Ancient answers for modern applications

Do you think the first nuclear reactor began operating in the years immediately before the Manhattan Project (code name for the project to develop the atomic bomb)?

Think again. A site in West Africa (Oklo) was discovered in 1972 that was proven to be the site of a natural reactor that operated on and off for hundreds of thousands of years.

Analysis of fission products at the site proved the existence of the reactor, which apparently went critical more than 1.7 billion years ago.

How could that happen, since natural uranium today has only about 0.7 percent U235 and uranium in modern nuclear fuel needs to be enriched to about 3 percent to start and sustain nuclear fission?

The answer is that the half-life of U235 is about 704 million years. That means that 704 million years ago natural uranium contained approximately 1.4 per cent U235, so 1.4 billion years ago natural uranium contained approximately 2.8 percent U235.

The estimated date of the fissioning at Oklo, 1.7 billion years ago, would be the time-frame when the concentration of U235 in naturally occurring uranium exceeded 3 per cent.

Periodic flooding of the site provided water to moderate the nuclear reaction, and other conditions, including the geometry of the ore bodies, allowed the fission process to occur.

The reaction continued until heat from the reactor dried up the water and the reaction stopped until the next flooding occurred. This went on for hundreds of thousands of years.

This story would be just a scientific curiosity were it not for the fact that analysis of the site at Oklo has informed our understanding of the transport of radioactive materials in the environment.

You see, the fission products from the natural reactor were found mere centimeters away from the location of the reaction, encased in a glassy matrix formed by molten sand and rocks.

So, if you were looking for a way to isolate nuclear waste from humans and the environment, we have the results of a 1.7- billion-year experiment to say that glass is the answer.

The Defense Waste Processing Facility at the Savannah River Site ultimately encases nuclear waste produced during the Cold War in glass poured into steel canisters. That stuff is not going anywhere that we don't want it to go. We have an ancient experiment to prove it.

Nuclear: Building a free nation, productive state, strong region

BY C. L. MUNNS
Vice Admiral, USN (ret) Chairman CNTA, former CEO SRNS.

PHOTO COURTESY OF WWW.SRS.GOV

In May 1955, a new employee gets her badge picture taken. Badge designs have changed over time, as has the technology used to make them!

It's been more than 100 years since Madam Curie discovered Radium. Hard work by brilliant people has led us to know and harness the atom.

Consider what has been accomplished since: x-rays, microwaves, nuclear propulsion, nuclear electricity, nuclear medicine and more.

Today our nuclear industry keeps our nation free; it makes our state productive and our region strong.

Nationally, nuclear medicine provides cutting-edge treatment for many maladies including cancer and other disorders. One hundred nuclear facilities in 31 states generate vital "base load" electricity.

It is clean, accounts for 64 percent of all our emission- free electricity and it is cheaper than other sources of power. Nuclear technologies ended World War II, enabled our ships and submarines to bring the Cold War to a peaceful conclusion, and continues to provide our National Security today.

Our state is more productive. Nuclear enterprises provide tens of thousands of good- paying jobs, a significant portion of our state's GDP, and a reason major industries find South Carolina attractive.

It helps our other industrial sectors – aerospace, automotive, general manufacturing – by providing cheap, reliable electricity. Kevin Marsh, CEO of SCANA, has said that nuclear is the most reliable and cheapest electricity on his system.

South Carolina's nuclear power plants supplied 57 percent of the state's electricity last year, and that has helped drive South Carolina's industrial electric rates nearly 10 percent below the national average.

Our region is stronger. We are home to the whole "nuclear ecosystem:" a nuclear-experienced work force, technically focused education, nuclear power plants, the Savannah River Site, and many smaller business in support.

Aiken would not be the place that we enjoy without the SRS. Whether you consider the number of employees, the size of its payroll, the community facilities it has funded, or the neighborhood organizations it supports, they all contribute to the Aiken we love.

Imagine Aiken without our two Colleges, our Center for the Performing Arts, much of the funding and manpower for our civic and charitable organizations. One of every five jobs and one of every four households is SRS-related.

SRS provides more than our livelihoods. SRS makes the world safer. Our neighbors that work at SRS contribute daily to our national security, whether it be their production of tritium, their leadership to rid the world of proliferable nuclear weapons materials, their expertise in sensitive monitoring or their high-end modeling and computing.

They provide us energy security through efforts in hydrogen research, battery R&D, and nuclear materials expertise. They have provided energy systems for our space probes to the planets and beyond.

Those neighbors are world leaders in environmental remediation. Our Savannah River National Laboratory is the only national lab rooted in nuclear chemical engineering and a principle focus on environmental management.

In addition, the work at SRS has closed Cold War liquid waste tanks, processed nuclear materials in chemical separations, cleaned up old decommissioned facilities and provided environmental expertise around the world.

They do a very important job for our nation, our region and our state. They do it safely. Every year their OSHA safety rate is ten times better than the US industry average. They do it professionally with care and great skill.