



Savannah River Site Watch

Auf Wiedersehen to DOE Nuclear Waste Dumping Scheme

U.S. DOE Plans to Export German Spent Nuclear Fuel to the Savannah River Site for Processing & Dumping have been Terminated after 10 Years, Yielding Good Outcome for South Carolina

Unsuccessful Effort to Illegally Export Spent Fuel from Germany to SRS Ends in Environmental Victory, Positive Nuclear Nonproliferation Result - Thanks to Public Engagement

Overview of Failed Attempt to Import Highly Radioactive German Nuclear Waste to SRS prepared by Tom Clements, Director, Savannah River Site Watch, Columbia, SC, <https://srswatch.org/>, January 2023, Comments welcome: srswatch@gmail.com

A decade-long effort to export highly radioactive graphite spent fuel from an experimental reactor in Germany to the U.S. Department of Energy's Savannah River Site (SRS) in South Carolina has formally ended. Thus, the dumping at SRS of a large volume of high-level radioactive waste will be avoided, resulting in a significant environmental victory.



Main entrance at Forschungszentrum Jülich (FZJ), where AVR spent fuel is stored and managed by the Jülicher Entsorgungsgesellschaft für Nuklearanlagen (JEN); some had hoped to dump the waste at SRS

The important decision to halt the export scheme was definitely stated in an email message from the German institution that manages the spent fuel in question, the Jülicher Entsorgungsgesellschaft für Nuklearanlagen mbH (JEN),¹ to Savannah River Site Watch in an October 19, 2022 email: **“The option to ship the aforementioned spent fuel has indeed been terminated...”** This decision and associated actions by other German entities thus ends a

¹ Jülicher Entsorgungsgesellschaft für Nuklearanlagen mbH (JEN), Jülich Nuclear Waste Storage Company <https://www.jen-juelich.de>

decade-long effort to import, process and dump the spent fuel at SRS. As DOE itself has failed to act to terminate the project, the decisions from Germany, which has been paying for development of the export and processing plans, will dictate the end of participation in the import scheme by SRS.

Some of the graphite spent fuel, used in a long-closed graphite electricity production reactor, contains U.S.-origin highly enriched uranium (bomb-grade uranium, or HEU) that must be kept out of the hands of those with nefarious intentions. But DOE itself has determined that there is no proliferation risk if the material remains in Germany. Termination of the plan to export the highly radioactive material to SRS could well mean that pursuit of development of a new reprocessing technique by Savannah River National Laboratory to remove the uranium - a technology which DOE has inexplicably failed to assess from a nuclear non-proliferation perspective - has stumbled and will no longer be pursued with German funding. That result constitutes a significant nuclear nonproliferation victory that can be recognized by those seeking to limit technologies that could be used to separate weapon-usable materials such as plutonium and HEU.

The credit for this success goes to German public-interest organizations such as STOP Westcastor,² the anti-nuclear group .ausgestrahlt³ and German politicians and their staff affiliated with the Green Party⁴ and Die Linke.⁵ It must be mentioned that the leading members in the Bundestag, all now retired, who were against the transport from the start include Sylvia Kotting-Uhl, Hubertus Zdebel and Oliver Krischer, who is now the Minister for the Environment, Nature Protection and Transport in the state of North Rhine-Westfalia,⁶ where the material in question is stored. It is clear that the victory is due to citizen engagement in Germany and the U.S. in the face of government intransigence, especially by the U.S. Department of Energy, which worked against the public interest in this matter.

² Herzog magazine, article *10 Jahre „Stop Westcastor“*, January 15, 2021, <https://www.herzog-magazin.de/nachrichten/10-jahre-stop-westcastor/>

³ .ausgestrahlt, “gemeinsam gegen atomenergie,” <https://www.ausgestrahlt.de/>

⁴ “Alliance 90/The Greens parliamentary group,” <https://www.bundestag.de/en/parliament/groups/greens-group-245716>

⁵ Die Linke, <https://www.bundestag.de/parlament/fraktionen/linke>

⁶ “Oliver Krischer übernimmt Amtsgeschäfte als Minister für Umwelt, Naturschutz und Verkehr,” <https://www.land.nrw/pressemittteilung/oliver-krischer-uebernimmt-amtsgeschaefte-als-minister-fuer-umwelt-naturschutz-und-> member Bundestag from 2009-2022. Herr Krischer has met with the SRS Watch director and enabled a visit to the FZJ site in 2014 to see the AVR reactor dismantlement, AVR reactor storage building and to receive a tour of the AVR spent fuel storage facility, where the Castor cask storage was viewed.



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

Mock-up of uranium-impregnated graphite ball, or pebble, used as fuel in the helium-cooled high-temperature AVR reactor at the Jülich Research Center

Efforts to Dump German High-Level Nuclear Waste at SRS began in Earnest in 2012

In 2012, under the DOE-Germany research agreement of 1998,⁷ discussions began in secret between DOE and German entities to import irradiated graphite spent fuel that had been used in the Arbeitsgemeinschaft Versuchsreaktor (AVR) and Thorium-Hoch-Temperatur-Reaktor (THTR-300), electricity generating grid-connected gas-cooled experimental “pebble bed” reactors; neither was a research reactor. The AVR operated from 1966-1988. The THTR, which operated from 1983-1989, had numerous accidents.

The total number of graphite balls, or pebbles, each approximately 6 centimeters in diameter, totals almost one million. The vast majority of the fuel balls were fabricated in Germany. The number of tiny uranium kernels embedded in each graphite ball is many thousand. About 290,000 balls from the AVR stored in 152 castor casks at the Forschungszentrum Jülich (Jülich Research Center, or FZJ)⁸ located just outside the city of Jülich, near the Dutch border in western Germany. The other “pebbles” are stored in 305 casks at the Ahaus⁹ interim spent fuel storage facility, also located in the state of North Rhine-Westfalia. Due to reactor accidents, many of those balls may be damaged. Most of the radioactive balls contain US-supplied highly enriched uranium (HEU), but about 20% of the balls contain low-enriched uranium (LEU).

The AVR spent fuel balls are stored on-site at the FZJ in robust Castor casks. Due to inadequacies in the storage facility, the license for the facility, issued by Federal Office for Radiation Protection, expired in 2013 and the supervisory authority, the Ministry of Economics

⁷ Agreement between the Department of Energy of the United States of America and the Federal Ministry of Education, Science, Research and Technology of the Federal Republic of Germany on Cooperation in Energy Research, Science and Technology, and Development, 20th February 1998, <https://srswatch.org/wp-content/uploads/2022/11/Agreement-between-US-and-Germany-1998-doc-2.pdf>

⁸ Forschungszentrum Jülich (Jülich Research Center, or FZJ), <https://www.fz-juelich.de/en>

⁹ Federal Office for the Safety of Nuclear Waste Management, “Central Interim Storage Facility Ahaus,” https://www.base.bund.de/EN/nwm/interim-storage/central/ahaus/ahaus_node.html

of the State of North Rhine-Westphalia, ordered the spent fuel to be removed.¹⁰ In 2016, the Federal Office for the Safety of Nuclear Waste Management (BfE) became the licensing authority for interim storage of the spent fuel. Authorities have been dragging their feet in building a new facility at FZJ that meets seismic standards and the current facility remains with an expired license but a new license could be issued by the entity now managing the spent fuel.



View of the 152 Castor casks containing approximately 290,000 irradiated graphite fuel balls at the Jülich Research Center. The license for the facility expired in 2013 and the casks were ordered removed, which has not happened. As of November 2022, it appears the facility could either be modified and relicensed or a new seismically qualified building could be constructed (the preferred option)

The graphite balls, on average about 1900 per castor cask, contain a significant amount of radioactive material, including a “releasable source term” consisting of Tritium, Kr-85, and C-14.¹¹ All of these isotopes, plus others, would either have been released into the environment in South Carolina or “contained and disposed of” - “disposed of” could simply mean dumped and eventually released into the U.S. environment - at SRS or elsewhere. DOE has indicated that each castor cask contains about 4,500 curies of radionuclides.

Agreements between Germany and the U.S. to Explore Disposition in the U.S.

Discussions between DOE and German entities culminated in a U.S. Department of Energy letter of March 5, 2012¹² to the Germany Ministry of Education and Research, stating that DOE’s Office of Environmental Management would conduct a “feasibility study regarding the acceptance and disposition¹³ of this spent fuel at the Savannah River Site.”

¹⁰ Federal Office for the Safety of Nuclear Waste Management, “AVR cask storage facility near Jülich, “ <https://www.base.bund.de/EN/nwm/interim-storage/decentralised/licence/kkj-en.html>

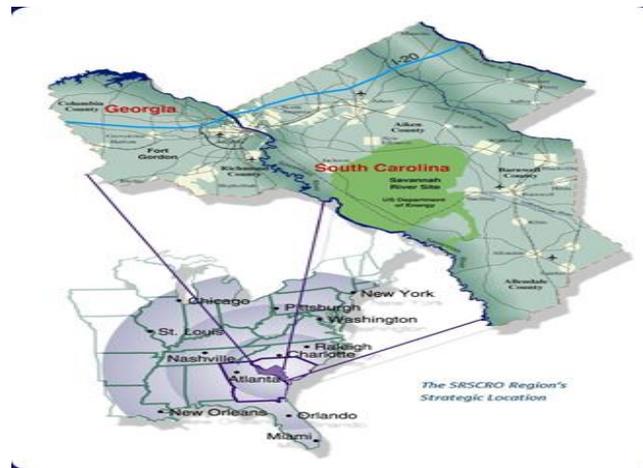
¹¹ Lawrence Livermore National Lab, *CASTOR THTR/AVR Containment Review*, August 2020, page 6, <https://www.osti.gov/servlets/purl/1670542>

¹² U.S. Department of Energy letter to German Ministry of Education and Research, concerning acceptance and disposition of German spent fuel at the Savannah River Site, March 5, 2012, https://srswatch.org/wp-content/uploads/2022/11/Letter-from-DOE-to-Germany-March-5-2012-Doc_3.pdf

¹³ The word “disposition” is used by DOE to obfuscate the fact that much of the waste would be dumped at SRS or other facilities.

Discussions between DOE and German entities culminated in a U.S. Department of Energy letter of March 5, 2012¹⁴ to the Germany Ministry of Education and Research, stating that DOE's Office of Environmental Management would conduct a "feasibility study regarding the acceptance and disposition¹⁵ of this spent fuel at the Savannah River Site." It is important to point out that the agreement was not being pursued by DOE's National Nuclear Security Administration, which deals with nuclear weapons and nuclear proliferation matters, but rather by the part of DOE that deals with waste management and site "clean up."

Savannah River Site – Growing Nuclear Weapons Role, Nuclear Waste Dilemma



DOE's Savannah River Site in South Carolina, 310-square mile (803-square kilometers) in size, was created in the early-1950s to produce tritium and weapon-grade plutonium for nuclear weapons, in 5 non-power reactors. 51 high-level waste (HLW) tanks were filled as a by-product of production of those materials and the challenge to empty all of those tanks remains. Over 4250 robust canisters have been filled with glassified HLW, about half the number needed to empty the HLW tanks, but a geologic repository to which to ship them does not exist so they're stranded at SRS. Adding German waste to the tanks will put pressure on SRS "clean-up."

SRS currently processes all tritium for U.S. nuclear warheads and special interests are pushing for production of plutonium "pits," the core of all U.S. nuclear weapons, at the site. The goal is to produce 50 or more pits per year at the proposed SRS Plutonium Bomb Plant, for new and existing nuclear warheads. The pit project received \$1.3 billion in the Fiscal Year 2023 appropriations passed by Congress in December 2022. SRS has been a key nuclear weapons facility and now has a larger role under President Biden's plan for new nuclear weapons.

¹⁴ U.S. Department of Energy letter to German Ministry of Education and Research, concerning acceptance and disposition of German spent fuel at the Savannah River Site, March 5, 2012, https://srswatch.org/wp-content/uploads/2022/11/Letter-from-DOE-to-Germany-March-5-2012-Doc_3.pdf

¹⁵ The word "disposition" is used by DOE to obfuscate the fact that much of the waste would be dumped at SRS or other facilities. See DOE update to SRS Citizens Advisory Board on HLW issues at SRS, including number of HLW canisters filled: *The Liquid Waste – A Status*, January 25, 2022, https://www.srs.gov/general/outreach/srs-cab/library/meetings/2022/ms/Liquid_Waste_Update.pdf

On October 18, 2012, an annex to the U.S. Department of Energy-Germany cooperation agreement of 1998 on “cooperation of research and development to support a decision on the acceptance and disposition of graphite fuel elements by the United States” was signed by DOE and the Federal Ministry of Education and Research.¹⁶

Behälter und Inventar



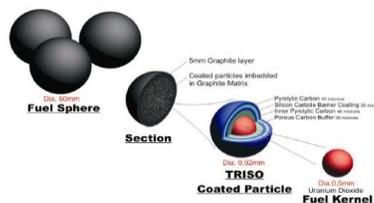
152 Behälter vom Typ
CASTOR AVR/THTR



Pro Behälter
2 AVR-Transport- und
Lager-Kannen



kugelförmige
Brennelemente
aus Grafit:
950 pro Kanne
1900 pro Behälter
288.161 insgesamt



“Container and Inventory” - Page from JEN presentation of 14 September 2022 at a meeting in Ahaus of the National Monitoring Committee (on high-level waste disposal), showing how graphite “pebbles” are loaded into a Castor cask stored at Jülich, with schematic of uranium “fuel kernels” impregnated into graphite “fuel sphere” like those loaded into the AVR & THTR pebble bed gas-cooled reactors

Then, in December 2012, Savannah River Nuclear Solutions, the main private contractor for DOE at the Savannah River Site, and the Forschungszentrum Jülich (Jülich Research Center, FZJ, in Jülich, Germany) the entity holding the AVR spent fuel, signed a “Work for Others” (WFO) agreement concerning research on disposition of the fuel pebbles.¹⁷ That document was obtained by SRS Watch via a Freedom of Information Act request. The work was to take place at the Savannah River National Laboratory.

¹⁶ “Implementing annex” between DOE and Germany concerning “acceptance and disposition of graphite fuel elements,” October 18, 2012, https://srswatch.org/wp-content/uploads/2022/11/Implementing-Annex-Oct-18-2012-Doc_4.pdf

¹⁷ “Work for Others” between SRS and Germany concerning import, processing and disposal of AVR spent fuel storage at FZJ, December 2012, obtained by SRS Watch via a FOIA request, heavily redacted, https://srswatch.org/wp-content/uploads/2022/11/Work-for-Others-Agreement-December-2012-Doc_6_Redacted.pdf

That WFO agreement has been annually renewed and we are now on modification number 9 to the agreement, which expires on February 28, 2023.¹⁸ The Savannah River National Lab is now run by contractor Battelle Savannah River Alliance, LLC and the German entity managing the AVR spent fuel since 2015 is the Jülicher Entsorgungsgesellschaft für Nuklearanlagen mbH (JEN). WFO agreements between 2012 and 2022 have been obtained by SRS Watch via FOIA requests, with some of them being posted on the SRS Watch website (and they should be available from DOE).

As the ultimate disposal in Germany of high-level waste is still unclear, as is also the case with such waste in the United States, it is understandable that interim and final disposal options for the AVR spent fuel would be discussed. Consideration of cross-border dumping options not only undermines international nuclear-waste-management norms but also places profit from international transport and dumping above a domestic solution. And, above all, any export of the material in question would be illegal under German law,¹⁹ a clear-cut issue that has been disregarded by U.S. authorities from the inception of the project. Likewise, shipment of German commercial spent fuel for foreign reprocessing is not permitted. DOE appears to have not prepared an analysis concerning the legality of exporting spent nuclear fuel from German experimental reactors, as was admitted to SRS Watch in 2015.²⁰ (It can't be repeated enough that neither the AVR nor the THTR were research reactors and rather were experimental nuclear power reactors connected to the electricity grid and thus export of such material is prohibited. Efforts to redefine the reactors AVR and THTR as "research reactors" were disingenuous.)

The recently decided halt in the effort to ship the material to SRS for processing and dumping is a marked reversal in a position maintained by some German regulatory authorities since the research agreement was signed with Savannah River National Laboratory in 2012. But the termination decision has clearly been in the pipeline for years as the opposition to the proposal grew over time and the realization sank in that it was unworkable.

DOE Initially Failed to Inform the Public what was Afoot

As DOE stood silent, it fell to SRS Watch to reveal to the public in 2012, initially at a SRS Citizens Advisory Board meeting, that secret activities were taking place to analyze importation of the AVR spent fuel. Collaboration between public interest groups in Germany and South Carolina

¹⁸ "Work for Others" agreement, modification number 9, between SRS and JEN, signed February 2022, expires February 28, 2023, <https://srswatch.org/wp-content/uploads/2022/11/2022-02-21-WFO-13-021-Mod-No.-9-received-23-March-2022.pdf> SRS Watch will file a FOIA request for any subsequent agreement post-Feb 2023.

¹⁹ Legal analysis for Greenpeace Germany, "Expert Opinion: Shipment and Disposition of Spent Nuclear Fuel from the AVR Jülich Nuclear Reactor to the U.S. Department of Energy Savannah River Site and Non-Compliance under German and European Law," 3rd December 2014, https://srswatch.org/wp-content/uploads/2022/11/Greenpeace-Germany-rechtsgutachten-juelich_engl-December-2014.pdf

²⁰ DOE FOIA response letter to SRS Watch, May 7, 2015, affirming that no legal analysis has been prepared on German spent fuel import to SRS, http://www.srswatch.org/uploads/2/7/5/8/27584045/foia_letter_no_doe_legal_analysis_may_7_2015.pdf

opposed the idea from the start and this opposition, as well as opposition by potent political forces in Germany, have combined to produce a positive outcome for both waste management at SRS and for nuclear non-proliferation. Positive in that no HEU will be separated at SRS and that the development of a graphite spent fuel reprocessing technique, which would have negative global nuclear non-proliferation implications, has been dealt a severe blow.



View of the AVR spent fuel storage building at the Jülich Research Center, in 2014, from outside the site. At that time, the SRS Watch director, Tom Clements, pictured above, toured the AVR spent fuel storage facility, AVR reactor building, AVR reactor vessel storage building and low-level waste storage areas.

DOE's Office of Environmental Management, which established a web page²¹ with selected pertinent documents on the waste import plan, prepared an Environmental Assessment (EA) - *ACCEPTANCE AND DISPOSITION OF SPENT NUCLEAR FUEL CONTAINING U.S. - ORIGIN HIGHLY ENRICHED URANIUM FROM THE FEDERAL REPUBLIC OF GERMANY* - on the import and processing and disposal of the material at SRS.²² The EA is a lesser document prepared under the National Environmental Policy Act (NEPA) than a full-blown Environmental Impact Statement (EIS) and has less public input. In addition to U.S. commenters, various German organizations and members of the public there, as well as two members of the Bundestag, submitted EA comments against the export.

²¹ DOE's Office of Environmental Management web page "German HEU Project,"

<https://www.energy.gov/srs/german-heu-project>

²² DOE's Environmental Assessment "Environmental Assessment (EA)- ACCEPTANCE AND DISPOSITION OF SPENT NUCLEAR FUEL CONTAINING U.S.- ORIGIN HIGHLY ENRICHED URANIUM FROM THE FEDERAL REPUBLIC OF GERMANY," December 2017, <https://www.energy.gov/nepa/ea-1977-acceptance-and-disposition-spent-nuclear-fuel-containing-us-origin-highly-enriched>

The final EA was issued in December 2017 and DOE's Finding of No Significant Impact (FONSI)²³ - a determination issued to justify not preparing an EIS - states that "DOE's Proposed Action is to receive, store, process, and dispose certain SNF containing U.S.-origin HEU that was irradiated in a research and development program of the Federal Republic of Germany (Germany). This SNF was irradiated for research and development purposes in experimental and demonstration reactors in Germany. If the current feasibility studies show adequate promise, and DOE and Germany decide to proceed with the project, DOE would accept this SNF at SRS for storage, processing and disposition. The U.S.-origin HEU was provided to Germany between 1965 and 1988 and return of the SNF to the U.S. would support the U.S. policy objective to reduce, and eventually eliminate, HEU from civil commerce, consistent with U.S. nonproliferation policy."

The EA admitted that "German Policy and Law" were outside the scope of the EA, thus revealing that any legal obstacles in Germany (or in the European Union), critical to the status of the spent fuel, were conveniently left unreviewed. DOE also claimed in the EA that separation of the HEU and LEU balls "is not reasonable."

If the German high-level waste had been imported, the EA confirms that the "proposed action" had the shipment taking place via the port at Joint Base Charleston-Weapons Station, a military port north of the commercial port of Charleston, South Carolina. The German port identified for the export was believed to have be Nordenham, near the port of Bremerhaven on the North Sea. It is unknown what the cost of the export would have been to Germany but it would have been very expensive and controversial, but lucrative for some.

S.4 Proposed Action

If the feasibility studies show adequate promise, and DOE and Germany decide to proceed with the project, the German government would work with DOE to transport SNF in chartered ships across the Atlantic Ocean to Joint Base Charleston-Weapons Station, near Charleston, South Carolina. From Joint Base Charleston-Weapons Station, the casks would be transported to SRS on dedicated trains in accordance with applicable U.S. regulatory requirements. **Figure S-1** shows the locations of facilities for the proposed activities.

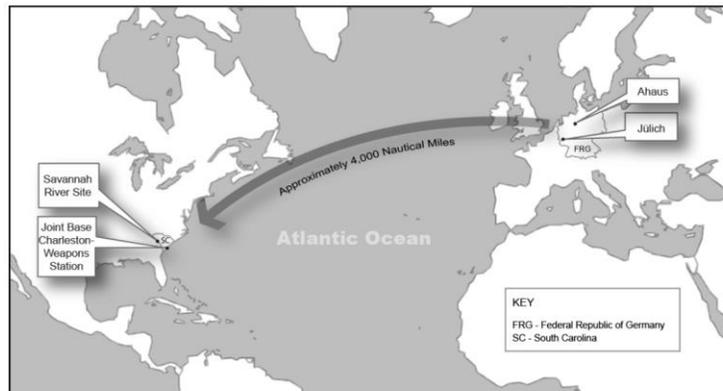


Figure S-1: Proposed Project Locations

²³ DOE's "Finding of No Significant Impact" (FONSI) based on DOE's Environmental Assessment on German spent fuel import, December 2017, <https://www.energy.gov/nepa/ea-1977-acceptance-and-disposition-spent-nuclear-fuel-containing-us-origin-highly-enriched>

Extract from Environmental Assessment, page S-4, graphic on export of AVR spent fuel by sea on “chartered ships” from Germany to Charleston, then shipment via “dedicated trains” 133 miles to SRS

The FONSI also stated that “This FONSI is not a decision to select any alternative or to proceed with the proposed project.” If the foreign waste import to SRS was to have been pursued, the preparation of an EIS would have been required and would have stirred up the matter further in the U.S. and Germany. Thus, in the EA, DOE postponed a fight for later concerning any import of the spent fuel, which may well have faced legal opposition and citizen protest in both the U.S. and Germany, which has outlawed export of spent fuel such as the material in question. Now, preparation of an EIS is moot.

DOE has Failed to Provide Required Updates about Developments

DOE also stated in the FONSI, which was issued under NEPA regulations, “that DOE will provide updates at the DOE-managed Savannah River Site Citizens Advisory Board (SRS CAB) meetings, and to other stakeholders, about the progress of technology development and any decisions on acceptance of the material.” DOE has not lived up to its legally stipulated pledge. It was SRS Watch that informed the SRS Citizens Advisory Board (SRS CAB)²⁴ on July 26, 2022 in Augusta, Georgia and the South Carolina Nuclear Advisory Council (SC NAC)²⁵ on October 24, 2022 in Columbia, South Carolina that the project was being terminated in Germany.

Additionally, SRS Watch provided an update to CAB committees at meetings on December 13, 2022 in Aiken, SC, pointing out that DOE had failed to meet its obligations as stated in the FONSI to provide updates to the CAB and stakeholders about the status of the import plan.

Though DOE’s Office of Environmental Management and SRNL are well aware of the situation in Germany, DOE has not responded to the SRS Watch revelation of the status of the project and staunchly refuses to provide the required updates. Thus, DOE willingly remains in chronic violation of its obligations under the FONSI. This matter warrants investigation by both DOE’s Office of NEPA Policy and Compliance and the DOE Office of Inspector General. SRS Watch will provide this report to those offices as well as to the U.S. Government Accountability Office (GAO).

It should be noted that the last DOE public presentation about the German spent fuel to either the SRS CAB or NAC appears to have been almost 5 years ago, on January 29, 2018. That presentation to the NAC, entitled *Update on the German Graphite Fuel Project*,²⁶ contains some useful information but is woefully out of date. As was consistently the case, it has been public interest groups in the U.S. and Germany that obtained information about the languishing project and provided it to the public, as is the case with this report. A link to a January 2016

²⁴ Savannah River Site Citizens Advisory Board, <https://www.srs.gov/general/outreach/srs-cab/srs-cab.html>

²⁵ South Carolina Nuclear Advisory Council, <https://www.admin.sc.gov/NAC>

²⁶ US DOE presentation to SC Nuclear Advisory Council, *Update on the German Graphite Fuel Project*, January 29, 2018, https://www.admin.sc.gov/sites/default/files/real_property/nac/German%20Project%20Update.pdf

presentation to the CAB entitled *Discussion of Draft Recommendation: Update on Environmental Assessment for German Highly-Enriched Uranium* has been removed from the CAB website²⁷ and there appears to have been no public presentations on the issue in 2017 or later to the CAB.²⁸

After issuance of the FONSI on December 20, 2017, it appears that DOE attempted to remove the issue from public view. But SRS Watch has foiled DOE's misguided effort via FOIA requests and information from Germany and has regularly posted information on the matter, which includes this report.

Graphite Spent Fuel Reprocessing Research by Savannah River National Lab

The research to process the graphite balls - for uranium removal and for disposal of the radioactive graphite - has taken place at Savannah River National Laboratory. As stated earlier, DOE is now on modification #9 of the initial 2012 agreement, which runs through February 2023. Since 2016, those agreements have been between SRS and a new entity created to manage the AVR spent fuel, the Jülicher Entsorgungsgesellschaft für Nuklearanlagen mbH (JEN).



AVR reactor at the Jülicher Research Center in 2014, before its dismantlement. The reactor was subsequently removed and placed in a special storage facility on site. The words projected onto the reactor building by Greenpeace read "South Carolina not a Nuclear Waste Dump for Germany."

²⁷ The document on the CAB website, under the list for 2016 meetings - https://www.srs.gov/general/outreach/srs-cab/meeting_summaries_2016.html - "could not be found."

²⁸ Presentations to SRS CAB in 2017: https://www.srs.gov/general/outreach/srs-cab/meeting_summaries_2017.html

It is unknown what information or progress reports on development of techniques for processing the irradiated graphite have been passed from DOE/SRNL to FZJ or JEN. FOIA requests for such documents have gone unanswered. DOE must reveal what information it has shared with Germany.

Some technical reports on SRNL's work on AVR and THTR spent fuel processing area available on DOE's Office of Scientific and Technical Information (OSTI) website (<https://www.osti.gov/> - for example, search for "AVR"). The most recent reports found on the OSTI website date from 2019 and report some progress in development of a reprocessing technique for graphite material. Any scientific reports from 2019 forward should be released and made public.

Citizen Opposition to the Import Culminated in SRS CAB Opposition

The plan to import the AVR spent fuel was opposed since 2012 by the public and on September 26, 2017, the SRS Citizens Advisory Board (CAB) adopted as a comment on the draft Environmental Assessment a recommendation entitled "Oppose Receipt of German SNF for Treatment and Storage in the U.S."²⁹ In the December 21, 2017 response by DOE,³⁰ the DOE manager of SRS did not accept the CAB recommendation and pushed forward with the project despite opposition to it and recognized problems with it. Many members of the public spoke before the CAB in support of its approval of the recommendation against import of the German spent fuel and in opposition to the import scheme. The company that sought to transport the spent fuel by sea, via the port of Nordenham, Germany, consistently supported the scheme due to profit to be made.

NNSA Says the Material Does not Pose a Proliferation Risk in Germany

DOE's Office of Environmental Management originally claimed that repatriation of the spent fuel containing highly enriched uranium, bomb-grade uranium, was being done for nuclear non-proliferation reasons. But a FOIA response in 2015 to SRS Watch yielded a key memo dated August 1, 2013 and entitled "Proliferation Attractiveness of Jülich Graphite Spheres," by NNSA's Office of Global Threat Reduction. The memo stated that the spent fuel in Germany does not pose a proliferation risk: "We also assess the material is not attractive to sub-state/terrorist entities in its current state. Since the material is stored in a secure environment in a politically stable country, it is not a proliferation concern."³¹ This definitive statement embodies the DOE position that has endured for almost a decade but which EM has ignored.

²⁹ See SRS Citizen Advisory Board recommendation, "Oppose Receipt of German SNF for Treatment and Storage in the U.S., September 26, 2017, https://www.srs.gov/general/outreach/srs-cab/library/recommendations/Rec_350_-_German_Fuel.pdf

³⁰ U.S. DOE response to SRS CAB recommendation against AVR spent fuel import, December 21, 2017, https://www.srs.gov/general/outreach/srs-cab/library/responses/DOE_Response_to_CAB_Rec_350.pdf

³¹ DOE's National Nuclear Security Administration memo on no proliferation concern with AVR spent fuel storage, August 1, 2013, <https://srswatch.org/wp-content/uploads/2022/11/DOE-memo-on-no-proliferation-risk-of-AVR-spent-fuel-August-1-2013.pdf>

Another FOIA request by SRS Watch, for any Nonproliferation Impact Assessment (NIA) that may have been prepared by NNSA on the development of a new reprocessing technique for the graphite fuel, garnered a response in January 2015 that there were no documents responsive to the request.³² A 2014 emailed request to the SRS Office of External Affairs (for activities of the Office of Environmental Management at SRS) for a NIA yielded the emailed response that “DOE does not perform such assessments” (meaning EM does not prepare them, which was rebutted by SRS Watch, and did not prepare one in this case).³³ EM has continued to fail to present a NIA, which should have been prepared at the start of the project.

The Environmental Assessment on import of the waste admits that the import is not for nuclear nonproliferation reasons: “This would not be a nonproliferation action and a nonproliferation assessment would not be required for this project.”³⁴ It is of great concern that no DOE office has assessed the international nuclear proliferation risks of developing graphite spent fuel reprocessing techniques, to remove HEU and/or LEU, at SRS.

We are not aware that either NNSA or other agencies or organizations have documented any claim that export of the AVR spent fuel from Germany is necessary for nuclear non-proliferation reasons. Likewise, based on oral comments before the SRS CAB, it appears that SRNL was developing the graphite fuel reprocessing technique with the anticipation that it could be commercialized and applied to other irradiated graphite spent fuel, regardless of proliferation concerns.

Thus, only a weak case was presented that the material was of proliferation concern and when that became apparent DOE’s Office of Environmental Management changed their tune and claimed the import was for environmental and not nuclear nonproliferation reasons. But the public in the U.S. and in Germany never accepted that dumping the AVR spent fuel on SRS was justified for environmental or nuclear nonproliferation reasons.

There could possibly be continued research, if DOE and Germany agreed and if Germany paid for it, by DOE’s Office of Environmental Management concerning German management and disposal in Germany of the AVR and THTR spent fuel. In the past, it has appeared that direct disposal, if any German HLW repository were ever located, was the option under consideration. (As indicated in various scientific papers.) Whether or not disposal options might involve the

³² FOIA response letter to SRS Watch, no Nuclear Non-Proliferation Impact Assessment has been prepared on development of graphite spent fuel reprocessing techniques being developed by SRNL, January 21, 2015, <https://srswatch.org/wp-content/uploads/2022/11/DOE-memo-on-no-proliferation-risk-of-AVR-spent-fuel-August-1-2013.pdf>

³³ Communication from SRS Office of External Affairs to Tom Clements, SRS Watch, October 30, 2014, with rebuttal: <https://srswatch.org/wp-content/uploads/2022/11/DOE-proliferation-impact-assessments-October-2014.pdf>

³⁴ DOE Environmental Assessment on the spent fuel import, *Appendix B: Public Comment Summary*, December 2017, page B-12, <https://www.energy.gov/sites/default/files/2017/12/f46/DOE%20EA%201977%20Appendix%20B%20121417%20Part%201.pdf>

complex and risky extraction of the uranium kernels embedded in the graphite with subsequent downblending to LEU would be up to German entities and the German public, if valid environmental and non-proliferation reasons for that option could be made. So far, it appears that there has been no case made for extraction in Germany of the uranium kernels.

Where does the Waste-dumping Scheme Stand Now?

On October 15, 2019, Savannah River Nuclear Solutions, then operator of Savannah River National Lab, prepared “end use certificates,” obtained by SRS Watch in response to a FOIA request, “for presentation to the export authorities of the Federal Republic of Germany” for the export from Germany to SRS of a small amount of irradiated graphite³⁵ as well as for the export of 33 unirradiated graphite balls.³⁶ It is believed that neither export from JEN has taken place but DOE’s Office of Environmental Management, as part of the effort to shroud the project in unnecessary secrecy, has said nothing on the matter. The irradiated graphite material, obviously, was to be used as part of efforts at SRNL to develop a reprocessing technique to remove uranium and to help determine disposition of remaining radioactive graphite.

The controversial plans to import irradiated fuel samples may indeed have been terminated and one SRNL report from 2019 appears to have confirmed this: “Irradiated fuel pebbles will not be available for any stage of process development.”³⁷ That same report confirms that no construction of the required pilot-scale facility, as discussed in the Environmental Assessment, has been achieved. Such a facility will likely be very costly and has not been noted in either documentation from Germany or in DOE budget requests to Congress. There would be off-gassing of fission products during processing in any pilot or full-scale facility, which heightens concern about why such radioactive gas produced in Germany should be vented in South Carolina and if that complies with U.S. or German environmental laws and regulations.

To highlight the radiation risks involved with handling the irradiated graphite balls, the Environmental Assessment that was prepared on import and processing of the irradiated graphite fuel affirms that “As a result of irradiation and decay, the SNF also contains actinides, fission products, and other radioactive isotopes.” While some fission products discharged into the high-level nuclear waste tanks at SRS via reprocessing, or digestion, could be vitrified in the Defense Waste Processing Facility, thus increasing strains on the SRS waste system, fission products in the graphite balls could be volatilized and released into the atmosphere.

³⁵ End Use Certificate prepared by SRNL, for export from JEN in Germany to SRS of irradiated graphite, October 15, 2019, <https://srswatch.org/wp-content/uploads/2022/11/irradiated-balls-FOIA-response-SRS-JEN-WFO-attachment-2-irradiated-balls-signed-Oct-15-2019.pdf>

³⁶ End Use Certificate prepared by SRNL, for export from Jen in Germany to SRS of 33 unirradiated graphite balls, October 15, 2019, <https://srswatch.org/wp-content/uploads/2022/11/unirradiated-balls-FOIA-response-SRS-JEN-attachment-unirradiated-balls-signed-Oct-15-2019.pdf>

³⁷ SRNL report, *Activities to Establish Technical Confidence for HTGR Fuel Processing*, June 2019, page 16, <https://sti.srs.gov/fulltext/SRNL-RP-2019-00419.pdf>

In June 2020, SRS Watch wrote to then Secretary of Energy Dan Brouillette and Senior Adviser for Environmental Management William White, asking that the US-Germany cooperation on import the spent fuel, via the annually modified Work for Others agreement, be terminated.³⁸ Nobody in DOE bothered to even acknowledge the letter and, reflective of the way that DOE has dealt with the public in other matters, there still has been no response from DOE.

In June 2022, the new the Christian Democratic Union (CDU)-Green Party coalition government in NRW agreed to a joint platform that exporting the AVR spent fuel to the US would not be pursued.³⁹ ⁴⁰ In parallel, the new environment minister of NRW, Oliver Krischer, a former Bundestag member for the Green Party, was appointed. Mr. Krischer has long been against the export of the AVR spent fuel. He facilitated a visit to the AVR spent fuel storage facility by the SRS Watch director in 2014 (one of two SRS Watch visits to Germany on this matter).

Next, Silke Krebs, the State Secretary from the Ministry of Economics in NRW said at a nuclear waste meeting (Das Nationale Begleitgremium - National Monitoring Committee⁴¹) on September 13, 2022 that “The goal is to mediate in the search for the final repository for highly radioactive waste...” Thus, only two options for storage of the AVR spent fuel remain on the table. These options are construction of a new, up-to-date storage facility at Jülich or consolidation of the AVR spent fuel at the Ahaus storage facility. It was reported in publicity from the meeting that she “sees the construction of an interim storage facility in Jülich as the best solution...the aim is therefore to press ahead with the construction of a new interim storage facility in Jülich.”⁴² It was becoming clearer that the US option was dead.

The newspaper in Aachen, Germany, the *Aachener Zeitung*, reported on 24 June 2022 that the option to export the AVR spent fuel to SRS had been canceled.⁴³ Also on 24 June, it was reported that Oliver Krischer, who had opposed the AVR spent fuel export as a member of the

³⁸ SRS Watch letter to DOE, requesting that SRS-JEN cooperation on import and reprocessing of AVR spent fuel be terminated, February 20, 2020, <https://srswatch.org/wp-content/uploads/2022/11/letter-to-DOE-terminate-SRS-JEN-agreement-Feb-20-2020.pdf>

³⁹ *Atom Müll soll vorerst in Jülich bleiben*, Aachener Nachrichten, 24 June 2022, https://www.aachener-zeitung.de/politik/deutschland/atommuell-soll-vorerst-in-juelich-bleiben_aid-71867629?fs=e&s=cl

⁴⁰ *Jülich Nachrichten* newspaper, article on CDU-Green decision to build a storage facility at Jülich, 9 July 2022, <https://srswatch.org/wp-content/uploads/2022/11/9-Juli-2022-article-no-US-export.pdf>

⁴¹ National Monitoring Committee, in English: https://www.nationales-begleitgremium.de/EN/Home/home_node.html;jsessionid=08B408FC622349486C0175515E7968D6.intranet242 & in German: <https://www.nationales-begleitgremium.de>

⁴² Das Nationale Begleitgremium, article from 13 September 2022 - “Silke Krebs, NRW-Staatssekretärin für Wirtschaft, Industrie, Klimaschutz und Energie, sieht den Bau eines Zwischenlagers in Jülich als beste Lösung an,” 13 September topic: “Zukunftsvertrag NRW – Atomenergie Was plant die neue Landesregierung zur Zwischenlagerung?” by Silke Krebs, Staatssekretärin im Ministerium für Wirtschaft, Industrie, Klimaschutz und Energie NRW (Grüne), https://www.nationales-begleitgremium.de/SharedDocs/Artikel/DE/Veranstaltungen_Workshops/2022/Bericht_VA_Ahaus_Zwischenlagerung_13_9_2022.html

⁴³ *AVR-Castoren aus Jülich: Bund bevorzugt Transport nach Ahaus ab 2024*, Aachener Zeitung, 6 October 2022, https://www.aachener-zeitung.de/lokales/juelich/bund-bevorzugt-transport-nach-ahaus-ab-2024_aid-77905351

Green Party in the Bundestag, had been appointed at the Minister of Environment, nature Project and Transport in the government of the state of North Rhine-Westfalia.⁴⁴

The German website <https://umweltfairaendern.de> reported on 14 September 2022⁴⁵ that the US option had been terminated and again reported this on 28 September,⁴⁶ along with reporting that construction of a new up-to-date on-site storage facility at Jülich was possible, as was consolidation of the AVR spent fuel at the interim storage facility in Ahaus.

On September 14, 2022, in a JEN presentation to a periodic meeting of the National Monitoring Committee (on nuclear waste disposal efforts) entitled *OPTION: TRANSPORT OF THE AVR CONTAINERS FROM THE INTERIM STORAGE FACILITY IN JÜLICH TO THE INTERIM STORAGE FACILITY IN AHAUS*⁴⁷ it was stated that “repatriation to the USA is no longer pursued as an option.” (In German: “Die Rückführung in die USA wird als Option für die unverzügliche Räumung nicht weiter verfolgt.”) The presentation went on to say that the “processing procedure for AVR-BE [AVR Brennelemente - fuel elements] in the USA not yet secured,” meaning that after a decade of R&D that Savannah River National Lab has not finalized R&D to the point of deployment of the processing technique in a pilot facility to demonstrate removal of the uranium kernels from the irradiated graphite balls. Some would define that as a failure of their decade-long efforts.

In the September 14 presentation, JEN did not mention any proliferation concerns related to leaving the AVR spent fuel in Germany, to be stored at Jülich or Ahaus prior to final disposal.

⁴⁴ See official NRW website at <https://www.land.nrw/landeskabinett/oliver-krischer> and also news article *Oliver Krischer wird NRW-Umwelt- und Verkehrsminister*, Aachener Zeitung, 24 June 2022, https://www.aachener-zeitung.de/nrw-region/oliver-krischer-wird-nrw-umwelt-und-verkehrsminister_aid-71871489

⁴⁵ See article *Hochradioaktiver Atommüll bleibt in Jülich? Export in die USA abgesagt – neues Zwischenlager vor Ort angestrebt* at <https://umweltfairaendern.de/2022/09/14/hochradioaktiver-atommuell-bleibt-in-juelich-export-in-die-usa-abgesagt-neues-zwischenlager-vor-ort-angestrebt/>

⁴⁶ See article *Jülicher Atommüll: Bund setzt auf Transporte nach Ahaus – Land NRW will neues Zwischenlager* at <https://umweltfairaendern.de/2022/09/28/juelicher-atommuell-bund-setzt-auf-transporte-nach-ahaus-land-nrw-will-neues-zwischenlager/>

⁴⁷ Dr. Guido Caspary, Hauptabteilungsleiter Entsorgungsbetriebe der JEN Jülicher Entsorgungsgesellschaft für Nuklearanlagen mbH, (Head of Department Waste Management of JEN Jülicher Waste Management Company for Nuclear Facilities Ltd.), *OPTION: TRANSPORT DER AVR-BEHÄLTER AUS DEM ZWISCHENLAGER IN JÜLICH INS ZWISCHENLAGER AHAUS* PowerPoint presentation, 11 pages, 14 September 2022, https://www.nationales-belegitgremium.de/SharedDocs/Downloads/DE/Downloads_66_Sitzung_14_9_2022/JEN-Praesentation_Transport_AVR-Behaelter_Caspary.pdf?__blob=publicationFile&v=2

Rückführung in die USA

Die Rückführung in die USA wird als Option für die unverzügliche Räumung nicht weiter verfolgt.

Hauptargument

- Transport-Sicherungskonzept Straße-Schiff extrem aufwändig.
 - Verarbeitungsverfahren für die AVR-BE in den USA noch nicht abgesichert.
 - Genehmigung für das Bestandslager wahrscheinlich, nach AtG dann keine Ausfuhr mehr gestattet.
- Realisierung nicht wahrscheinlich!

Page from JEN presentation of 14 September 2022, *OPTION: TRANSPORT OF THE AVR CONTAINERS FROM THE INTERIM STORAGE FACILITY IN JÜLICH TO THE INTERIM STORAGE FACILITY IN AHAUS: “Repatriation to the U.S. is not being pursued as an option...”*

In addition to the failure of SRNL to develop the processing technique and by-product waste disposal plan, it is suspected that the goal to empty the research reactor spent fuel storage pool (in the old L-Reactor) and to then halt use of the H-Canyon reprocessing plant for processing that spent fuel by 2033⁴⁸ - along with the parallel goal to empty and close the high-level waste tanks - played a role in this matter. According to the Finding of No Significant Impact mentioned earlier, H-Canyon would have played a key role in various options of processing the AVR spent fuel. Use of H-Canyon for this purpose would require “some modification” of unknown costs. In general, it appears that DOE wants to avoid major costs with repair and upgrade of H-Canyon before its mission is completed around 2033. (It is unlikely that Germany was prepared to pay for costly H-Canyon modifications and upgrades.)

JEN, Manager of the AVR Spent Fuel, Confirms U.S. Option has been Terminated

And on October 19, 2022 came the final blow, with JEN sending an explanatory email⁴⁹ to SRS Watch about the situation in which it was stated, in English, **“The option to ship the aforementioned spent fuel has indeed been terminated by JEN.”**

⁴⁸ DOE presentation to SC Nuclear Advisory Council, *Accelerated Basin De-Inventory*, October 24, 2022, https://www.admin.sc.gov/sites/default/files/real_property/ABD%20Presentation%20_10_20_22%20Final%20.pdf

⁴⁹ Email exchange between SRS Watch and JEN, with affirmation by JEN that the US option has been terminated, 19 October 2022, <https://srswatch.org/wp-content/uploads/2022/11/Confirmation-to-Clements-from-JEN-that-US-options-has-been-terminated-Oct-19-2022.pdf>



Between 2012 and 2022, many demonstrations against export of the AVR spent fuel and in support of a new on-site storage facility have been held at the entrance gate of the Jülich Research Center. The event pictured above was in 2015. Photo courtesy of Stop WESTCastor. (10 Jahre „Stop Westcastor“: https://gruene-dueren.de/2021/01/10-jahre-buendnis-stop-westcastor_21539.html)

While JEN gives a nod in the mentioned email to the role of the Federal Ministry of Education and Research in any decision, it is only JEN that is preparing for storage of the AVR spent fuel. JEN has now confirmed at least twice that not only has the US option been terminated but that the only two options that remain on the table are a new, licensed storage facility at Jülich (or a renewal in the earlier license) or shipment to the Ahaus storage facility.

Concerning the interim storage facility at Jülich, JEN stated in the October 19, 2022 email to SRS Watch that in the future that spent fuel stored in a facility licensed by Federal Office for the Safety of Nuclear Waste Management (BfE) clearly could not be exported:

Additionally the supervisory authority directed JEN to obtain a renewed license for the existing interim storage facility. According to recent information from the licensing authority, such a license may be issued in the near future. If this were to occur the German Atomic Energy Act would prohibit a subsequent export of the spent fuel, since spent fuel stored in a licensed facility may not be exported under current legislation.

Thus, the proposal backed by those seeking to profit from the development of the reprocessing technology or from shipment of the high-level waste is dead. The contract between JEN and SRS (Batelle Savannah River Alliance, manager of SRNL) should now be terminated and DOE must announce an end to this misguided project. If EM wants to help Germany develop a plan to dispose of the waste in Germany that should be made public.

German entities have left the option on the table to build a new spent fuel storage facility at Jülich and it is the opinion of NGOs in Germany, as well as SRS Watch, that this option must immediately be pursued. Efforts to ship the AVR spent fuel long distance over land to Ahaus will lead to more delays, environmental and security risks, increased costs and vocal, motivated opposition and this must be avoided. A German blog reported on 29 November 2022 that the federal government’s parliamentary groups in the Bundestag favored shipment of the AVR spent fuel to the existing Ahaus interim storage facility while the governing CDU-Green coalition in the state of NRW favor construction a new interim storage facility at Jülich.⁵⁰ That blog reaffirmed, as presented in this report, that “the formerly planned option of exporting this nuclear waste to the USA is now completely off the table.” (“Die ehemals geplante Option eines Export dieses Atommülls in die USA ist inzwischen komplett vom Tisch.”)

DOE Must Publicly Provide Documentation that the Project has been Terminated

While this brief report lacks many details, any similar update or report is lacking from the U.S. Department of Energy, as required. Lack of such an update leaves DOE in the awkward position of violating the commitment in the Finding of No Significant Impact of December 2017, in which DOE said “that DOE will provide updates at the DOE-managed Savannah River Site Citizens Advisory Board (SRS CAB) meetings, and to other stakeholders, about the progress of technology development and any decisions on acceptance of the material.”

- DOE is hereby challenged to present its updates, for the public record, on the status of the now-terminated project. Such mandated updates have not been provided to the Savannah River Site Citizens Advisory Board or to other stakeholders since 2018, in possible violation of a stated commitment under the National Environmental Policy Act. The SRS CAB should formally request an update. DOE’s Office of Inspector General, DOE’s Office of NEPA Policy and Compliance and the Government Accountability Office should investigate the failure of DOE’s Office of Environmental Management to provide updates about the project, as stipulated in the FONSI, to the SRS CAB and stakeholders.
- DOE must admit that the project has been terminated by entities in Germany. If DOE still contends that the importation and dumping of the German spent fuel is proceeding, then facts to support this contention must be presented and DOE is challenged to proceed to preparation of an Environmental Impact Statement reviewing detailed impacts of the scheme to process and dump the highly radioactive waste at SRS, with public required input.

⁵⁰ Post by Dirk Siefert on [umweltFAIRaendern.de](https://umweltfairaendern.de), “Regierungsfractionen im Bundestag: Kosten statt Sicherheit? Atommüll aus Jülich soll ins Zwischenlager Ahaus – NRW soll Mehrkosten allein tragen,” 29 November 2022, <https://umweltfairaendern.de/2022/11/29/regierungsfractionen-im-bundestag-kosten-statt-sicherheit-atommuell-aus-juelich-soll-ins-zwischenlager-ahaus-nrw-soll-mehrkosten-allein-tragen/>

I again want to extend a big thanks to German NGOs and politicians with whom I have worked over the last decade to defeat this misguided project and to them goes the credit for this success.

###

There is a significant amount of documentation and information not mentioned in this overview document. Ask SRS Watch for details: srswatch@gmail.com. And, go to the SRS Watch website, <https://srswatch.org/>, and search for “Germany.”

Also, contact the U.S. Department of Energy for more information, documentation and comments. We apologize for not having a DOE contact name or office. So it goes for most other DOE and NNSA projects, which are carried out absent the ability of the public to inquire of managing officials and with little accountability.

See oral comment to the DOE/contractor booster group, the South Carolina Nuclear Advisory Council, about termination of the German export plans - see link to archived video of “Governor’s Nuclear Advisory Council” meeting October 24, 2022, public comment by Tom Clements, SRS Watch director, at 3h:4m:20s:
<https://www.scstatehouse.gov/video/archives.php>



Sticker by the German anti-nuclear group .ausgestrahlt (in Hamburg):
“**Stop the Nuclear Waste Export! No Castor Cask Export to the USA!**”

This document has been prepared for the public record in large part as DOE has utterly failed in its responsibility to provide mandated updates about the German waste-import project. The director of SRS Watch intends to visit Germany in the first half of 2023 and plans to meet again with officials on the matter, in part to garner details about the project's termination and to also affirm that opposition in South Carolina endured for the length of the proposal.

Tom Clements
Director, Savannah River Site Watch
1112 Florence Street
Columbia, South Carolina USA 29201
srswatch@gmail.com
<https://srswatch.org/>
<https://www.facebook.com/SavannahRiverSiteWatch>

