

# WHAT'S NEXT FOR NUCLEAR WASTE?

## A New Strategy for the CSRA



September 2009



COMMUNITY REUSE ORGANIZATION

*two states, one future*



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## PREFACE

This White Paper was prepared by the Savannah River Site Community Reuse Organization (SRSCRO) to serve as a catalyst for public dialog concerning the implications of the Obama Administration's decision to halt more than two decades of work on Yucca Mountain in Nevada as the nation's permanent nuclear waste repository.

United States policies governing the permanent disposal of high level waste are defined by the Nuclear Waste Policy Act of 1982, as amended. This Act specifies that high-level waste will be disposed of underground, in a deep geologic repository, and that Yucca Mountain, Nevada, will be the single candidate site for characterization as a potential geologic repository.

The government's about face on this critical issue leaves state and local leaders with more questions than answers. Those responsible for public safety, job creation, image enhancement and citizen confidence must now lead in a new reality. They must come to terms with their community's lingering – perhaps permanent -- role as caretaker for the Nation's highly radioactive waste.

As a region, we are now left wondering what's next? How we will come together in unity to address a path forward in the wake of this broken promise – one that has implications of the longest possible term and a potential chilling effect on the region's future growth and prosperity?

It is the goal and intent of the SRS Community Reuse Organization to assist the communities in our region in reaching consensus concerning a path forward in addressing with the Federal government the impacts on our region resulting from the absence of a promised permanent repository for nuclear waste.

The ideas expressed in this paper are intended for information and education and a platform for public discussion as interested citizens and groups work together to arrive at a community consensus and a strategy for communicating our common position known to key decisionmakers.

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## **What's Next for Nuclear Waste? A New Strategy for the CSRA**

### **An Unwilling Long-Term Landlord**

The Obama Administration's 2009 announcement that it would abandon Yucca Mountain in the Nevada desert as the Government's preferred solution for long-term storage of nuclear waste swept across the landscape like the rippling aftershock of a feared atomic blast.

The news was sudden and abrupt – terse in its language and far-reaching in its impact. Secretary of Energy Steven Chu said Yucca Mountain is no longer an option for storing highly radioactive waste, including spent nuclear fuel from commercial and governmental programs as well as legacy materials from the Cold War effort. A blue ribbon panel would be created, the Secretary said, to determine a new strategy for the ultimate disposal of these wastes.

Senate Majority Leader Harry Reid hailed the decision as “our most significant victory to date in our battle to protect Nevada from becoming the country's toxic wasteland.”

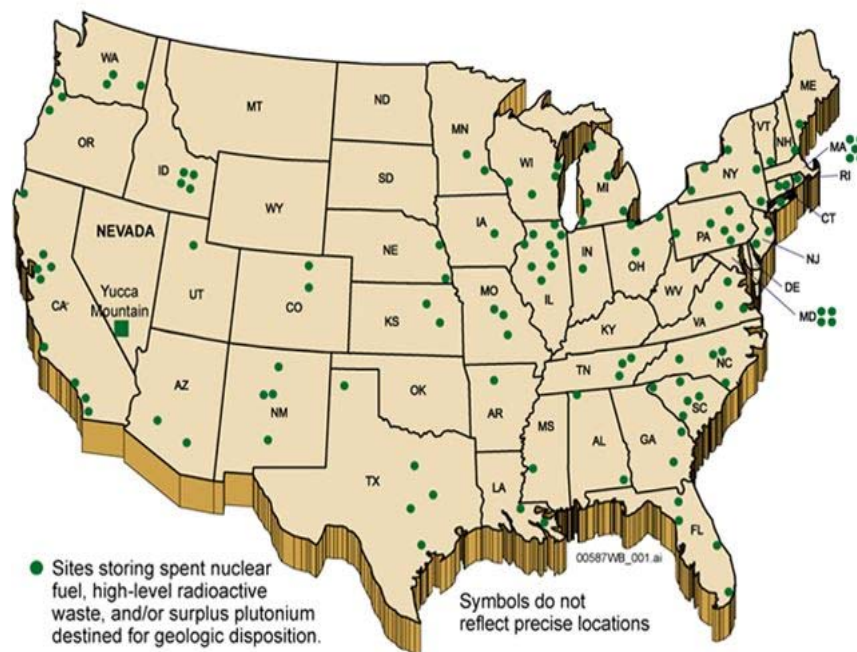
Then he added: “President Obama recognizes that the proposed dump threatens the health and safety of Nevadans and millions of Americans. His commitment to stop this terrible project could not be clearer.”

Even now, the Government's rejection of its only answer to long term storage resounds in communities across the country, including our own, as local leaders reluctantly are forced to see their hometowns for what they may now have become – an unwilling permanent landlord for what many Americans consider to be the world's deadliest legacy.

We are not alone. High-level nuclear waste from the U. S. nuclear weapons complex currently resides at 16 sites in 13 states and totals 7,000 metric tons. This is approximately ten percent of the estimated capacity of the Yucca Mountain repository. There is also some 63,000 metric tons of used commercial nuclear fuel stored in 41 states that has also been designated for Yucca Mountain.

It is up to the region's leaders – elected officials, business owners, economic development professionals, educators, heads of community organizations, labor leaders and others – to join together to form a consensus concerning the new reality of nuclear waste management that has dawned in recent days and that, undoubtedly, will remain at the forefront of our agenda for months and years to come.

Figure 1: U. S. Sites Where High-Level Defense Waste and Spent Fuel are stored.



Spent nuclear fuel is used fuel from a reactor that is no longer efficient in creating electricity because its fission process has slowed. Until a permanent repository is built, nuclear power plant operators must safely store this fuel at their reactor sites.

Significant quantities of high-level radioactive waste produced by defense reprocessing programs at Department of Energy facilities must also be included in any high-level radioactive waste disposal plan.

## What Kind of Nuclear Waste Are We Talking About?

Two types of waste products are usually included in any discussion of a permanent repository – ***spent nuclear fuel*** and ***high-level defense waste***.

Spent nuclear fuel is used fuel from a reactor that is no longer efficient in creating electricity, because its fission process has slowed. However, it is still thermally hot, highly radioactive, and potentially harmful. Until a permanent disposal repository for spent nuclear fuel is built, nuclear power plant operators must safely store this fuel at their reactor sites.

One alternative for dealing with spent nuclear fuel is ***“reprocessing.”*** Reprocessing extracts isotopes from spent fuel that can be used again as reactor fuel. Although this would extend the life of our nuclear fuel resources and help in our national goal of energy independence, commercial reprocessing is currently not practiced in the United States, although it has been allowed in the past.

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Significant quantities of high-level radioactive waste are produced by the defense reprocessing programs at Department of Energy (DOE) facilities, such as Savannah River, Hanford and Washington state and by commercial reprocessing operations at West Valley, New York. These wastes, which are generally managed by DOE, are not regulated by NRC. However they must be included in any high-level radioactive waste disposal plans, along with all high-level waste from spent reactor fuel.

Because of their highly radioactive fission products, high-level waste and spent fuel must be handled and stored with care. Since the only way radioactive waste finally becomes harmless is through decay, which for high-level wastes can take hundreds of thousands of years, the wastes must be stored and finally disposed of in a way that provides adequate protection of the public for a very long time.

United States policies governing the permanent disposal of high level waste are defined by the Nuclear Waste Policy Act of 1982, as amended. This Act specifies that high-level waste will be disposed of underground, in a deep geologic repository, and that Yucca Mountain, Nevada, will be the single candidate site for characterization as a potential geologic repository.

The challenge of properly disposing of nuclear waste touches every man, woman and child in America. It speaks to public safety, to energy independence, to technology and innovation, to global competitiveness and economic leadership and to the political will to do what is right -- what must be done for the good of our communities today and of future generations tomorrow.



When spent fuel is removed from a reactor, it is placed in a special pool of water contained in a steel-lined concrete basin.



## The Nuclear Fuel Cycle

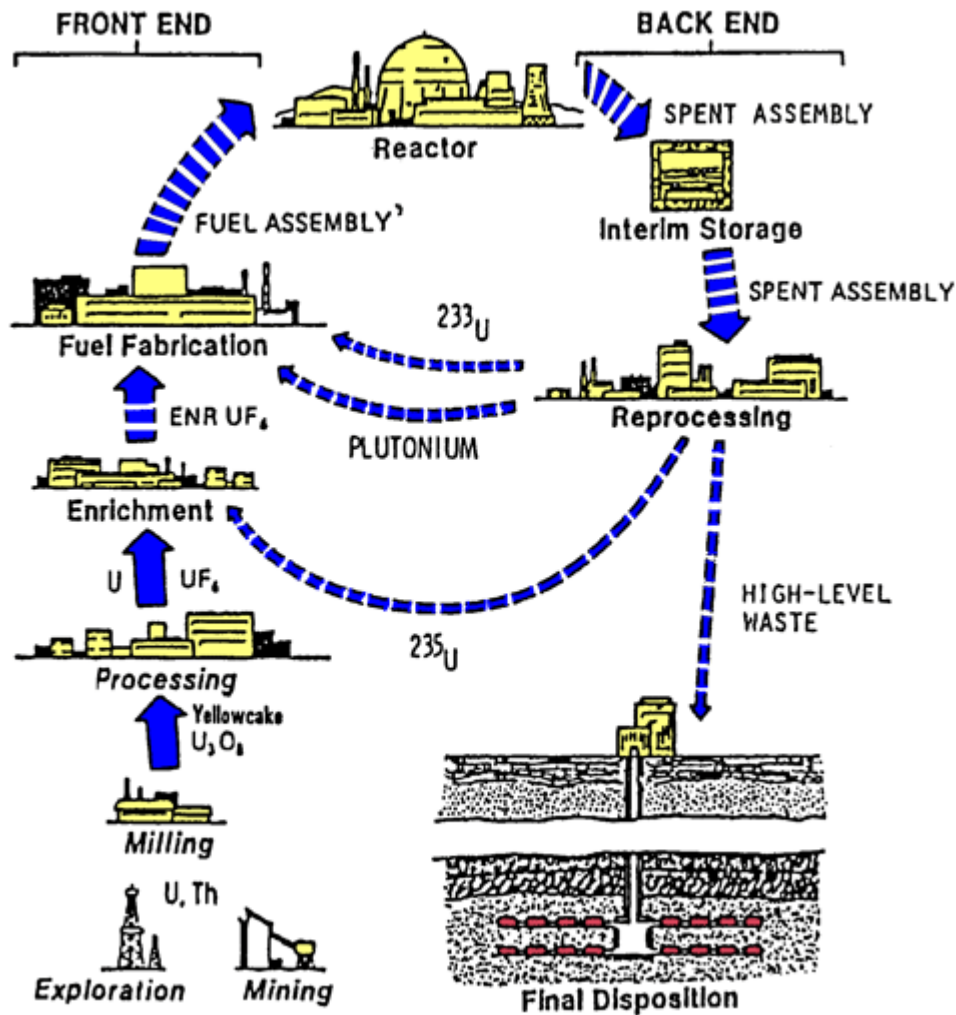


Figure 2: This drawing shows the steps of the nuclear fuel cycle from initial mining and production to use in the reactor, reprocessing and final disposition.

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## The Winds of Change

As a region, we are now left wondering what's next? How we will come together in unity to address a path forward in the wake of this broken promise – one that has implications of the longest possible term and a potential chilling effect on the region's future growth and prosperity?

The announcement to jettison Yucca Mountain as the preferred storage option came only a few days into the new Obama Administration which came to power on the winds of change. The news was not completely unexpected. The signs had been building for years amid construction delays and growing public opposition and the increasing political clout of Nevada's senior senator.

As Senate Majority Leader, Harry Reid became a force to be reckoned with and one whose opposition would ultimately seal the repository's fate. With more than \$7 billion invested by nuclear power consumers and taxpayers since its inception, many saw Yucca's cancellation as the most expensive "Not in my Backyard" protest ever, despite the fact that state and local governments in Nevada had received over \$400 million in "mitigation" payments since the early 1980s.

### **A Day of Reckoning**

But when it finally came, the decision still hit hard in our region and others whose economy depended for years on federal paychecks and promises. Now, one of the biggest promises appears broken. The President says Yucca Mountain is gone. For all those communities across the country who believed and followed – for all of those who thought the waste was just passing through -- the Day of Reckoning has arrived.

What was unspoken is now clear. When it comes to disposal of high-level nuclear waste from the nation's nuclear defense program, there is no Plan B. No alternate location. No secondary geologic formation. No backup technology. No other plan. It was always Yucca Mountain. Nothing else.

The government's about face on this critical issue leaves state and local leaders with more questions than answers. Those responsible for public safety, job creation, image enhancement and citizen confidence must now lead in a new reality. They must come to terms with their community's lingering – perhaps permanent -- role as caretaker for the Nation's highly radioactive waste.

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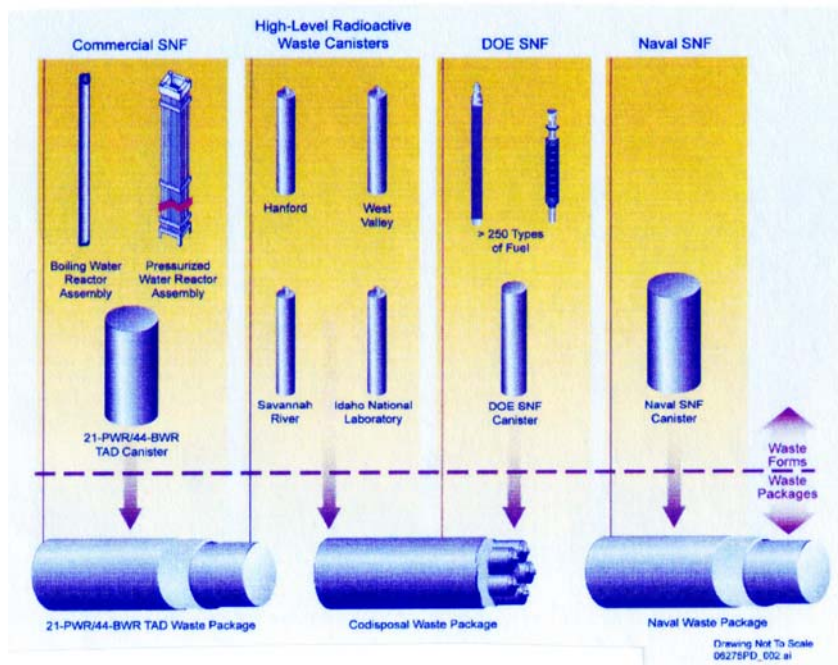


Figure 3: Waste forms and packages to be stored in Yucca Mountain (Courtesy: CNTA).

## Seeking a New Strategy

For our region, whose economy was shaken by the dramatic post-Cold War downsizing of its largest employer and now seeks to diversify, hard choices lie ahead. The SRS Community Reuse Organization (SRSCRO) encourages regional dialog on this important issue in a constructive way that can help lead to consensus concerning a new strategy that is now required in light of the Administration's decision.

Local communities like ours had for years embraced their limited, defined role in nuclear waste storage -- one that was always clear in our minds and, therefore, acceptable. We were willing temporary hosts, agreeable short-term custodians.

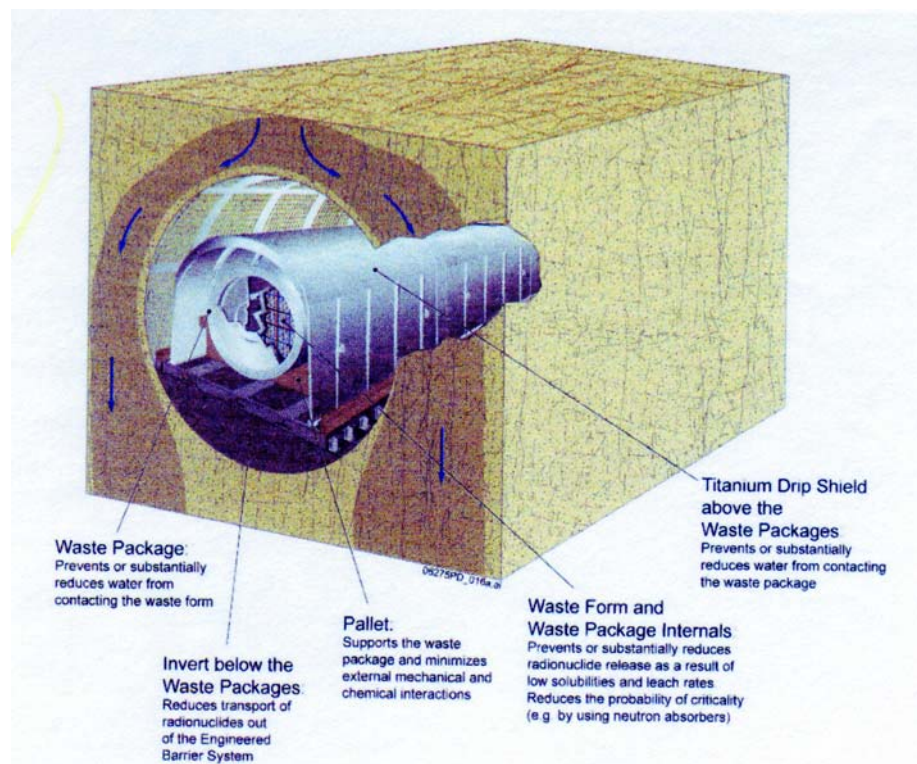
The public discourse in the months ahead must respect the viewpoints of all parties and must be focused on blending disparate positions into a common, unified approach the community can embrace and support



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In storing high-level nuclear waste, we saw ourselves as a hotel. Our guests were transient – staying for a while and then moving on. We never envisioned building a permanent retirement home for them. We viewed our role as a way station for nuclear waste, a place where it could stay overnight while its ultimate home was being prepared “somewhere else” – a remote desert place called Yucca Mountain.

When the waste finally reached the depths of Yucca Mountain, it would be safe and secure. It was a solution forever sealed from human intervention. The waste would permanently reside in a highly engineered hole in the ground impervious to water and worry. For most Americans, it was a place where out of sight definitely meant out of mind. For most, it seemed the perfect solution.



**Figure 4:** There is a natural tendency for any water to move around large openings or excavation in rock. The emplacement tunnels or “drifts” shown above provide a stable environment for other engineered barrier system features at Yucca Mountain. (Courtesy: CNTA).

Even now, the Government's rejection of its only answer to long term storage resounds in communities across the country, including our own, as local leaders reluctantly are forced to see their hometowns for what they may now have become – an unwilling permanent landlord for what many Americans consider to be the world's deadliest legacy.

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## What Now?

For community leaders in the Central Savannah River Area and in other Department of Energy communities around the country, one question remains:

What do we do now?

The high-level nuclear waste we so readily accepted as temporary now seems much more permanent, and community leaders in the Central Savannah River Area today find themselves at a crossroads – torn between accepting the announced fate of the government's only solution or continuing to fight for permanent storage at Yucca Mountain.

There are powerful advocates who remain committed to the fight. In a recent letter to Secretary Chu, 17 Republican Senators took the Administration to task for its quick decision to scuttle Yucca Mountain. The group was led by Senator James Inhofe (R-OK), ranking member of the Senate Environment and Public Works Committee, and included South Carolina Senator Jim DeMint. They wrote to Secretary Chu:

"The American taxpayer has invested too much money in Yucca Mountain to simply have it pushed aside without explanation. Over \$7.7 billion has been spent researching Yucca Mountain as a potential repository site, and neither the National Academy of Sciences, the Nuclear Waste Technical Review Board, nor any of our National Labs involved in conducting the studies and evaluating data have concluded that there is any evidence to disqualify Yucca Mountain as a repository," the Senators wrote.

"As recently as August 2008, all ten National Lab directors, including you, signed a letter on the essential role of nuclear energy which advocated continuing the licensing of a geologic repository at Yucca Mountain.

"Given this history, President Obama's memoranda that science should govern public policy and his commitment to an unprecedented level of openness, we find it difficult to reconcile your statement that Yucca Mountain "is not an option" made after only six weeks in office."

When it comes to disposal of high-level nuclear waste from the nation's nuclear defense program, there is no Plan B. No alternate location. No secondary geologic formation. No backup technology. No other plan. It was always Yucca Mountain. Nothing else.

The Senators also noted that since the first National Academy of Science (NAS) study in 1957, deep geologic disposal has been viewed as the safest approach to disposal of nuclear waste. In 1983, the Nuclear Waste Policy Act (NWPA) was signed into law providing for the siting and development of a repository for our nation's used nuclear fuel and nuclear waste culminating in the recommendation of the Yucca Mountain site.

In accordance with that law, electricity consumers have contributed \$30 billion for the disposal of civilian spent fuel and taxpayers have paid \$3.5 billion for the disposal of the nuclear waste legacy of the Cold War. Courts have affirmed the federal government's obligation to dispose of spent fuel. Taxpayers face up to \$11 billion in liability costs even if the Department of Energy begins accepting used fuel and nuclear waste in 2020 and an additional \$500 million with each passing year of delay. At present, the nuclear industry has nearly 63,000 metric tons of civilian used fuel awaiting disposal in addition to 7,000 metric tons of defense waste stored at Department of Energy facilities.

The pro-Yucca sentiments in the lawmakers' letter were underscored in a Washington Post editorial following the President's action:

"By stripping the funding for the nuclear repository at Nevada's Yucca Mountain, President Obama has succeeded in killing the contentious project that remains unfinished 22 years after Congress selected the site. He compounds the error by not offering an alternative. If the president's vision for a clean energy future is to be believed or is to come to fruition, nuclear energy must be a part of the mix, and the safe disposal of its radioactive waste must be given more serious consideration."

### **We Have a Huge Stake in this Issue**

If and when a "blue ribbon panel" is assembled to chart a new strategy for nuclear waste storage, our region deserves – and demands – a seat at the table as part of this committee.

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In a March 18, 2009, letter to South Carolina Governor Mark Sanford, the Governor's Nuclear Advisory Council outlined four reasons why South Carolina is a key stakeholder in this issue:

- The state has seven operating nuclear reactors at four sites. Four additional reactors at two sites are planned. Each of these reactors produces spent nuclear fuel which must be ultimately disposed of by the Department of Energy; however, until such time as a repository is available, the spent fuel will be stored at each site. Only Illinois and Pennsylvania have more commercial nuclear power reactors than South Carolina.
- The Savannah River Site has approximately 3,000 canisters of stabilized legacy high level waste from the Cold War stored on site, and another 3,000 to 4,000 canisters will be generated in the process of stabilizing the remaining liquid radioactive waste now in aging tank farms at SRS. This stabilized high level waste must be disposed in a federal repository, but until a federal repository is available, it will be stored at SRS. New York, Washington and Idaho have similar high level waste.
- Savannah River Site is the receipt and storage site for aluminum-clad research reactor spent fuel from decommissioned research reactors worldwide. Based on approved operational plans, SRS will process this fuel in H Canyon to recover the enriched uranium for use as fuel in commercial nuclear reactors. The high level waste resulting from processing the fuel will be stabilized along with other high level waste at SRS and stored until a repository is available.
- Savannah River Site was selected by DOE to provide interim storage for surplus non-pit plutonium in the United States. The plutonium originally located at Rocky Flats, Hanford, Los Alamos and several weapons

"While we have no concerns about the about the ability to store and maintain these materials in the near term, the impacts of long-term interim storage, including continued safety, have not been evaluated."

--Ben C. Rusche  
Chairman  
SC Governor's  
Nuclear Advisory  
Council

Only Illinois and Pennsylvania have more commercial nuclear power reactors than South Carolina.

research laboratories will be consolidated at SRS by about 2012. Approximately 60 percent of the weight of the plutonium is destined to be converted to commercial nuclear fuel in the Mixed Oxide Fuel Fabrication Facility (MOX).

However, DOE planned to dispose of the remaining 40 percent in the federal repository by dissolving in H Canyon, incorporating the plutonium into borosilicate glass in the Defense Waste Processing Facility with existing high level liquid waste, and storing in the Glass Waste Storage Buildings at SRS until a repository is available.

Chairman Ben Rusche wrote that while the Council has no concerns about the ability to store and maintain these materials in the near term, the impacts of long-term interim storage, including continued safety, have not been evaluated.

He further stated that "it is the opinion of the Council that South Carolina will continue to host much of the material destined for the federal repository until one becomes available, and will bear a disproportionate share of any adverse consequences of our Nation's inability to develop a repository. For these reasons, South Carolina's participation in any federally-supported studies or discussions of alternatives to Yucca Mountain is vital to the state's well-being and the common good of the state and the Nation."

The SRSCRO Board of Directors wholeheartedly endorses the viewpoint expressed by the Governor's Nuclear Advisory Council and adds its voice to the call for our two-state region to be appropriately represented on any panel formed to review this critical issue.

### **The Demise of Yucca Mountain: Problem or Opportunity?**

The Chinese use two brush strokes to write the word "Crisis". One brush stroke stands for "danger", the other for "opportunity". Which is it for our region? True, the Government's apparent rejection of Yucca Mountain as a



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permanent repository for nuclear waste creates something of a crisis. But for us, does it mean “opportunity” or “danger”?

There are those who see both. Some see tremendous opportunity in our half century history of nuclear accomplishment and in the reservoir of stellar talent that has already created and deployed technology designed to ensure safe storage of nuclear waste, creating jobs and international focus on our capabilities.

Supporters point to the Savannah River Site’s half century of experience in nuclear fuel cycle programs. They highlight an extensive commercial nuclear energy supply centered on Plant Vogtle in Georgia and on seven nuclear reactors on four sites in South Carolina. They remind us of the presence in our region of the world’s premier nuclear power engineering and construction companies, of our central location with respect to the resurgence of nuclear power in the Southeast and a government, business and community base that understands and appreciates the benefits of nuclear energy.

Others see dangerously dark days ahead for a region whose potential is marred by the prolonged presence of nuclear waste and crippled by the unappealing specter of a worldwide reputation as a “nuclear waste dump”. To them, it deters industry, crimps job growth, numbs entrepreneurship and innovation, tarnishes civic pride and ultimately fuels the widespread perception of an unsafe place to live and work.

### **Forming a New Strategy**

Both viewpoints have advocates, and both have merit. It is up to the region’s leaders – elected officials, business owners, economic development professionals, educators, heads of community organizations, labor leaders and others – to join together to form a consensus concerning the new reality of nuclear waste management that has dawned in recent days and that, undoubtedly, will remain at the forefront of our agenda for months and years to come.

“Without Yucca Mountain or an acceptable alternate, commercial spent nuclear fuel and glass logs from the SRS Defense Waste Processing Facility will remain at their existing locations – this is an unacceptable long-term situation.”

--Community information  
provided to Congressional  
Delegation, April 2009

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The seeds of dialog and consensus have already been planted. Local community groups, including area Chambers of Commerce and Citizens for Nuclear Technology Awareness, have prepared documents addressing this critical issue. The chamber document suggests that Yucca Mountain be preserved as a disposal pathway for Spent Nuclear Fuel “unless and until a better option is approved”. It calls for establishing reprocessing as the national policy option for management of Spent Nuclear Fuel.

The document underscores the fact that capabilities already existing in the region provide a “unique opportunity for public/private partnerships in developing non-polluting nuclear power as an increasingly important part of our nation’s energy mix.”

In a separate document, Citizens for Nuclear Technology Awareness (CNTA), a regional grassroots educational organization, echoed its support for continued development of Yucca Mountain as the ultimate repository.

“The Yucca Mountain repository is a safe, scientifically sound solution to the storage of used nuclear fuel and high level defense waste,” the paper concludes. “There has been no suggestion by more than 50 scientific reviews of the Yucca Mountain project that this option is not suitable for its intended purpose. We urge compliance with the Nuclear Waste Policy Act and that the necessary funding be restored to pursue the Yucca Mountain Repository project.”

As part of our regional dialog, local leaders should work together to examine key questions related both to the status of Yucca Mountain and to the future of reprocessing spent nuclear fuel. For ease of reference, these questions are divided into categories – ***CONTINUED SUPPORT FOR YUCCA MOUNTAIN and ADOPTION OF REPROCESSING AS NATIONAL POLICY.***

The seeds of dialog and consensus have already been planted as local community groups have prepared documents addressing this critical issue.

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Specifically, these questions include:

**I. CONTINUED SUPPORT FOR YUCCA MOUNTAIN**

**A. Should Congress reaffirm the 2002 legislation which specifies that Yucca Mountain is to be developed as the national repository?**

DOE has submitted a license application to NRC to construct the Yucca Mountain repository. NRC has up to four years to review the application. We anticipate that funding in the President's 2010 budget proposal will not be adequate to support the application review process, and the Yucca Mountain project will fail. A funding level of about \$350 Million (a continuation of past funding trends) will allow the license review process to remain on schedule.

Electric utility ratepayers in 35 states have paid \$30 Billion into the Nuclear Waste Fund to develop Yucca Mountain. South Carolina and Georgia ratepayers have paid \$1.2 Billion and \$675 Million respectively. In addition 39 states have commercial reactor SNF or DOE high level radioactive wastes scheduled for disposal in Yucca Mountain.

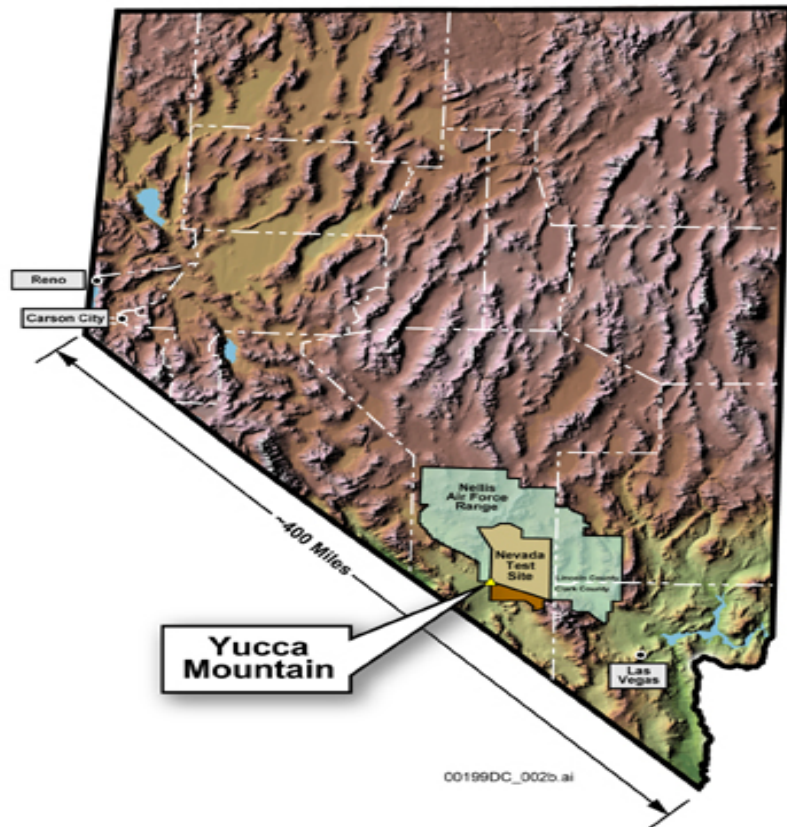
Consideration should be given to designating the CSRA as an "affected unit of government" as defined in the Nuclear Waste Policy Act.

**B. Should the Governors of the 39 states with either commercial SNF and/or DOE high level radioactive nuclear waste contact their federal delegations to express their concern and request that the Yucca Mountain disposition pathway for SNF and DOE high level radioactive wastes be reestablished?**

Should Congress reaffirm the 2002 legislation which specifies that Yucca Mountain is to be developed as the national repository?

“The American taxpayer has invested too much money in Yucca Mountain to simply have it pushed aside without explanation. Over \$7.7 billion has been spent researching Yucca Mountain as a potential repository site, and neither the National Academy of Sciences, the Nuclear Waste Technical Review Board, nor any of our National Labs involved in conducting the studies and evaluating data have concluded that there is any evidence to disqualify Yucca Mountain as a repository,”

--Letter to Secretary of Energy  
From 17 Republican Senators



**C. Should stakeholders from South Carolina and Georgia be included as members of the Blue Ribbon Commission being assembled by DOE to consider alternatives to Yucca Mountain?**

Many believe processing is a better spent nuclear fuel management option than direct disposal. Processing of spent nuclear fuel will have two significant benefits: (1) it will reduce (but not eliminate) the need for deep geologic disposal of wastes from nuclear power production and (2) the unburned fuel materials in spent nuclear fuel can be separated and returned to a nuclear reactor as fresh fuel.

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## **II. Adoption of Reprocessing as National Policy**

### **A. Should Congress approve legislation which establishes processing as the national policy for management of spent fuel?**

If processing of spent nuclear fuel is authorized today, commercial-scale plants will probably use the 'PUREX' process, a proven process which results in liquid wastes and separates plutonium in its pure form. Improved spent nuclear fuel processing methods can reduce the amount of wastes generated and provide improved security for plutonium contained in SNF. These are worthwhile objectives, and are the type of program ideally suited for research and engineering development at SRS.

### **B. Should DOE and the Congress approve a vigorous program to (1) select a new spent nuclear fuel process and (2) develop and demonstrate the new process at the engineering scale on SRS as soon as possible?**

A portion of the energy-bearing materials separated from spent nuclear fuel are not suitable for use in conventional nuclear power reactors. A new type of reactor which can 'burn' this otherwise unburnable fuel is needed to (1) reduce security concerns, (2) reduce waste requiring geologic disposal and (3) recover the maximum energy content from spent nuclear fuel. Commercial reactor vendors and DOE have been performing low-budget research on alternate reactor types. Some of these concepts are ready for scale-up and a public/ private partnership at SRS is an ideal location to demonstrate a new reactor type. Construction and operation of a new reactor type is not required immediately.

### **C. Should DOE and the Congress approve a program to develop alternate reactor types which can burn the portion of recovered fuel which is not suitable for use in conventional nuclear power reactors?**

Without Yucca Mountain or an acceptable alternate, commercial spent nuclear fuel and glass logs from the SRS Defense Waste Processing Facility will remain at their existing locations – this is an unacceptable long-term situation. In addition, DOE is contractually committed to

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As we wrestle with the implications of “life after Yucca”, we must consider the full impact of the Administration’s decision on our community, our economy, our way of life, our ability to attract new jobs and the way we view ourselves -- as well as how others see us.

take spent nuclear fuel from commercial utilities and the unavailability of Yucca Mountain or commercial spent nuclear fuel processing might result in DOE forcing consolidation of commercial spent nuclear fuel at its field locations, including SRS. Therefore, we believe it is in the community’s best interest to (1) aggressively pursue opening of Yucca Mountain and (2) establish processing as an acceptable spent nuclear fuel management option.

The completion of Yucca Mountain and reprocessing are both important, and both should be part of any Spent Nuclear Fuel management policy. While the processing option can recover unburned fuel, it also generates high level radioactive wastes which require geologic disposal (with less volume and less radiotoxicity than direct disposal). In addition Yucca Mountain can receive and dispose of 6,000 canisters of vitrified high level radioactive waste currently being produced and stored on SRS. Without Yucca Mountain there is no approved disposition pathway for this SRS waste.

### **Other Considerations**

In addition to the questions raised above, there are other considerations for the community as well.

1. As affected units of government, should we advocate that the Nuclear Waste Policy Act of 1982 as amended be reopened to address our region’s prolonged role as host to high-level nuclear waste? Specifically, should the law be changed to require the Federal Government to compensate local units of government for their willingness to continue to serve as host while the Government develops other, more permanent storage options?
2. Should the region retain the services of Washington, DC-based firm to represent its interests with Federal agencies and elected officials on Capitol Hill? As we face a lengthy delay in progress toward an ultimate solution for nuclear waste storage, is it time to ensure that

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our voice is amplified and our case is presented in the strongest possible terms with Government decision makers?

3. What groups should be brought together to develop regional consensus and how is this done (e.g. CNTA, CAB, Economic Development Groups, County Councils?)
4. Since resolution of this critical challenge impacts many regions besides ours, should we coordinate with affected units of government in other states to amplify our voice, maximize our ability to communicate with policy makers and ensure that the final resolution addresses national needs and concerns in a comprehensive way?

### **Life After Yucca**

In the coming months, the SRS Community Reuse Organization will seek to assist our region in developing consensus concerning a national strategy for safe, permanent nuclear waste disposal.

We will reach out to elected officials, business leaders, economic development groups, state and local governments, the Department of Energy and its contractors, community groups with a perspective on nuclear issues and the long-term betterment of the community, and citizens at-large. Our purpose is to inform and create dialog leading to consensus and a plan of action.

As we wrestle with the implications of “life after Yucca”, we must consider the full impact of the Administration’s decision on our community, our economy, our way of life, our ability to attract new jobs and the way we view ourselves -- as well as how others see us.

It is a complex tapestry of interrelated issues unprecedented in their scope and impact – the convergence of strongly-held ideology, social conscience and political compromise, a questioning reliance on technology, the quest for energy independence, and the tension between raw emotion and the long-term well-being

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of our nation as we seek to manage and maximize the legacy of our historic commitment to harness the power of the atom.

The public discourse in the months ahead must respect the viewpoints of all parties and must be focused on blending disparate positions into a common, unified approach the community can embrace and support. That work is already underway. The SRSCRO – representing five counties and two states closely tied to the future of the Savannah River Site – stands ready to lead and partner with others in a cooperative regional effort to forge a nuclear waste strategy that will serve our best interests and those of the nation for generations to come.

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# U.S. State by State Commercial Nuclear Used Fuel and Payments to the Nuclear Waste Fund

State	Metric Tons of Uranium	Nuclear Waste Fund Contributions (\$ M)
Alabama	2,790	719.7
Arizona	1,710	508.7
Arkansas	1,180	285.6
California	2,590	795.7
Colorado	30	0.2
Connecticut	1,890	353.0
Florida	2,720	743.4
Georgia	2,330	662.3
Idaho	90	NA
Illinois	7,420	1,706.9
Iowa	430	108.7
Kansas	570	180.9
Louisiana	1,080	309.5
Maine	550	65.5
Maryland	1,220	343.5
Massachusetts	610	156.8
Michigan	2,310	503.0
Minnesota	1,090	375.9
Mississippi	730	194.0
Missouri	610	187.3
Nebraska	790	252.5
New Hampshire	480	146.3
New Jersey	2,280	574.8
New York	3,280	762.9
North Carolina	3,220	801.7
Ohio	980	287.5
Oregon	350	75.5
Pennsylvania	5,410	1,502.4
South Carolina	3,610	1,197.9
Tennessee	1,350	439.5
Texas	1,810	580.3
Vermont	580	89.8
Virginia	2,240	672.1
Washington	570	152.8
Wisconsin	1,250	344.2
Other	NA	7.6
Total	60,150	16,088.3

Idaho is holding used fuel from Three Mile Island 2

Used Fuel Data is rounded up to the nearest ten and is as of January 2009, Nuclear Waste Fund Contributions as of June 30, 2008

Source: ACI Nuclear Energy Solutions and Department of Energy

Updated: 4/09

## **Glossary of Nuclear Waste Terms**

### **Atom**

The basic component of all matter; it is the smallest part of an element having all the chemical properties of that element. Atoms are made up of protons and neutrons (in the nucleus) and electrons.

### **Background Radiation**

Radiation arising from natural radioactive material and always present in the environment, including solar and cosmic radiation and radioactive elements in the upper atmosphere, the ground, building materials and the human body.

### **Canister**

The outermost container into which vitrified high-level waste or spent fuel rods are to be placed. Made of stainless steel or inert alloy.

### **Cask**

Container that provides shielding during transportation of canisters of radioactive material. Usually measures 12 feet in diameter by 22 feet long and weighs 200 tons.

### **Chain Reaction**

A self-sustaining series of nuclear fissions taking place in a reactor core. Neutrons produced in one fission cause the next fission.

### **Civilian Waste**

Low-level and high-level (including spent fuel) radioactive waste generated by commercial nuclear power plants, manufacturing industries and institutions (hospitals, universities and research institutions.)

### **Cladding**

Protective alloy shielding in which fissionable fuel is inserted. Cladding is relatively resistant to radiation and to the physical and chemical conditions in a reactor core. Cladding may be made of stainless steel or an alloy such as zircaloy.

### **Closed Fuel Cycle**

A closed fuel cycle includes chemical reprocessing to recover the fissionable material remaining in the spent fuel. An open fuel cycle does not. (See Fuel Cycle).



## **Curie**

A measure of the rate of radioactive decay; it is equivalent to the radioactivity of one gram of radium or 37 billion disintegrations per second. A nanocurie is one billionth of a curie; a picocurie is one trillionth of a curie.

## **Daughter Product**

Nuclides resulting from the radioactive decay of other nuclides. A daughter product may be either stable or radioactive.

## **Decay**

Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles, photons or both.

## **Decommissioning**

Preparations taken for retirement of a nuclear facility from active service, accompanied by a program to reduce or stabilize radioactive contamination.

## **Decontamination**

The removal of radioactive material from the surface of or from within another material.

## **Defense Waste**

Radioactive waste resulting from weapons research and development, the operation of naval reactors, the production of weapons material, the reprocessing of defense spent fuel and the decommissioning of nuclear-powered ships and submarines.

## **Defense Waste Processing Facility (DWPF)**

The largest radioactive waste glassification plant in the world, the Defense Waste Processing Facility (DWPF) converts the liquid nuclear waste currently stored at the Savannah River Site (SRS) into a solid glass form suitable for long-term storage and disposal.

## **Disposal**

Permanent removal from the human environment with no provision for continuous human control and maintenance.

## **Dose**

A quantity of radiation or energy absorbed; measured in rads.

## **Dry Cask Storage**

Heavily shielded, air-cooled storage casks for storing spent fuel.

## **Exposure**

A measure of ionization produced in air by X-rays or by gamma radiation. Acute exposure generally refers to a high level of exposure of short duration; chronic exposure is lower-level exposure of long duration.

## **Fissile**

Able to be split by a low-energy neutron, for example, U-235.

## **Fission**

The splitting or breaking apart of a heavy atom such as uranium. When a uranium atom is split, large amounts of energy and one or more neutrons are released.

## **Fission Products**

A general term for the complex mixture of nuclides produced as a result of nuclear fission. Most, but not all, nuclides in the mixture are radioactive, and they decay, forming additional (daughter) products. The complex mixture of fission products contains about 200 different isotopes of over 35 elements.

## **Fuel Cycle**

The complete series of steps involved in supplying fuel for nuclear reactors. It includes mining, refining, the fabrication of fuel elements, their use in a reactor and management of spent fuel and radioactive waste.

## **Half-Life**

Time required for a radioactive substance to lose 50 percent of its activity by decay. The half-life of the radioisotope plutonium-239, for example, is about 24,000 years. Starting with a pound of plutonium-239, in 24,000 years there will be one-half pound of plutonium-239, in another 24,000 years there will be  $\frac{1}{4}$  pound, and so on. (A pound of actual material remains but it gradually becomes a stable element.)

## **High Level Waste**

Highly radioactive material containing fission products, traces of uranium and plutonium and other transuranic elements; it results from chemical reprocessing of spent fuel. Originally produced in liquid form, high level waste must be solidified before disposal.

## **Interim Storage**

The temporary holding of waste on or away from the generator's site when disposal space is not available. Monitoring and human control are provided and subsequent action involving treatment, transportation or final disposition is expected.

## **Low Level Waste**

Radioactive waste not classified as high level waste, transuranic waste, spent fuel or by-product material. Most are generally short-lived and have low radioactivity. An example is protective gloves used by workers in a nuclear facility.

## **Mixed Waste**

Waste that contains both radioactive and hazardous chemical components.

## **Radiation**

Particles or waves from atomic or nuclear processes (or from certain machines). Prolonged exposure to these particles or rays may be harmful.

## **Radioactive Waste**

Liquid, solid, or gaseous waste resulting from mining of radioactive ore, production of reactor fuel materials, reactor operation, processing of irradiated reactor fuels, and related operations, and from use of radioactive materials in research, industry, and medicine.

## **Radioactivity**

The spontaneous emission of radiation from the nucleus of an atom. Radioisotopes of elements lose particles and energy through the process of radioactive decay.

## **Repository**

A permanent disposal facility for high-level of transuranic waste and spent fuel.

## **Reprocessing**

The process by which spent fuel is separated into waste material for disposal and into material such as uranium and plutonium to be reused as fuel.

## **Spent Fuel**

Fuel that has been “burned” (irradiated) in a nuclear power plant’s reactor to the point where it no longer contributes efficiently to the nuclear chain reaction. Spent fuel is thermally hot and highly radioactive.

## **Storage**

Operations that are designed to provide isolation and easy recovery of radioactive material and which rely on continuous human monitoring, maintenance and protection from human intrusion for a specified period of time.

## **Tank Farms**

Underground storage tanks at some Department of Energy facilities used to store liquid radioactive waste prior to vitrification. The liquid nuclear waste in tank storage exists in two forms, a sludge form and a salt form. The sludge form, while comprising only about 10% of the

volume in the tanks, contains about half of the radioactivity. The salt form readily dissolves in water, comprises about 90% of the volume and contains the balance of the radioactivity

### **Transuranic Waste (TRU)**

Waste material contaminated with U-233 (and its daughter products), certain isotopes of plutonium and nuclides with an atomic number greater than 92 (uranium). It is produced primarily from reprocessing spent fuel and from use of plutonium in fabrication of nuclear weapons.

### **Vitrification**

The conversion of high-level waste into a glassy or non-crystalline solid for subsequent disposal.

### **Volume Reduction**

Various methods of waste treatment, such as evaporation for liquids or compaction for solids, aimed at reducing the volume of waste.

### **Waste Isolation Pilot Plant (WIPP)**

The Waste Isolation Pilot Plant – known as WIPP – in New Mexico is the world's first underground repository licensed to safely and permanently dispose of transuranic radioactive waste left from the research and production of nuclear weapons.

### **Yucca Mountain**

Yucca Mountain is located in a remote desert on federally protected land within the secure boundaries of the Nevada Test Site in Nye County, Nevada. It is approximately 90 miles northwest of Las Vegas. The U. S. Department of Energy began studying Yucca Mountain in 1978 to determine whether it would be suitable for the nation's first long-term geologic repository for spent nuclear fuel and high-level radioactive waste. Currently stored at 121 sites around the nation, these materials are a result of nuclear power generation and national defense programs.