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Sent: Monday, November 04, 2013 8:32 AM
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The attached public comment is submitted by Dr. Andrew G. Cook

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Used Nuclear Fuel – confidence rule

**Public Hearing Statement by
Dr. Andrew G. Cook
70 North Cove Road
Rome, Maine
November 4, 2013**

Ladies and Gentlemen of the NRC staff, engineers, parents, grandparents, and members of the audience, who like me are deeply concerned about our environment:

We can be confident that – Commercial Nuclear Fuel in the United States– is safely stored, can be safely stored and will be safely stored.

My name is Andrew Cook. I am a parent, a concerned environmentalist, a physicist and an engineer. I have three adult children, two married. I worked for the Appalachian Mountain Club & served on my township environmental advisory board. I earned my PhD from MIT where I worked with Dr. Sam Ting at Brookhaven National Laboratories on the Nobel Prize winning discovery of the J/Psi particle. I earned two engineering degrees from MIT and a bachelor's degree in physics from Cornell. When I was a child, my father created some of the first nuclear fuel ever designed at the Canadian Chalk River Laboratories. I have devoted my professional career to the study of nuclear fuel and its ultimate disposition. I am a citizen concerned about the environmental future for my children, grandchildren and great grandchildren.

As a physicist and engineer I can say with confidence that used nuclear fuel is, can be and will be safely stored.

I know it is safely stored because I have seen the used fuel at our US nuclear energy facilities. Used nuclear fuel is a solid, rock like ceramic, encased in strong metal tubes that are sealed. It is a solid, a rock, that is protected from the environment. It is temporarily stored and cooled in NRC licensed fuel storage pools.

I know this fuel is safely stored. I have seen:

- the attention to detail and safety exhibited in the design of those storage sites,
- the care the operating staffs take with fuel and
- the rigorous, independent assurance the on Site Nuclear Regulatory Commission inspectors provide.

Further I have seen the dry fuel storage systems used at these sites. These designs, like our AREVA Trans Nuclear dry storage system, are licensed by the US Nuclear Regulatory Commission to extremely

stringent safety requirements. The storage container's one inch thick stainless steel casing and the three foot thick reinforced concrete shield buildings are serving us all well. These structures have been demonstrated to safely withstand the direct impact of high velocity missiles. The used nuclear fuel is safely stored in anticipation of its ultimate disposition.

I also know the fuel is safely stored because it is being safely stored and even recycled by my company at our La Hague France nuclear fuel recycling center. There, using US created technology, we are routinely, today, safely storing nuclear fuel, and safely recycling nuclear fuel. Further, we, today are melting the extremely small amount of left over material into glass. These glass cylinders, about 2 feet by 4 inches in diameter form a solid, water impervious engineered and licensed, environmentally friendly approach for long term underground storage.

As a physicist and engineer, I know the used nuclear fuel can be safely stored. I know that because the US Federal Government is today storing highly radioactive nuclear fuel material in the US' own Waste Isolation Pilot Project in New Mexico. This project, known as WIPP, has been licensed by the US Government. It is used by the US Department of Energy for the long term underground storage of transuranic actinides thousands of feet underground in a "salt dome" formation. Safe underground geological disposal is being done today, by the US Government.

Maybe more importantly I know the used fuel can be safely stored since it was, by the earth 1.7B years ago. At one of our AREVA uranium mines in Oklo, Gabon Africa we discovered that 1.7B years ago 16 nuclear chain reactions, actual real natural nuclear reactors, ran on their own, underground, in the presence of water, long before humans even existed. The reason we know is that we found the "used fuel" by products of those reactors right there, less than one foot from the location of the reactors themselves. What happened? The reactors naturally shut down, some of the used fuel became entrained in the water, and then like all minerals do, it precipitated out of solution. And indeed the byproducts of the reactions were found, precipitated out and in crystalline form, less than one foot from their point origin.

So the earth has shown us, in marvelous natural detail, that even in the direct presence of water, the used fuel can be safely stored for more than a billion years in underground geological formations.

By why do I say the used fuel will be safely stored with confidence?

Let's consider a long term geological storage site. Here is what must happen for anything to get into our environment. First water must penetrate thousands of feet into the rock in a location where water has not been present for millions of years. Assuming water can even get there, through the rock, the water has to dissolve the inch thick stainless steel canisters that contain the nuclear fuel, then if the water has to dissolve the zirconium metal cladding around the fuel, and finally that water has to dissolve the fuel itself, which is a hard ceramic, just like this coffee cup I am holding. Water does not dissolve ceramics.

However, if all of that occurs the water now may contain a small fraction of the radioactive materials. Let's consider what must happen next. Somehow the water has to get back out of the ceramic, past the zirconium, past the stainless steel canister and now the greatest challenge of all, penetrate the rock and get back thousands of feet, up against gravity to the surface. What happens when water carries something and starts to migrate? Those things in it precipitate out of solution.

You can see that natural phenomena here on my handkerchief. I spilled some coffee. You can see that the coffee precipitated out in a ring on my handkerchief, while the water continued outwards. How far did the coffee get – two inches. The same will happen to the fission products. They will precipitate out of solution and form crystals, just as happened at Oklo within feet of the point of origin. They will never make it the thousands of feet up through solid rock to the surface aquifers.

Of course we may want to recover that fuel. Why? Because it represents the OPEC oil equivalent of energy for the US in terms of the energy it still contains. It could be used by our grandchildren and great grandchildren and their children down on the line as one of our great energy resource legacies.

But all of this has little bearing if there is no need for nuclear energy. So is it needed?

I can assure you as a concerned parent and concerned environmentalists it is most assuredly needed. First let's consider that most one of us got here tonight by consuming at least a gallon of gasoline or diesel fuel. Where did the waste from that transportation go?

Unlike the solid, safely stored nuclear fuel, all of the waste from our trips here went straight into the air, the air you and I are breathing right now. And this situation persists worldwide. 85% of all the energy consumed by humans today and into the future comes from carbon based fuels – fire wood, biomass, coal, oil, and natural gas. Accessibility to energy improves lives and increases standards of living.

As the world population continues to grow this situation will persist, despite the fact that renewables – like nuclear energy – are desirable. It will occur because the world's peoples' world hunger for energy is so huge and the population growth is so significant, that carbon based fuels will be the inexpensive, accessible energy source of choice for those in greatest need.

We see this occurring in China where air pollution from carbon-based fuels is reaching near toxic levels. We are breathing the waste from those carbon based fuels, every minute, every breath.

In fact today, it is highly unlikely that the US, a leader in managing CO₂, can achieve its climate goals without the CO₂ free energy of nuclear energy.

Nuclear energy will be a key component in providing a healthy, CO₂ free relief valve. Nuclear energy is the CO₂ free source that can serve as a stable and reliable back up for wind and solar energy. It is the

CO2 free, environmentally friendly, renewable energy source that is here for us 24/7 365 days a year rain, or shine, wind or no wind, day and night regardless of the weather. And we see it doing this job for the US as it accommodates that electric energy fluctuations associated with other renewables.

Nuclear energy is the low cost, safe reliable soldier that has stood beside us through oil embargos, gas pipe line pressure drops, coal pile freezes and even system wide black outs. Our nuclear energy plants have been there as worthy and durable soldiers helping us with a diversified and secure CO2 free energy mix. It is for this reason that leading environmentalists like Patrick Moore, Steve Brand, James Lovelock and Greg Warren all strongly support nuclear energy.

Ladies and gentlemen, let me take off my technical hat. I am a father of three wonderful children: a doctor, a teacher and a forester. They all will likely have families, and their children will have children too. I want them to be able to enjoy the beauty of Maine, the trails of White Mountains, and all the natural beauty our country and our world hold. I am concerned for their long term safety in our tumultuous and warlike Middle Eastern situation. I am concerned about their safety in the hundreds and thousands of years going forward in terms of the environment. I like any parent want to leave them with the best possible world I can. I want to leave them a better one than I was born into.

Today there are many concerned and knowledgeable people here: young engineers, young couples, mothers, fathers, grandparents – people who like me are concerned about the future – and people who, like me, know nuclear energy can be a key contributor to that safe, environmentally successful future.

Members of the NRC staff, and to the commissioners of the NRC, we ask you to hear our voices. Used nuclear fuel is being safely stored, can be safely stored and will be safely stored **with confidence**.

Please pass the new waste confidence rule.

Thank you