Savannah River Site Watch

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Savannah River Site Faces Unprecedented Import of Highly Radioactive Spent Nuclear Fuel from Two German Nuclear Power Reactors; Export from Germany Illegal and Unwarranted

Scoping Comments on the US Department of Energy's "Environmental Assessment for the Acceptance and Disposition of Used Nuclear Fuel Containing U.S.-Origin Highly Enriched Uranium From the Federal Republic of Germany"

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The following comments and attachments are submitted for the record. I request that each comment as well as the contents of the attachments be addressed in full and that this comment and the attachments be made publicly available as part of the draft Environmental Assessment (EA). As some of the attached documents are in German and are of importance to the matter at hand, I request that they be reviewed and translated into English and responded to the in draft EA.

These comments apply to a proposal by US and German entities to import into the US highly radioactive graphite spent fuel from two long-shuttered commercial prototype power reactors, the Arbeitsgemeinschaft Versuchsreaktor (AVR) reactor, which operated from 1967 to 1988, and the Thorium High Temperature Reactor (THTR)-300, which operated from 1983 to 1989. The two gas-cooled electricity production reactors are classified as experimental or prototype reactors that were to be a basis for further deployment of such commercial reactors. They were not research reactors.

These comments are influenced by my participation in the EIS process and engagement with DOE officials in the mid-1990s regarding "take back" of research reactor spent fuel containing US-origin highly enriched uranium (HEU), much of which is now stored at the US Department of Energy's Savannah River Site. Since that time, I have been very familiar with the take-back program and issues concerning the management of that spent fuel at SRS. The current proposal is outside the bounds of the take-back program and must be rejected as a matter of policy.

The fuel being considered in the EA document is starkly different from the research reactor spent fuel received at SRS and would be the first commercial spent fuel shipment not only into SRS but also into the United States. It unprecedented and the import raises both environmental and nuclear non-proliferation concerns (as a new processing technique is being developed to process the spent fuel).

Savannah River Site Watch is in favor of the "no action" alternative of not importing the German commercial spent fuel.

Mock German Graphite Commercial Spent Fuel "Pebble"

Rudolf Printz, Leiter des Bereiches Nuklear-Service im Forschungs-Zentrum Jülich, zeigt das Modell einer Graphit- Brennelemente-Kugel. (Andreas Endermann (dpa))

Shipment of AVR and THTR Commercial Spent Fuel to US has not been Analyzed in Policy Documents

The proposal at hand is unprecedented and would likely constitute the first import into the US of commercial spent fuel, for reprocessing and dumping. While a policy exists to take research reactor spent fuel to SRS for storage, no such policy exists on non-research fuel such as the graphite fuel now being considered for import. Though it likely contains some remaining US-origin HEU, it is perplexing that DOE is attempting establish a new spent fuel import policy via a National Environmental Policy Act process and not via a wider discussion about the policy itself.

As the DOE's Global Threat Reduction Initiative (GTRI) appears to be scouring the world for materials to bring to SRS, including the questionable shipment of liquid high-level waste from Canada and secret shipments of plutonium (which have no disposition path and are being orphaned at SRS), it is no surprise the GTRI is looking to bring in lucrative business deals to Savannah River National Lab, under the troubling "work for others" program, and to SRS. But should business deals be the driver for sound environmental and non-proliferation policies?

The GTRI program has over the past years expanded material being eyed to be brought to the US, but those materials were primarily research reactor spent fuel planned to be stored in the spent fuel pool (basin) in the old L-Reactor at SRS. No analysis has been done of bringing in spent commercial fuel that would not be stored in the L-basin.

The *SUPPLEMENT ANALYSIS FOR THE U.S. DISPOSITION OF GAP MATERIALSPENT NUCLEAR FUEL* (DOE/EIS-0218-SA-4, January 2009) stated:

> The National Nuclear Security Administration's (NNSA's) Global Threat Reduction Initiative (GTRI) is a vital part of the U.S. national security strategy of preventing the acquisition of nuclear and radiological materials for use in weapons of mass destruction (WMD) and other acts of terrorism. The GTRI mission is to reduce the amount of and protect vulnerable nuclear and radiological materials located at civilian sites worldwide. In support of nonproliferation goals, NNSA conducts

> a Foreign Research Reactor (FRR) Spent Nuclear Fuel (SNF) Acceptance Program that recovers FRR SNF from foreign countries. The fuel eligible for recovery under this program was manufactured from U. S .-origin highly enriched uranium (HEU) and comes from countries specifically identified in the Record of Decision (ROD) for the *Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel (FRR SNF EIS)* (DOE/EIS-0218) (DOE 1996a) and its Supplement Analyses (SAs) (DOE 1998a, 1998b, 2004a}1 Analysis in the *FRR SNF EIS* is based on the receipt of about 19.2 metric tons (21.1 tons) of heavy metal (MTHM) of FRR SNF; current projections, however, indicate that the program will recover about 6.9 MTHM (7.6 tons) of FRR SNF.
>
> NNSA has identified a category of material currently in foreign countries that presents a potential threat to nonproliferation goals and may not have adequate safe and secure management options; it is referred to as Gap Material SNF consisting of SNF containing non-U.S. -origin HEU and SNF containing U.S.-origin HEU that was not addressed in the *FRR SNF EIS.* If no other reasonable pathways are identified to address U.S. national security interests, such as return to secure locations in the countries of origin or other commercial disposition options, NNSA proposes to transport up to 1 MTHM (1 ,000 kilograms or 1.1 tons) of Gap Material SNF to the United States in accordance with applicable U.S. and international requirements. Gap Material SNF from countries other than Canada would be transported by chartered ship to the Charleston Naval Weapons Station (NWS), Charleston, South Carolina, and then transferred to truck or rail car for shipment to the Savannah River Site (SRS), Aiken, South Carolina, for storage in L-Basin pending ultimate disposition.

The above document and those documents named in it were lacking in that they did not address the German graphite spent fuel as it appears that consideration to ship it to the US did not begin until 2012. This delay in considering this spent fuel for import into the US is an indication that it was to be managed in Germany (until the length of the storage license at Juelich was expiring and technical difficulties continuing). It seems like it simply became easier to look at paying a large sum to dump the spent fuel in the US, under the cloak of non-proliferation, than building news storage facilities in Germany and disposing of it there.

Legal Basis for Export of Commercial Spent Fuel from Germany has Not Been Established

It is noted that in the "Statement of Intent" of March 28/April 1, 2014 signed between the U.S. Department of Energy, the Federal Ministry of Education and Research of the Federal Republic of Germany and the Ministry for Innovation, Science and Research of the State of North Rhine-Westphalia on behalf of the North Rhine-Westphalia State Government "for the Proposed Use of Savannah River Site Facilities for Disposition of German Research Reactor Pebble Bed Fuel" that the following is affirmed that all parties will meet applicable laws and regulations:

> III. General Considerations 3. "Each participant is to conduct activities contemplated by this Statement of Intent in accordance with all applicable laws and regulations and any international agreements to which its government is a party."

It has thus been established that both U.S. and German entities that any party to the Statement of Intent will meet applicable international law and treaties and laws of the United States and Germany as well as the European Union. This will include EU directives and regulations agreed to under the European Atomic Energy Community (EURATOM) and nuclear waste management practices agreed to

with the International Atomic Energy Agency (IAEA) - such as the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management – and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

The draft EA must fully describe how the shipment within Germany, across the Atlanta Ocean and in the United States complies with "all applicable laws and regulations and any international agreements." If a demonstration is to be made of the legality of the proposed shipment, the EA must outline each law and regulation that is applicable. If proof cannot be provided that the cross-border transfer of the power reactor spent fuel in question to an unsafeguarded reprocessing plant at SRS is in compliance with law and regulations then it cannot be conducted.

The German Reactors were Experimental Commercial Reactors, not Research Reactors

The AVR was a 15 MWe electricity production reactor and the THTR-300 was a 300 MWe electricity production reactor; they were experimental prototype commercial reactors, not research reactors.

Shuttered Arbeitsgemeinschaft Versuchsreaktor (AVR) experimental gas-cooled reactor at Jülich

A review of documents shows that until very recently there has been no claim that the AVR and THTR-300 reactors were "research" reactors. This unsubstantiated claim has been creeping into documents, including the June 4 Federal Register notice, only as discussions to export the commercial spent fuel to SRS have arisen.

The name of the AVR reactor - Arbeitsgemeinschaft Versuchsreaktor - clearly reveals that it was an "experimental reactor." Versuchs in German translates as "experimental." "Research reactor" in German is Forschungsreaktor. We are not dealing that case with research reactors but rather experimental commercial reactors that actually produced electricity.

Even the German government notes that the reactors were power reactors. The Bundesamt für Strahlenschutz (Federal Office for Radiation Protection) includes maps of power and research reactors and the map labeled "Kernkraftwerke in Deutschland" (- http://www.bfs.de/de/kerntechnik/ereignisse/standorte/karte_kw.html - includes both the AVR and HTRT reactors. Those reactors are not included in the list "Forschungsreaktoren in Deutschland" (research reactors in Germany).

Map of German "Kernkraftwerke" – nuclear power reactors, by the Bundesamt für Strahlenschutz (Federal Office for Radiation Protection) – note that the AVR and THTR-300 reactors are listed (and are not on the map of locations of research reactors)

The government's Jülich facility, where the AVR reactor was located and where the spent fuel is now stored, does not call it a research reactor. A paper entitled "*INTERSTORAGE OF AVR-FUELS IN THE RESEARCH-CENTER JÜLICH GMBH*," presented to the WM'02 Conference, February 24-28, 2002, Tucson, AZ, by H. Krumbach of the Research-Center Jülich GmbH (FZJ), clearly affirms that the AVR was an "experimental nuclear power plant":

> Between 26.08.1966 and 31.12.1988 the experimental nuclear power plant AVR was operated

> the area of the Jülich research-center by the **A**rbeitsgemeinschaft **V**ersuchs-**R**eaktor mbH, the AVR company. This plant was a Helium cooled high-temperature-reactor with an electric gross-power of 15 MW.

The experts' group established by the Forschungszentrum Jülich (FSZ) to look into incidents and accidents at the AVR reactor, the AVR Expert Group, produced a report on April 11, 2014 entitled "*The AVR Experimental Reactor – Development, Operation, and Incidents*." The report – at http://www.fz-juelich.de/portal/EN/AboutUs/self-conception/responsibility/avr/avr-expertengruppe/report-avr-expert-group_summary.pdf?__blob=publicationFile – established that the AVR was an experimental reactor originally owned by a group of municipal electric utilities and later by "the state-owned energy company Energiewerke Nord GmbH (EWN)":

> In 1959, fifteen municipal electric utilities formed the association known as Arbeitsgemeinschaft Versuchsreaktor GmbH (AVR GmbH) with the objective of demonstrating the feasibility and operability of a gas-cooled, graphite-moderated high-temperature reactor. The AVR experimental reactor was constructed in the immediate vicinity of the then Nuclear Research Centre Jülich (KFA) (since 1990: Forschungszentrum Jülich (FZJ) GmbH) and was operated from 1967 until 1988. After AVR had been shut down, "safe enclosure" of the power plant was the next planned step. Plant parts that were no longer required were dismantled and the fuel elements were removed in accordance with the relevant licences. When AVR GmbH was taken over by the state-owned energy company Energiewerke Nord GmbH (EWN) in May 2003, the decommissioning strategy was modified with the aim of completely dismantling the facility in order to use the site for other purposes.

The International Atomic Energy Agency (IAEA) states on the webpage "AVR JUELICH (AVR)" - http://www.iaea.org/PRIS/CountryStatistics/ReactorDetails.aspx?current=114 – that the AVR went into "commercial operation" on May 19, 1969. Thus, the IAEA rightly regards it a commercial, not a research reactor

Likewise, the THTR-300 was also an experimental gas-cooled high-temperature reactor. On the IAEA webpage entitled "THTR-300 (Thorium High-Temperature Reactor)" - http://www.iaea.org/PRIS/CountryStatistics/ReactorDetails.aspx?current=92 - the IAEA states that reactor went into "commercial" operation on June 1, 1987 and was owned by the private company Hochtemperatur-Kernkraftwerk Gmbh.

To further affirm that the International Atomic Energy Agency has regarded the AVR and THTR-300 as electricity producing power reactors, in the 2103 edition of the IAEA's "*Nuclear Power Reactors in the World*," in "TABLE 16. REACTORS PERMANENTLY SHUT DOWN, 31 DEC. 2012," both power reactors are listed as "high-temperature gas-cooled reactors." (pages 47- 48 at http://www-pub.iaea.org/MTCD/Publications/PDF/rds2-33_web.pdf)

TABLE 16. REACTORS PERMANENTLY SHUT DOWN, 31 DEC. 2012

Country	Reactor		Type	Capacity (MW)			Operator	NSSS supplier	Construction start	Grid connection	Commercial operation	Shut down
	Code	Name		Thermal	Gross	Net						
GERMANY	DE -4	AVR JUELICH (AVR)	HTGR	46	15	13	AVR	BBK	1961-8	1967-12	1969-5	1988-12
	DE -12	BIBLIS-A (KWB A)	PWR	3517	1225	1167	RWE	KWU	1970-1	1974-8	1975-2	2011-8

Country	Reactor		Type	Capacity (MW)			Operator	NSSS supplier	Construction start	Grid connection	Commercial operation	Shut down
	Code	Name		Thermal	Gross	Net						
GERMANY	DE -18	BIBLIS-B (KWB B)	PWR	3733	1300	1240	RWE	KWU	1972-2	1976-4	1977-1	2011-8
	DE -13	BRUNSBUETTEL (KKB)	BWR	2292	806	771	KKB	KWU	1970-4	1976-7	1977-2	2011-8
	DE -502	GREIFSWALD-1 (KGR 1)	PWR	1375	440	408	EWN	AtEE	1970-3	1973-12	1974-7	1990-2
	DE -503	GREIFSWALD-2 (KGR 2)	PWR	1375	440	408	EWN	AtEE	1970-3	1974-12	1975-4	1990-2
	DE -504	GREIFSWALD-3 (KGR 3)	PWR	1375	440	408	EWN	AtEE	1972-4	1977-10	1978-5	1990-2
	DE -505	GREIFSWALD-4 (KGR 4)	PWR	1375	440	408	EWN	AtEE	1972-4	1979-9	1979-11	1990-7
	DE -506	GREIFSWALD-5 (KGR 5)	PWR	1375	440	408	EWN	AtEE	1976-12	1989-4	1989-11	1989-11
	DE -3	GUNDREMMINGEN-A (KRB A)	BWR	801	250	237	KGB	AEG,GE	1962-12	1966-12	1967-4	1977-1
	DE -7	HDR GROSSWELZHEIM	BWR	100	27	25	HDR	AEG,KWU	1965-1	1969-10	1970-8	1971-4
	DE -16	ISAR-1 (KKI 1)	BWR	2575	912	878	E.ON	KWU	1972-5	1977-12	1979-3	2011-8
	DE -8	KNK II	FBR	58	21	17	KBG	IA	1974-9	1978-4	1979-3	1991-8
	DE -20	KRUEMMEL (KKK)	BWR	3690	1402	1346	KKK	KWU	1974-4	1983-9	1984-3	2011-8
	DE -6	LINGEN (KWL)	BWR	520	268	183	KWL	AEG	1964-10	1968-7	1968-10	1977-1
	DE -22	MUELHEIM-KAERLICH (KMK)	PWR	3760	1302	1219	KGG	BBR	1975-1	1986-3	1987-8	1988-9
	DE -2	MZFR	PHWR	200	57	52	KBG	SIEMENS	1961-12	1966-3	1966-12	1984-5
	DE -15	NECKARWESTHEIM-1 (GKN 1)	PWR	2497	840	785	EnKK	KWU	1972-2	1976-6	1976-12	2011-8
	DE -11	NIEDERAICHBACH (KKN)	HWGCR	321	106	100	KKN	SIEM,KWU	1966-6	1973-1	1973-1	1974-7
	DE -5	OBRIGHEIM (KWO)	PWR	1050	357	340	EnBW	SIEM,KWU	1965-3	1968-10	1969-3	2005-5
	DE -14	PHILIPPSBURG-1 (KKP 1)	BWR	2575	926	890	EnKK	KWU	1970-10	1979-5	1980-3	2011-8
	DE -501	RHEINSBERG (KKR)	PWR	265	70	62	EWN	AtEE	1960-1	1966-5	1966-10	1990-6
	DE -10	STADE (KKS)	PWR	1900	672	640	E.ON	KWU	1967-12	1972-1	1972-5	2003-11
	DE -19	THTR-300	HTGR	760	308	296	HKG	HRB	1971-5	1985-11	1987-6	1988-9
	DE -17	UNTERWESER (KKU)	PWR	3900	1410	1345	E.ON	KWU	1972-7	1978-9	1979-9	2011-8
	DE -1	VAK KAHL	BWR	60	16	15	VAK	GE,AEG	1958-7	1961-6	1962-2	1985-11
	DE -9	WUERGASSEN (KWW)	BWR	1912	670	640	PE	AEG,KWU	1968-1	1971-12	1975-11	1994-8

As additional proof that the reactors were not research reactors, the IAEA's Research Reactor Database (RRDB) – http://nucleus.iaea.org/RRDB/RR/ReactorSearch.aspx?rf=1- does not list the AVR or THTR-300 as research reactors.

In the 2009 IAEA document "*Status and Trends of Nuclear Technologies Report of the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)" (*IAEA-TECDOC-1622), the IAEA affirms that the AVR and THTR-300 were power reactors:

2.4. Development of high temperature gas cooled reactors

First, a short history of the development of the high temperature gas cooled reactor will be presented and then, some ongoing national development programmes will be laid out.

2.4.1. Short history of high temperature gas cooled reactor development

The development of high temperature gas cooled reactor (HTGR) designs began in the 1950s shortly after the start up of WCR. An important role in the development of HTGR was played by the 20 MW(th) Dragon research reactor in the UK. It operated from 1964 through to 1977 within a framework of the OECD/NEA international collaboration as a productive research tool for the development of HTGRs.

Following the Dragon reactor, in the 1960s the demonstration reactors AVR (15 MW(e)) and the Peach Bottom HTGR (40 MW(e)) were constructed and successfully operated in Germany and USA, respectively. Both reactors used graphite as a moderator and helium as coolant in the core.

Commercialization was approached via the FSV-HTGR (330 MW(e)) that operated in the USA from 1976 to 1989 and by the THTR-300 (300 MW(e)) in Germany that operated from 1971 to 1989. In both reactors thorium was used as a fertile material in their core design. Especially in Germany this type of reactor was intended to be used for cogeneration, i.e. producing process heat for hydrogen production or other industrial applications such as fossil fuel upgrading.

> No new power reactors of the type HTGR were build after 1976, but a lot of concepts were developed in Europe and the USA till the end of the 1980s. Concepts include the German HTR-500, the Russian VG-400 and the US HTGR-SC. The modular concept was followed by direct cycle gas turbine modular design which could reach thermal efficiencies as high as 48%.

The US provided fuel not only to research reactors but also to Germany's experimental gas-cooled reactor program. The draft EA must demonstrate how much of the uranium fuel actually came from the US. It has been communicated from Germany that initial fuel was from the US and then a reduced amount was provided by the US. A 1965 Memorandum of Understanding (attached) between Germany and the US (Atomic Energy Commission) on the supply of some initial "fuel balls" implies that non-US uranium may have been involved in the fuel program, including as part of testing fuel performance:

> AVR-BBK agree to operate the AVR reactor with such fuel balls for a period of time commensurate with their useful life. At the discretion of AVR-BBK, other fuel balls may be inserted and tested in the AVR reactor during the period of its operation with the fuel balls procured in the U.S. provided that such fuel balls would be of the same general specifications as the fuel balls procured in the U.S. in particular with regard to fission product release. It is understood that AVR-BBK also will give consideration to inserting in the AVR reactor, at the request of the USAEC under terms to be agreed, other test elements that may be developed by the USAEC.

So, has DOE established that all of the fuel being considered to be brought to SRS is of US origin? If not, what is the justification for importing non-US-origin material? Will any non-US origin portion remain in Germany or be returned to Germany after any processing? If not, why not?

While the reactors were not research reactors, the effort to redefine them has been pursued in order to export the daunting waste problem posed by the irradiated graphite fuel. The German government has evidently prepared a confidential document exploring the issue of whether or not the AVR and THTR-300 were research reactors but this has not yet been provided to the public. That document was likely prepared very recently, as after-the-fact analysis of the reactors' operation to make a case that they were somehow research reactors. Rumors are that this document gives a legal basis for rebranding the reactors but whether or not it is accurate is another matter. Any legal document prepared by Germany or DOE which attempts to *post facto* redefine the purpose and use of the reactors much be produced for the record of the draft EA.

In sum, it is important to recognize that the reactors were not research reactors and export of spent nuclear fuel under German law is not legal. A disingenuous renaming of the reactors to be other than what they were may well be a deception carried out to try and enable spent fuel dumping by Germany. It is yet to be seen if this trick will work as hoped.

Illegal to Export Spent Fuel from Germany for Reprocessing

While the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, signed by both the US and Germany, allows export of spent fuel to a reprocessing plant, Germany has chosen to ban the export of spent fuel for reprocessing and disposal.

In "Questions and Comments in 2012 on the National Report posed to Germany" on the *Joint Convention Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* -

http://www.bmub.bund.de/fileadmin/bmu-import/files/pdfs/allgemein/application/pdf/ueberpruefungskonferenz_4_faq_en_bf.pdf - Germany clearly established that export of commercial spent fuel for reprocessing is now officially illegal and that spent fuel transports in Germany are of concern and "public opinion of the German society is not in favour of such transports":

> With the simultaneous ban of any delivery of spent fuel to the reprocessing plants abroad from July 2005 onwards the intermediate storage of spent fuel is the only step in practice in Germany today. (page 6)
>
> The amendment of the German Atomic Energy Act from 2002 states that the delivery of spent fuel to reprocessing facilities is banned from mid of the year 2005. The reason behind this regulation was that one of the products of reprocessing, the plutonium, must be used as mixed oxide fuel during the lifetime of the Nuclear Power Plants. In connection with the decision to phase out the use of nuclear power in the same amendment of the Atomic Energy Act it led to a balance between the production of plutonium and its consumption as nuclear fuel. (p. 39)
>
> In its 2001 amendment the German Atomic Act banned the reprocessing of spent fuel from 1 July 2005. Due to the ban and the fact that the number of transports of nuclear waste should be minimized, the nuclear power plant operators as waste producers have been obliged to store the spent nuclear fuel in interim storage facilities on the premises of their plants. Generally, the radioactive waste in these interim storages is stored dry in dual-purpose casks which are constructed for transport and storage. These casks are designed for extensive mechanical and thermal loads and fulfill the stringent requirements for accident-proof Type B(U) package design approval pursuant to the IAEA Safety Requirements TS-R-1 "Regulations for the Safe Transport of Radioactive Material". We also recognize the excellent safety records of radioactive material transports in Europe, however, the public opinion of the German society is not in favour of such transports. (p. 46)

Thus, the German nuclear waste management law is clear: export of commercial power reactor fuel for reprocessing and disposal is now illegal. Trying to make the case that the reactors have evolved into research reactors 25 years after their closure will be a substantial challenge for the EA.

Best Management Practice: Disposal in Germany

Directive 2011/70/EURATOM established a European Community standard for management of spent fuel and radioactive waste. The European Nuclear Supplies group document entitled "Spent fuel and radioactive waste directive" (http://www.ensreg.eu/nuclear-safety-regulation/eu-instruments/Spent-fuel-and-radioactive-waste-directive) makes it clear that "Member States are obliged to establish and implement national programmes for management of spent fuel and/or radioactive waste from generation to disposal. "

> The Directive aims at ensuring a high level of safety, avoiding undue burdens on future generations and enhancing transparency. It supplements the basic standards referred to in the Euratom Treaty as regards the safety of spent fuel and radioactive waste without prejudice to the Basic Safety Standards Directive.

> This Directive reaffirms the ultimate responsibility of Member States for management of the spent fuel and radioactive waste generated in them, including to establish and maintain national policies and frameworks, and to assure the needed resources and transparency. Prime responsibility of the licence holder for the safety of spent fuel and radioactive waste management under the supervision of its national competent regulatory authority is also reaffirmed. Strong provisions are foreseen for assuring safety of spent fuel and radioactive waste management. The role of the national regulatory authorities is reinforces and their independence strengthened.
>
> Each Member State remains free to define its nuclear fuel cycle policy. The spent fuel can be regarded either as a valuable resource that may be reprocessed or as radioactive waste that is destined for direct disposal. Whatever option is chosen, the disposal of high level waste, separated at reprocessing, or of spent fuel regarded as waste should be considered. The storage of radioactive waste, including long-term storage, is an interim solution, but not an alternative to disposal. To this end, Member States are obliged to establish and implement national programmes for management of spent fuel and/or radioactive waste from generation to disposal. Member States are obliged to notify to the Commission their national programmes by August 2015 and any subsequent significant changes.

According to the EU directive and German law from 2013 - *Endlagersuchgesetz* (Nuclear Waste Repository Site Selection Act) - Germany will not make agreements with other countries that would enable the export of radioactive waste, including spend fuel, for the purpose of permanent disposal outside of Germany. Germany responsibly affirmed that it would deal with its own high-level waste but with the business proposal to dump the AVR and THTR-300 spent fuel on SRS that commitment is shown to be suspect.

Germany has not instituted a viable effort to deal with the hard-to-manage AVR and THTR spent fuel under competent regulatory authorities. By planning to export commercial spent fuel, Germany is on the verge of violating the pertinent EU directive and its own law concerning nuclear waste management. It thus appears that Germany saw a "solution" to its graphite fuel predicament by simply dumping the waste problem outside its boundaries.

Likewise, Germany is not being mindful of the long-term storage or disposal of the spent fuel in the event it were shipped to the US. Germany may now be choosing to ignore that no disposition of the spent fuel exists at SRS or anywhere in the US, but the continued refusal to recognize this will not alleviate Germany of its nuclear waste management commitments.

It is worth pointing out that the SRS Citizens Advisory Board (SRS CAB), a duly established federal advisory panel on SRS clean up, went on record in July 2013 against bringing commercial spent fuel to the site. The position statement concludes: "The Savannah River Site Citizens Advisory Board wants the Department of Energy to know that it is opposed the use of SRS as a site for interim storage of spent nuclear fuel from commercial nuclear reactors." (http://www.srs.gov/general/outreach/srs-cab/library/positions/interimstorage.pdf) Though this was primarily addressing spent fuel from US reactors there has been concern expressed by CAB members about bringing foreign nuclear waste into SRS.

Non-Proliferation Concern: H-Canyon at SRS not Licensed by NRC, not Safeguarded by the IAEA; Former Nuclear Weapons Facility and being Kept on Stand-by for Under Defense Legislation

The H-Canyon reprocessing plant, the only operable reprocessing plant in the US, has been a key facility in the US nuclear weapons program. The H-Canyon primarily separated highly enriched uranium and has been slated to process surplus weapon-grade plutonium into plutonium oxide (for possible disposition). Though its weapons mission has been halted for now, the aging H-Canyon remains operable in part due to a requirement in military spending legislation, which directed that the facility "maintain a high state readiness" in the case of unspecified need.

A Government Accountability Office (GAO) report from 2008, entitled *DOE Needs to Take Action to Reduce Risks Before Processing Additional Nuclear Material at the Savannah River Site's H-Canyon* (http://www.gao.gov/assets/280/278577.pdf) underscores that DOE has been directed in defense legislation passed by the Congress to keep the facility operable:

> Under section 3137 of the Floyd D. Spence National Defense Authorization Act for Fiscal Year 2001 (Pub. L. No. 106-398) and section 3115 of the National Defense Authorization Act for Fiscal Year 2004 (Pub. L. No. 108-136), DOE must continue operations and maintain a high state of readiness at H-Canyon as well as provide necessary technical staff to operate the facility. (page 2)

According to a 2012 Savannah River Nuclear Solutions document entitled *H CANYON PROCESSING IN CORRELATION WITH F/HANALYTICAL LABS* (SRNS-L4600-2012-00142) H-Canyon had a key role in the US nuclear weapons complex at the Savannah River Site:

> Construction of the site and particularly H Canyon first began in the 1950s as the US government turned its attention to the cold war. The massive concrete building, resembling a canyon, started operations in 1955. The main ability of H Canyon is to recover uranium, plutonium and neptunium from enriched uranium fuel rods encased in aluminum. Throughout the cold war, H Canyon operated recovering materials from used nuclear fuel (UNF) for reuse. However, at the end of the war in 1992, H Canyon changed their mission to stabilizing remaining highly enriched uranium (HEU) materials present at SRS. One of H Canyon's most well-known accomplishments of that time is the purification of plutonium 238 for use in 30 of the National Aeronautics and Space Administration (NASA) missions, including the ongoing Cassini mission.

The Federal Register notice of June 4 mentions the role of the H-Canyon reprocessing plant at SRS in handling the graphite spent fuel:

> DOE would install a capability in H-Canyon at SRS to chemically remove the graphite from the fuel kernels via a molten salt technique (''chemical digestion'') being developed by the Savannah River National Laboratory. DOE currently estimates that it would take approximately 3 years to complete removal of the graphite from all the used fuel. The fuel kernels would be stored in H-Canyon. After all the fuel kernels have been extracted, they would be processed through the H-Canyon. This would separate the uranium from thorium and fission products.

It is of concern that the aging H-Canyon reprocessing plant, which uses a modified PUREX separation process, is neither regulated by the US Nuclear Regulatory Commission (NRC) nor safeguarded by the International Atomic Energy Agency (IAEA). The H-Canyon was constructed and operated as part of the

US nuclear weapons program, to provide special nuclear material for weapons ,and always been operated by DOE under a self-regulating approach and the IAEA has been excluded from the facility.

That German commercial spent fuel would be reprocessed, including processing by what is described as a "molten salt technique," to remove highly enriched uranium (HEU) is of concern. Legality of export of German spent fuel to a reprocessing plant aside, Germany would have no assurance from either the NRC or the IAEA about the status of any separated bomb-grade uranium. It appears that Germany would have to take the word of DOE about the fate of the separated HEU and could not rely on an independent authority such as the IAEA to verify processing of its spent fuel.

In a July 2014 paper by the NRC's David Hanks entitled *Impact of Selection of a Nuclear Facility in the United States of America for Implementation of International Atomic Energy Agency Safeguard,* to be presented at the Institute of Nuclear Materials Management 55th Annual Meeting in Atlanta, Georgia, he outlines how NRC-regulated facilities are safeguarded by the IAEA:

> Authority to issue regulations implementing the Agreement between the United States of America (U.S.) and the International Atomic Energy Agency (IAEA) for the Application of Safeguards in the U.S. (and Initial Protocol thereto) (INFCIRC/288) at licensed facilities was assigned to the US Nuclear Regulatory Commission (NRC)[i] pursuant to the Energy Reorganization Act of 1974. The NRC provides direct support of U.S. efforts to meet its nuclear non-proliferation obligations under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Acting as the U.S. National Regulatory Authority (NRA) for its commercial nuclear industry, the NRC is charged with providing oversight for implementation of procedures and practices necessary to facilitate information gathering, timely reporting, and in-field verification. The US-IAEA Safeguards Agreement, also known as the "Voluntary Offer Agreement," stems from discussions held between Nuclear Weapon States (NWS)[1] and major industrial Non-Nuclear Weapon States (NNWS), who were concerned that acceptance of safeguards under the NPT would place them at a commercial and industrial disadvantage in developing nuclear energy for peaceful uses. The US-IAEA Safeguards Agreement provides the IAEA the right, but not obligation, to apply international safeguards on source and special nuclear material (SNM) within the UNITED STATES, excluding facilities associated with activities of direct national security significance. Periodically, the U.S. provides the IAEA with an updated list of facilities eligible for the application of IAEA safeguards; adding or removing facilities from that list as necessary (Art. 2(b)). Revisions to this eligible facilities list (EFL) by the NRC and Department of Energy are submitted for a 60-day Congressional review before they are submitted to the IAEA.

With no NRC role for "support of U.S. efforts to meet its nuclear non-proliferation obligations under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)" as they apply to handling of SNM at an unsafeguarded facility raises troubling questions about the proposed German export. The paper notes that the IAEA would not apply safeguards to US nuclear facilities "associated with activities of direct national security significance," thus making the case as to how difficult it will be for the German government and public to know any details about the status of materials both during processing and in storage and disposal given the defense role of the H-Canyon.

As the deal between Germany and the SRNL, DOE and SRS is a commercial deal that could be worth hundreds of millions, safeguards should be applied at the H-Canyon if the deal goes through.

Of further concern is that Germany is paying SRNL for a new processing technique to remove HEU from graphite material. Under the agreement with SRNL, who owns the rights to the technique paid for by Germany? Where is documentation about who owns the intellectual rights to the process that is developed? How much has been paid to SRNL, SRS and DOE so far and how much will Germany pay for an overall deal? How will that money be spent? How much of it will go to pensions, profits, operation and waste management? How long will Germany pay for waste management? Will Germany be responsible for clean up and repair costs in case of accident?

From a nuclear non-proliferation perspective it is of great concern that Germany is flirting with violating its own norms concerning foreign reprocessing. The proliferation concerns are exacerbated by the fact that the H-Canyon and all other facilities at SRS that might handle the separated HEU are both unregulated by the NRC and unsafeguarded by the IAEA.

Of additional speculative concern is that there could possibly be a plan to process the US gas-cooled reactor spent fuel at the closed Fort St. Vrain and Peach Bottom reactors. If this is being considered, the EA may not be adequate as not including any processing of additional gas-cooled graphite spent fuel might constitute segmentation under NEPA. Thus, a full EIS on the processing of graphite spent fuel may be called for.

If direct disposal of the Fort St. Vrain spent fuel, stored at the reactor site in Colorado, and the Peach Bottom spent fuel, stored at the Idaho National Lab, is being considered, then this may be instructive for Germany as to how to manage the AVR and THTR spent fuel within its own territory. Ft. St Vrain, which had similarities with the THTR reactor, stores HEU fuel containing about 167 kg of enriched uranium that is about 54% enriched, Peach Bottom fuel at INL contains 224 kg of uranium enriched to 67%. (*U.S. HEU SPENT NUCLEAR FUEL INVENTORY* - http://fas.org/sgp/othergov/doe/heu/appc.pdf)

The draft EA must discuss disposal of the US HEU fuels from Ft. St. Vrain and Peach Bottom as it will be instructive for the "no action" alternative (of leaving the spent fuel in Germany for domestic disposal).

The draft EA must also discuss the differences between storage in Germany and at Ft. St. Vrain and INL and what the differences are in the storage techniques. It is certainly not clear if the US has any better methods at its disposal than Germany. Particularly if Germany builds new storage facilities the storage conditions may be better there. Additionally, in the event that any planned processing of the German spent fuel is aborted then storage at SRS must be discussed in the draft EA.

Violation of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT)?

The commercial deal to ship the spent fuel to SRS poses a dilemma for both the US and Germany as far as Treaty on the Non-Proliferation of Nuclear Weapons (NPT) goes. A violation of the NPT, designed to prevent the proliferation of nuclear weapons and nuclear weapons materials, is brewing if any shipment of the spent fuel takes place or if a new reprocessing technique is developed as a result of the proposal.

The requirements of Article III of the NPT are of particular importance:

> 1. Each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the International Atomic Energy Agency in accordance with the Statute of the International Atomic Energy Agency and the

> Agencys safeguards system, for the exclusive purpose of verification of the fulfillment of its obligations assumed under this Treaty with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. Procedures for the safeguards required by this article shall be followed with respect to source or special fissionable material whether it is being produced, processed or used in any principal nuclear facility or is outside any such facility. The safeguards required by this article shall be applied to all source or special fissionable material in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere.

As Germany is consciously making a decision to export commercial spent fuel "under its control" to an unsafeguarded reprocessing plant that has been used for nuclear weapons production is of grave concern. Though any deal to ship the spent fuel may likely include a clause about transfer of ownership, the fact will remain that it is German commercial spent fuel. Germany will not have information from either its competent regulatory authority, the NRC or the IAEA that any separated uranium does not go into a US program related to nuclear weapons or to power military submarines.

For its part, the US is protecting the H-Canyon from any application of IAEA safeguards and will this obscure what would happen with any separated uranium. Though the US has claimed that possession by the US of the German spent fuel is being done in the name of nuclear non-proliferation, ignoring of the application of legal requirements of the NPT, signed by both the US and Germany, erodes the treaty and will possibly result in separation of HEU not covered by the IAEA safeguards regime.

Violation of the legal requirements is of paramount concern and the proposed deal must not be used as the vehicle for the US and Germany to thumb their noses at the treaty that is a cornerstone of international nuclear non-proliferation efforts.

SRNL Techniques to Remove HEU May Pose a Proliferation Risk, in H-Canyon and Beyond

While many more details are needed about the process, DOE stated in the Federal Register that "DOE would install a capability in H-Canyon at SRS to chemically remove the graphite from the fuel kernels via a molten salt technique (''chemical digestion'') being developed by the Savannah River National Laboratory."

This new technique, which neither the Germans nor anyone else has apparently not been able to develop, may well pose a proliferation risk in its own right. The new technique, developed with $10 million (so far) in funding from Germany, could possibly open the door to reprocessing of graphite and other fuels to remove SNM, which could be seen as a backward nonproliferation step.

The draft EA must discuss any R&D that has taken place at SRNL, including what has happened with any samples of the graphite waste imported for testing purposes from Germany. What experiments were done on these samples and how is the waste being managed?

The draft EA must discuss in detail the process being developed to remove uranium and/or EU from the spent fuel and what degree of a proliferation risk it poses. For one thing, it is unknown if research details are being shared with Germany or any other country and if the new technique would be of interest to other countries now developing gas-cooled reactors, such as China or Russia. Could the separation technique be applied to fuel from other pebble bed reactors (PBR) and prismatic block reactors (PMR)?

The isotopic concentration of any uranium that would be separated must be discussed. While it has been stated that the fresh fuel contained 900 kg of US-origin HEU, it is not known how much HEU currently remains in the AVR or THTR spent fuel. A case has been made by Dr. Rainer Moorman – see attached – that the AVR fuel is now low-enriched uranium, due to irradiation during reactor operation and radioactive decay. The draft EA must present an analysis of the uranium content of the AVR and THTR spent fuel. If any of it no longer contains HEU, then any non-proliferation justification for its export has evaporated.

The draft EA must discuss why any processing to remove uranium, a technically complicated process that Germany has not developed, is superior to geologic disposal (where processing options are virtually eliminated and the fuel isolated from retrieval).

And, if a processing/reprocessing technique will be applied, why has it not been considered to be done in European nuclear weapons state that possess reprocessing plants – France and the United Kingdom? Under this option, by-product waste could much more easily be returned to Germany. (In any event it would be illegal under German law to export the spent fuel to either France or the UK.)

The Federal Register notice does not mention separation of any plutonium in the spent fuel but the draft EA must discuss this if it is being considered. If any plutonium were separated, what would happen to it (given that it would not be part of the program of disposition for surplus weapons plutonium)? Foreign civil plutonium secretly being brought in to SRS by the Global Threat Reduction Initiative is of growing concern, especially as that material is being orphaned with no disposition plans.

In sum, it is of concern that the proposed import of commercial graphite spent fuel may actually be stimulating new methods to remove uranium or HEU. A better approach from a nuclear non-proliferation perspective would be to focus on techniques for direct disposal of such spent fuel without removing any possible nuclear weapons material that it might contain.

H-Canyon Operational Problems

Due to problem at the aging H-Canyon processing plant, the facility remains shut down as of June 23, 2011, according to communication from SRS:

> H-Canyon continues to be in a warm standby condition. The facility was placed in this condition to make repairs on various portions of the ventilation system to ensure the system survives a potential earthquake. The ventilation system modifications and testing are expected to be completed in late July, at which time H-Canyon will return to "Operations Mode".

The H-Canyon, constructed in the early 1950s as part of the US nuclear weapons program, is about 60 years old. Technical and design problems, some due to aging, must be reviewed in the daft EA. Likewise, problems arising from what may well be a breakdown in safety culture must be reviewed. This thorough review of the status of H-Canyon and operation procedures must be presented in the draft EA and that it is capable of taking on a new mission (handling the German spent graphite commercial fuel).

In 2014 alone, numerous problems with the facility have been identified by the Defense Nuclear Facilities Safety Board (DNFSB), an independent federal agency overseeing the safety of DOE operations, as well as by SRS itself. From problems with the exhaust tunnel ventilation system to delamination of

concrete from facility walls to unanticipated generation of explosive hydrogen, the DNFSB has pointed out various safety issues this year alone.

A review of weekly DNFSB reports in 2014 alone reveals that unresolved safety questions were found related to H-Canyon operation and that the facility was placed on "warm standby":

DNFSB weekly report of March 21, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140321_116.pdf

H-Canyon: The site rep noted that the draft SRNS Startup Notification Report did not propose a DOE Readiness Assessment(s) for the upcoming head end, first and second cycle solvent recovery, and low enrichment uranium blending operations, none of which have operated with nuclear material in the last 12 months. DOE later stated that they will be conducting RAs for these.

DNFSB weekly report of April 4, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140404_116_0.pdf

H-Canyon continue to repair air handling unit and fire protection systems damaged by the loss of steam in early January.

SRNS stopped dissolver operations at H-Canyon last week when SRNL identified that measured hydrogen gas generation rates may be greater than the calculated hydrogen gas generation volume percent. As a result, SRNS declared a positive Unreviewed Safety Question this week. H-Canyon also went into warm standby mode this week and will remain in standby for approximately eight weeks.
Much of this time will be spent making modifications to the ventilation system to address the ground level release PISA. { Potential Inadequacies in the Safety Analysis (PISA) in}

DNFSB weekly report April 11, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140411_116.pdf

H-Canyon remains in Warm Standby while performing work to support the necessary facility modifications to address the positive Unreviewed Safety Question regarding ground level release (See 12/13/13 report.) This week they began the initial work to seal the recycle vessel ventilation (RVV) tunnel. The work package called for SRNS to remove an access plug to the tunnel to allow construction personnel to construct a concrete form. This form would then allow construction to pour a new concrete plug. SRNS personnel correctly called a timeout when the plug, which was expected to have recessed lifting lugs covered with lead caulking was instead found to have grout encasing the lead. The work package was revised and work was resumed

DNFSB weekly report of April 18, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140418_116.pdf

H-Canyon: Last week SRNS conducted an integrated loss of power test for the 221-H diesel. (See

4/11/14 report.) As planned, SRNS personnel were to open the breaker for the normal power, and the diesel generator was expected to start, the 52B breaker should have then closed and assumed the load on the generator but it did not. Because of this failure, power was lost to the instrument air compressor and pressure dropped below the alarm set point of 57 psig and the safety significant instrument air low pressure alarm was activated. Facility personnel terminated the test and returned to normal power. The facility entered the correct Limiting Conditions for Operation. In addition, a programmable logic controller (PLC) uninterruptable power supply associated with purge air was exhausted during the failed load test and the PLC lost its stored programing. This week a fact-finding meeting related to this incident revealed several conduct of operations lapses that the site intends to pursue for extent of condition.

DNFSB weekly report of May 2, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140502_116.pdf

H-Canyon: SRNS credits the instrument air system with providing air supply to actuate the canyon exhaust fan discharge dampers. Instrument air passes from the compressors through a set of air dryers to allow dry air to be stored in the receivers. Last night the #2 instrument air dryer failed to properly switch drying towers. Because of the failure to properly switch between drying towers, the instrument air header pressure dropped below the 57-psig alarm set point. The facility entered the alarm response procedures, which required that they place a portable compressor online, and isolate the instrument air dryer. This action resulted in the pressure returning to normal (90-psig).

DNFSB weekly report of May 23, 2014
http://www.dnfsb.gov/sites/default/files/Board%20Activities/Reports/Site%20Rep%20Weekly%20Reports/Savannah%20River%20Site/2014/wr_20140523_116.pdf

Work Planning and Control: A staff review of H-Canyon and HB-Line construction services work orders identified several cases where their format did not comply with the SRS Work Planning Guide. For example, hold points and action steps often did not require a printed name, signature and date. Notes and warnings routinely did not use the standard template, included action steps, and/or were split between pages. (Many of these requirements were formalized to address similar site rep observations – see 7/13/07 and 7/20/07 reports). While construction work planners have a desire to highlight hazard controls in their work orders, this needs to be integrated with site procedures to ensure consistency and avoid confusion. Construction services plans to perform an assessment to determine the extent of condition, to define a standard method for integrating hazard controls into work instructions, and reinforce expectations with their work planners. The staff plans to perform a more detailed review of work planning and control in June.

"Occurrence Reports" generated by SRS - linked at http://energy.gov/ehss/policy-guidance-reports/dashboards - also point out various problems with H-Canyon in 2014 alone. These and earlier technical and operational issues that have been identified must be addressed in the daft EA and argumentation must be presented that the aging H-Canyon is safe to operate for a new mission and that staff are capable of safely following applicable procedures and regulations:

Loss of Instrument Air During 221-H Emergency Diesel Loss of Power Test (U)

EM-SR--SRNS-HCAN-2014-0002

31. HQ Summary:

On April 11, 2014, personnel initiated the 221-H emergency diesel loss of power test. The test is designed to take normal site utility power offline and allow the diesel to start and assume the loads on the T2 transformer. Once the test started the breaker for the normal power opened, the diesel generator started, but the breaker did not close to assume the load. As a result of this condition power was lost to the instrument air compressor. The pressure dropped below the alarm set point of 57 pounds per square inch gauge (psig). The H-Canyon Technical Safety Requirements Limiting Condition of Operation 3.1.8 requires the instrument air system low pressure alarm to be operable with a set point of 20 pounds per square inch gauge psig or greater. The test was suspended and normal power was restored to the facility.

Dissolver Hydrogen Generation Rates Exceed Safety Basis Assumptions (U)

EM-SR--SRNS-HCAN-2014-0001

31. HQ Summary:

On March 28, 2014 during development of a flow sheet for new processing in the H-Canyon dissolvers, it was discovered that calculated hydrogen generation rates used in determining Technical Safety Requirements limits (sparge/purge air rates) may be non-conservative. The Savannah River National Laboratory (SRNL) flow sheet recipes were developed using a hydrogen gas generation volume percent calculation. When compared to actual hydrogen gas generation volume percent measured by SRNL, it was discovered that the calculated hydrogen gas generation volume percent used in the originating documents may not be conservative. A Potential Inadequacy in Safety Analysis was initiated and the USQ determination was positive.

Activation of HCAN Instrument Air Low Pressure Alarm (U)

EM-SR--SRNS-HCAN-2014-0003

31. HQ Summary:

On May 1, 2014, the safety significant HCAN Instrument Air Low pressure alarm activated due to a failure of the 2 Instrument Air Dryer to properly switch drying towers during operation. The failure caused the Instrument Air Header pressure to drop below the alarm set point of 57 psig. Limiting Condition of Operation (LCO) 3.1.8 was entered which requires the instrument air system low pressure alarm to be operable with a set point of 20 psig or greater. A portable air compressor was placed on line and the instrument air dryer isolated which restored the Instrument Air Header pressure to normal (~90 psig).

Failure of 6.8 E Temperature Instrumentation (SC)

EM-SR--SRNS-HCAN-2014-0004

31. HQ Summary:

On June 9, 2014, during routine distributed control system console monitoring, it was identified that the safety class 6.8 Evaporator temperature instrumentation loop had degraded and failed. The temperature indication is part of the Safety Class High Pot Temperature/Steam Flow interlock that is required to protect against the consequences of a red oil explosion. Personnel ensured that steam is isolated to 6.8 E and initiated work requests for Maintenance to checkout/repair the 6.8 E temperature loop. There was no impact to personnel or facility safety.

The items above are but a snapshot of issues with the H-Canyon and the draft EA must explore the status of H-Canyon in depth and if there are problems lurking in operation of the facility, including the threat of earthquakes to the integrity of the facility. The lengthy shut down of H-Canyon that is now taking place must likewise be discussed in relation to receipt and processing of the German commercial spent fuel. (SRS confirmed on June 23 that the shutdown of H-Canyon continues.)

There must also be a discussion in the draft document of what happens if H-Canyon is unexpectedly closed for a lengthy period of time or permanently. Likewise, there must be a discussion of what happens if the processing technique developed by SRNL does not work on a large scale. Will the spent fuel be returned to Germany?

Revised SRS High-Level Waste Plans Does Not Consider Processing or Handling of Graphite Waste

In the Federal Register notice, it is stated that "DOE would install a capability in H-Canyon at SRS to chemically remove the graphite from the fuel kernels" and states:

> DOE has identified three alternatives for disposition of the HEU that would be separated from the fuel kernels.
>
> Dissolution, purification, and down blending the HEU to low-enriched uranium (LEU) for reuse as reactor fuel (if the LEU can meet applicable specifications);
>
> Separating the uranium, down blending, and disposing of the uranium in an appropriate radioactive waste disposal facility; and
>
> Disposal of the uranium as waste without down blending via vitrification in the Defense Waste Processing Facility at SRS.

Under US law, waste streams from spent fuel processing are considered high-level waste (HLW) so any by-product waste streams after any removal of uranium would have to be managed as HLW. The Federal Register notice fails to mention this, which must be discussed in the draft EA. Likewise, the Federal Register notice fails to pose the option of return to Germany of any by-product waste and this must be analyzed in the draft EA.

The recently released Revision 19 of the Savannah River Site (SRS) *Liquid Waste System Plan* (posted at http://www.srswatch.org/uploads/2/7/5/8/27584045/r19_liquid_waste_plan_may_2014.pdf) plans for the future of high-level waste management at SRS based on technical challenges, legal requirements and the status of funding. The revised plan states that it "records a planning basis for waste processing in the LW System through the end of the program mission."

In this revised waste management plan, dated May 2014, there is no mention of processing of any graphite fuel in the H-Canyon or vitrification in the Defense Waste Processing Facility (DWPF) nor is there any mention of disposal of by-product HLW. The draft EA must discuss why this is the case.

The Federal Register notice mentions "removal of the graphite from all the used fuel" but fails to say what would happen with it. Likewise, option one – "Dissolution, purification, and down blending the HEU to low-enriched uranium (LEU) for reuse as reactor fuel (if the LEU can meet applicable specifications)" – is lacking as it does not say what would happen with the resultant by-product waste or if any separated uranium would be able to be used as reactor fuel due to possible contaminants in it.

Option 2 – "Separating the uranium, down blending, and disposing of the uranium in an appropriate radioactive waste disposal facility;" – fails to mention what "appropriate radioactive waste disposal facility" is being considered. Possible disposal facilities must be named and legal aspects of German waste disposal if those facilities must be discussed.

Option 3 – "Disposal of the uranium as waste without down blending via vitrification in the Defense Waste Processing Facility at SRS" – also ignores disposal of the graphite waste and does not mention the ability of the SRS waste system to handle such high-level waste. Would final disposal be at SRS?

The presentation of the options is also misleading as there would be no "disposal" of waste streams at SRS, including separated uranium that may be placed into the HLW system. The term "disposal" implies a method of finally getting rid of the waste but, as there is no high-level waste repository, SRS would be but an interim step toward any final disposition no matter how the material is processed.

High-level nuclear waste currently at SRS currently has no disposition path and though liquid HLW is being removed from tanks and vitrified, this material is simply paced in storage as there is no disposal plan for it. Any German waste that goes into the tank system would likewise have no disposition path beyond storage for an indefinite period of time. The draft E must discuss this.

Additionally, what will become of any radioactive gasses contained in the fuel elements during processing? How much is there and how much radiation is in the gas? List all isotopes and amounts. Will such gas be captured? If not, why not? Will captured gas be returned to Germany? If not why not? How much is there and how much radiation is in the gas? How much worker and public radiation exposure will result?

Other questions that must be addressed in the Draft EA

Are requirements for a new storage facility for the AVR spent fuel at Juelich a driver for the move to export the spent fuel? What is the status of licensing for the storage at Juelich?

What is the status of insulating carbon bricks that were inside the AVR reactor?

What were storage and disposal plans in Germany before the US was approached in 2012? Why has the approach to dispose of the spent fuel in Germany changed? Is it simply easier for Germany to dump a perplexing problem of its own creation on SRS? The EA must show that Germany has no ability to manage any spent fuel from any of its power reactors.

What is the radioactive content of the spent fuel? List all isotopes and amounts.

How will the spent fuel casks be transported across Germany?

What is the condition of the fuel and the casks? Will damaged, degraded or wet fuel make it harder to handle and/or process?

Are the CASTOR casks containing the spent fuel licensed by the Nuclear Regulatory Commission for import into the United States?

Are different casks used for the AVR and THTR fuel? If so, what are the differences in shipment, handling, storage and off-loading of the spent fueI the US?

Who would own the used casks and how would they be disposed of? If the goal is to reprocess the spent fuel and manage by-product material, why won't the casks be returned to Germany if the goal of the program is deal with the contents of the cask and not the casks themselves?

What is the situation in the German port of Nordenham or any other European port for handling radioactive casks?

What is the role of Edlow International (http://edlow.com/) in the transport of the spent fuel? Please provide contracts between Edlow and DOE when the draft EA is issued.

What shipping company will be used and what special feature will the ships have to prevent a nuclear accident? Will ships owned by Pacific Nuclear Transport Ltd. (http://www.pntl.co.uk/) be involved?

The draft EA must include any further agreements between DOE and Germany to conduct research on the AVR and THTR-300 spent fuel or to ship it to the US for processing and storage. The draft EA must include a policy document stating that import of spent fuel from German commercial reactors is to be US policy (and demonstrate that such action is acceptable from a proliferation and waste management perspective).

Conclusions

Shipment of power reactor fuel from Germany for reprocessing and disposal is illegal under German law. Germany and the Unites states must honor this export ban.

The AVR and THTR-300 reactors were experimental power reactors and there is no evidence in the record that they were research reactors. SRS has received research reactor spent fuel but receipt of foreign commercial spent fuel from Germany is unprecedented for both SRS and the United States.

SRS has a huge amount of nuclear waste that it is struggling to deal with and it has not been demonstrated that it can deal with a large amount of graphite waste. No additional nuclear waste must come into the site, especially foreign commercial spent fuel. The public does not want SRS to become a national or international nuclear dump and does not want the current high-level waste management plan to be sidetracked by dealing with imported nuclear waste materials.

The "no action alternative" of leaving the spent fuel in Germany for Germany to manage is the best option from an environmental and proliferation perspective. The U.S. should offer to help Germany, if need be and if requested, to deploy storage and disposal methods in Germany.