commercial reactors for seven years.

Recycling also produces a final waste product that is simpler to manage and may be disposed of more economically and environmentally-friendly than in Yucca Mountain. With what we already know, recycling used fuel may make a lot of sense, and needs to be reconsidered.

There are other options as well. If the future energy projection is a dominance of nuclear power for base load supply, then continued development of advanced fuel cycles can also be very useful. With these technologies, the different constituents of the waste stream are further separated in order to customize the disposal plan for each waste stream. This is the underlying premise of the Global Nuclear Energy Partnership (GNEP) initiative that the Department of Energy currently has underway. Intellectually, the proposal works well. Most of the individual technologies exist today on a laboratory or pilot scale; whether they can be commercially deployed in an economically-sustainable manner is yet to be seen. But, this option is clearly worthy of investigation and consideration.

There are options, viable options, for what to do with the used fuel, what form to place the waste products in, and where to dispose of the wastes. Direct disposal in Yucca

Mountain is not the only option – it is a viable option, but it may or may not be the optimum option for the full inventory of used fuel in the U.S.

If we are going to make informed decisions regarding used fuel and nuclear waste management, and if we have expectations that those decisions be effectively and efficiently implemented, then it is going to take a fundamentally different management and governance structure than we currently have through the U.S. Department of Energy. Both the decision-making/program implementation process and funding authorization process must be restructured.

With the program run from an administrative department, we see continued redirection with every change in Energy Secretary, and we should anticipate that trend to continue for decades to come. Many of you have met Ward Sproat or at least heard him speak. In my opinion, Ward is doing a great job of executing the task he has been given – prepare and submit a license application for a repository at Yucca Mountain. And, if you listen to Ward speak about the other efforts he has underway, they all relate to implementation of good planning and project management tools – the types of processes you see in a well-run private sector organization. But Ward is not likely to be sitting in that seat for more than another year and a half, and there is little reason to believe that Ward's good work will continue. In fact, history suggests the program will be redirected once again.

In my viewpoint, a new government authority, a High-Level Waste Authority if you will, needs to be created -- one that is governed by a board of part-time directors with expertise

in corporate governance. A board that can recruit, hire and provide oversight to an executive director, who is accountable for results and whose future is based on performance rather than an election cycle.

Fixing the governance structure by itself doesn't solve the problem, however. The process for the allocation of funds from the Nuclear Waste Fund must be completely restructured. This money is not general tax revenue. It is money paid by the electric ratepayers whose interests you represent. It should not be tied up in the political tug of war that goes on in Washington.

I believe that access to the Nuclear Waste Fund should be controlled by people with your skills -- controlled by people with your priority in looking out for the interests of the people who contribute to the fund. I personally believe that a five-member, full-time commission should be established to manage access to the fund. The fund would remain in the U.S. Treasury, but through orders, this commission can grant access to the revenues and interest to the High-Level Waste Authority. These commissioners, while appointed by the President, should first receive the nomination of the Governors of those states in which used nuclear fuel is currently stored.

These are just my ideas -- I have no doubt there are more and better ideas available, if we can initiate a real discussion.

This final picture is of the dry storage facility at our Oconee Nuclear Station which began commercial operation in 1973. This storage facility is the largest such facility in the U.S., safely and securely storing more than 1,000 MTU of used fuel. Again, utilities continue to demonstrate that used fuel is very manageable. But on a national level...

As a country with the largest economy in the world, a work force that is well educated, and the best technological capability in the world, we do not have any excuse for failing to more effectively manage our used fuel on a national level better than we have. The majority of our representatives in Washington don't believe that nuclear waste management needs their immediate attention. Your encouragement in making the search for a more effective solution to our used fuel management problem is very much appreciated.

Thank you for your time. I would be glad to take any questions.