

**TENNESSEE VALLEY AUTHORITY  
Blending of Surplus Highly Enriched  
Uranium From the Department of  
Energy, to Low Enriched Uranium for  
Subsequent use as Reactor Fuel at  
the  
Tennessee Valley Authority's Browns  
Ferry Nuclear Plant**

**AGENCY:** Tennessee Valley Authority.

**ACTION:** Issuance of record of decision.

**SUMMARY:** This notice is provided in accordance with the Council on Environmental Quality's regulations (40 CFR parts 1500 to 1508) and the Tennessee Valley Authority's (TVA) procedures implementing the National Environmental Policy Act. On February 14, 2001, TVA published a notice of adoption of the Final Environmental Impact Statement (FEIS), "Disposition of Surplus Highly Enriched Uranium," prepared by the U.S. Department of Energy (DOE), Office of Fissile Materials. This FEIS was released by DOE in June 1996. TVA was not a cooperating agency on that FEIS. In February 2001, TVA re-circulated the FEIS to agencies and persons who had provided comments on the original DOE FEIS. EPA's Notice of Availability for the re-circulation of the FEIS appeared in the **Federal Register** on February 16, 2001. Subsequent to TVA's adoption of the DOE FEIS and consideration of public comments received on TVA's adoption of the FEIS, TVA has decided to implement the actions related to the preferred alternative identified by DOE. The preferred alternative in DOE's FEIS, as adopted by TVA, is Alternative 5, Maximum Commercial Use.

TVA's actions related to the preferred alternative include entering into an interagency agreement with DOE to obtain approximately 33 metric tons of highly enriched uranium (HEU) for blend down and subsequently to use the low enriched uranium (LEU) in the form of nuclear reactor fuel at TVA's Browns Ferry Nuclear Plant (BFNP). Interagency agreements are a common method for federal agencies to frame roles, responsibilities, and conditions for arrangements between agencies. TVA actions related to the preferred alternative also include entering into contracts with a

consortium composed of Framatome ANP of Lynchburg, Virginia and Richland, Washington and Nuclear Fuel Services of Erwin, Tennessee, to process and blend the uranium and to fabricate the fuel. **FOR FURTHER INFORMATION CONTACT:**

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**SUPPLEMENTARY INFORMATION:  
Synopsis of Decision**

After analysis of the adequacy and applicability of the DOE's Final Environmental Impact Statement for Disposition of Surplus Highly Enriched Uranium, TVA's adoption of the DOE FEIS (**Federal Register**, February 14, 2001), re-circulation of the DOE FEIS, and the consideration of public comments received on TVA's adoption of the FEIS, TVA decided to implement the actions (as described below) related to the preferred alternative identified in the DOE FEIS. These actions include entering into an interagency agreement with the DOE and into contracts with a private consortium for the procurement and processing of the HEU and for the fabrication of LEU into nuclear fuel. TVA will obtain approximately 33 metric tons of HEU from the DOE for blending down and subsequently use the LEU as nuclear reactor fuel at TVA's BFNP. Framatome ANP will process and blend the uranium at the Nuclear Fuel Services facility in Erwin, Tennessee, and fabricate fuel at its facilities in Richland, Washington. The first fuel covered by the contracts is expected to be loaded during the spring of 2005 and the last reload is expected to occur in 2015.

**Basis for Decision**

TVA has decided to implement the actions described under the DOE preferred alternative (Maximum Commercial Use) because it would result in substantial savings to TVA ratepayers in nuclear fuel costs in the years 2005-2015, thereby aiding TVA in its mission of providing low cost, reliable power for the Tennessee Valley region without significantly impacting the environment. Implementation of

TVA's actions would also avoid the environmental impacts associated with producing an equivalent amount of LEU from 14 million pounds of natural uranium (as U308) that in turn would require mining of 140,000 tons of ore.

#### Background

In accordance with United States policies and international agreements for the non-proliferation of weaponsusable fissile material, the President declared on March 1, 1995 that approximately 200 tons of this material was surplus to United States defense needs. In the HEU Final EIS (Issued June 28, 1996), DOE considered the potential environmental impacts of alternatives for a program to reduce global nuclear proliferation risks by blending up to 200 metric tons of United States-origin surplus HEU down to LEU to make it non-weapons usable. The resulting LEU was to either be sold for commercial use as fuel feed for nondefense nuclear power plants, or disposed of as low-level radioactive waste (LLW). After consideration of the public comments received, DOE finalized the HEU EIS and decided to implement the preferred alternative (Maximum Commercial Use) of the FEIS. Implementation of the preferred alternative will involve gradually blending up to 85 percent of the surplus HEU to a U-235 enrichment level of approximately 4 percent for sale and commercial use over time as reactor fuel feed, and blending the remaining surplus HEU down to an enrichment level of about 0.9 percent for disposal as LLW. This would take place over an estimated 15-to 20-year period.

Three blending technologies (uranyl nitrate hexahydrate [UNH] liquid) blending; uranium hexafluoride (gas); or molten metal blending), and four potential blending sites (DOE's Y-12 Plant in Oak Ridge, Tennessee; DOE's Savannah River Site in Aiken, South Carolina; the Babcock and Wilcox Naval Nuclear Fuel Division Facility in Lynchburg, Virginia; and the Nuclear Fuel Services, Inc. Plant in Erwin, Tennessee) were considered in the FEIS.

DOE issued the Final Environmental Impact Statement for Disposition of Surplus Highly Enriched Uranium in June 1996, and subsequently issued a Record of Decision on July 29, 1996.

TVA published a Notice of Adoption for this FEIS in the **Federal Register** on February 14, 2001, and the **Environmental Consequences**

The environmental analyses in DOE's FEIS estimated that the incremental radiological and other impacts of disposition of HEU during normal

storage) would be substantively the same as activities that have been analyzed in DOE's FEIS. The incremental impacts from TVA's actions would be low and well within the

**14, 2001, and the Environmental Protection Agency's** Notice of Availability for re-issue of the FEIS appeared in the **Federal Register** on February 16, 2001. The FEIS was recirculated by TVA to federal and state agencies. Individuals and organizations who had provided comment on DOE's draft EIS were mailed the Notice of Adoption and a letter noting TVA's adoption of the FEIS, and its availability. Additionally, the FEIS was placed in local libraries in Aiken, South Carolina; Richland, Washington; Athens, Alabama; and Erwin, Oak Ridge, Knoxville, and Chattanooga, TN.

At their March 28, 2001, public meeting, the TVA Board of Directors approved delegation of authority to enter into the Interagency Agreement with the Department of Energy for obtaining surplus HEU and processing the HEU to LEU. The Board further approved delegation of authority for awarding separate contracts to Framatome ANP (Lynchburg, VA and Richland, WA) for processing and blending HEU to LEU, and for fabrication of fuel assemblies for use in TVA reactors. The environmental impacts of the above actions were earlier evaluated by TVA and determined to be bounded by the actions analyzed in the DOE FEIS. The FEIS was subsequently adopted by TVA.

#### Alternatives Considered

Because of the large number of potential combinations of end products, blending technologies and blending sites, DOE formulated several representative alternatives that bounded potential effects. The Final HEU EIS adopted by TVA considered and analyzed the No Action Alternative and four reasonable alternatives for blending of a nominal 200 metric tons of surplus HEU down to LEU to make it nonweapons-usable. In addition to the No Action Alternative (continued storage of surplus HEU), DOE considered four alternatives that represent reasonable choices within the matrix of possible combinations for blending of different proportions of the surplus HEU for commercial use or for disposal as waste, with variations on numbers and locations of blending sites. The analyses of potential effects from the types and amounts of materials, transfer of materials, and sites in the range of alternatives considered by DOE bound those implemented in TVA's actions.

The FEIS considered:

- Alternative 1-No Action (continued accident-free operations would be low for workers, the public and the environment, and well within regulatory requirements for all alternatives. Blending activities that would be conducted for the proposed TVA actions

storage)

- Alternative 2 (No Commercial Use)-Blend 100 percent to waste (at all four sites)
- Alternative 3 (Limited Commercial Use)-Blend 75 percent to waste (at all four sites), 25 percent to fuel (at 2 commercial sites)
- Alternative 4 (Substantial Commercial Use)-Blend 35 percent to waste, 65 percent to fuel (at any 1 site, the 2 commercial sites, the 2 DOE sites, or at all 4 sites)
- Alternative 5 (Maximum Commercial Use)-Blend 15 percent to waste, 85 percent to fuel (at any 1 site, the 2 commercial sites, the 2 DOE sites, or at all 4 sites).

As described in the DOE FEIS, each alternative involving commercial use of LEU derived from surplus HEU (Alternatives 3, 4, and 5) included transfer of 50 metric tons of surplus HEU and 7,000 metric tons of natural uranium from DOE stockpiles to the United States Enrichment Corporation (USEC) for eventual sale and commercial use.

#### Environmentally Preferred Alternative Council on Environmental Quality

(CEQ regulations require that a Record of Decision identify the environmentally preferred alternative(s). The analyses in DOE's HEU final EIS indicated that the environmentally preferred site for the blending facility would be the Savannah River site (SRS). However, since the impacts at all proposed blending sites are expected to be low during normal operations (including radiological impacts) and well within regulatory limits, and since the overall risks associated with potential accidents are low, TVA concludes that the minor environmental differences between sites would not serve as a basis for choosing among them. Each of the facilities identified in the FEIS would be capable of blending up to the entire inventory of surplus HEU without significant adverse environmental impacts. Further, location of the oxide conversion facility at NFS in Erwin, Tennessee, where conversion of UNH liquid to uranium dioxide powder will occur with subsequent shipment of the oxide powder to the Framatome ANP Richland nuclear fuel fabricating facility, has less potential for environmental impacts than shipment of UNH liquid or crystals to the fabricating facility.

would be substantively the same as activities that have been analyzed in DOE's FEIS. The incremental impacts from TVA's actions would be low and well within the

bounds of impacts described in the DOE FEIS. There would be some increases in water usage, fuel needs, and waste generation from use of the NFS site. However, these increases can be accommodated at the NFS site. The only additional construction required would be that for an oxide conversion facility and a uranyl nitrate storage facility at the NFS site. As discussed in response to comments below (Impact of Converting Low Enriched Uranyl Nitrate Solution to UO<sub>2</sub> (Provision 7), the potential effects of performing the conversion to oxide at NFS is not a substantial change relevant to environmental concerns in the FEIS. Further, the impact of these minor changes is within the bounds of impacts analyzed. Conversion of the material at NFS would result in fewer and safer shipments of a less soluble form of uranium.

#### Response To Public Comments Received on TVA's Adoption Of DOE's FEIS

During the public review period, four agencies (US Environmental Protection Agency (EPA), Nuclear Regulatory Commission (NRC), Alabama Department of Environmental Management (ADEM) and Tennessee Department of Environment and Conservation (TDEC)); two organizations (Local Oversight Committee-Oak Ridge Reservation (LOC) and the Citizens for National Security (CNS)); and three individuals responded with comments on TVA's notice of adoption of the DOE FEIS for highly enriched uranium (HEU) disposition. On March 16, 2001, the EPA published their Availability of Comments on Environmental Impact Statements in the **Federal Register** in which the EPA expressed lack of objections with TVA's adoption of, and no concerns with, DOE's FEIS provided TVA follows the actions described in the FEIS. On March 8, 2001, the Alabama Department of Environmental Management (ADEM) responded that the agency had no comments concerning the disposition of highly enriched uranium into rmcleal- fuel assemblies for the TVA BFNP in Athens, Alabama.

General comments from individuals included concerns regarding: (1) Threat of nuclear materials to humans and the environment (1 individual); (2) comments of support regarding the nuclear power industry and/or the TVA action (2 individuals); (3) the appropriateness of using an Interagency Agreement between TVA and DOE (LOC); and 4) desire for a public meeting or additional time for comment

(LOC and 1 individual). The first two comments were noted. With regard to the third comment the proposed use of an Interagency Agreement between TVA and DOE to document each parties obligations is an appropriate contractual instrument to specify the role of two federal agencies implementing a project. A considerable number of opportunities were provided to the public to comment on the original DOE FEIS. The 33-day period provided for submitting comments on TVA's adoption of DOE's FEIS (after re-circulation of the FEIS), constituted additional opportunity for review of TVA's proposed actions and their relationship to DOE's actions. All comments received were considered in TVA's deliberations.

Other comments from the public, organizations, and agencies were in the following areas of specific concern:

- General comments about need to maintain consistency with the DOE FEIS (EPA, TDEC, LOC, CNS);
- Source of blendstock, inclusion of off-specification materials in the DOE FEIS, the processes used for blending and types of products involved (LOC, NRC, 1 individual);
- Desired identification of specific transport routes, methods and types of materials (CNS, LOC, 1 individual) as it relates to the DOE FEIS;
- Scaling down of potential impacts to the lesser quantities involved in the TVA action (1 individual);
- NEPA analysis related to the NFS facility and the environmental assessment to be performed by NRC for a license amendment for the NFS facility (NRC, 1 individual);
- Age of the DOE FEIS and identification of areas the commenter believed needed updated, additional review or further disclosure of analyses, e.g. socioeconomic, transportation, safeguards and accident scenarios (CNS);
- Assurance that regulation and licensing would be consistent with NRC procedures for other commercial fuel cycle facilities in the United States and previous Records of Decision issued by DOE regarding disposition of Low Level Waste (TDEC).

TVA initiated review on the use of surplus HEU as a source of low enriched uranium in March, 1994 in response to a Commerce Business Daily inquiry and **Federal Register** notice from DOE for proposed disposition options for uranyl nitrate (UN) solutions at its Savannah River Site (SRS). TVA performed feasibility studies specifically aimed at utilization of "off-spec" HEU as a source of enriched uranium for TVA reactors and began discussions with commercial fuel vendors to

identify potential

interest in providing fuel fabrication services using such uranium. Based on these studies, TVA provided input for DOE's consideration in evaluating the alternatives for HEU disposition in the FEIS. Following NEPA review for potential environmental effects, TVA conducted a limited successful demonstration (from Spring 1999 through Fall 2000) at its Sequoyah Nuclear plant using 4 fuel assemblies derived from off-specification highly enriched uranium. Results of the test indicated that the HEU-derived fuel performed normally, caused no changes in plant operational parameters, characteristics or safety, and resulted in no new or additional wastes beyond those occurring with typical operations.

In 1997, TVA and DOE signed a Memorandum of Understanding to fully investigate the commercial and technical viability of using up to 33 metric tons of "off-spec" HEU. TVA requested formal proposals from all domestic commercial fuel vendors in 1998 to provide services including HEU purification, downblending, conversion to uranium dioxide powder, and fabrication into fuel assemblies. A consortium composed of FramatomeCogema Fuels in Lynchburg, Virginia, Siemens Power Corporation in Richland, Washington, and Nuclear Fuel Services in Erwin, Tennessee, provided the best proposal. Subsequent to the original proposal, FramatomeCogema Fuels and Siemens Power Corporation merged into Framatome ANP. TVA then initiated joint negotiations with DOE and the consortium to determine the most costeffective approach to complete the HEU disposition consistent with the FEIS assumptions. These negotiations have culminated in the TVA decision to enter into agreements with DOE and the commercial consortium. These agreements have the following major provisions

1. DOE shall provide natural uranium in the form of UF<sub>6</sub> to TVA as blendstock.
2. TVA shall provide natural uranium oxide for downblendingg 33 metric tons of HEU.
3. TVA's contractor shall convert 225 metric tons of natural uranium powder into UN solution and ship the solution to SRS for downblending HEU.
4. DOE shall downblend approximately 16 metric tons of HEU at **SRS into low-enriched UN solution containing 233 metric tons** of uranium.
5. TVA's contractor shall ship the low-enriched UN solutions from SRS to the NFS site.
6. DOE shall ship approximately 17 metric tons of HEU to NFS for

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downblending into low-enriched UN solution containing 228 metric tons of uranium.

7. TVA's contractor shall convert all of the low-enriched UN solutions to UO<sub>2</sub> powder containing 461 metric tons of uranium at the NFS site.

8. TVA's contractor shall ship the UO<sub>2</sub> powder to Richland, WA for fuel pellet and fuel assembly fabrication.

The environmental impacts of the above actions have been evaluated by TVA and determined to be bounded by the actions analyzed in the FEIS. The following discussion provides the basis for this determination, and also attempts to address comments received from the public, organizations and agencies.

#### **Impact of Blendstock Selection**

##### **(Provisions 1 and 2)**

DOE evaluated a number of different options for providing uranium blendstock to blend the HEU (FEIS pages 2-4 & 2-14). These included depleted uranium and natural uranium both in the form of UF<sub>6</sub> and uranium oxide powder. The natural or depleted UF<sub>6</sub> to be provided to TVA already exists in DOE inventory at the USEC. Transfer to TVA would be accomplished at the USEC site by a "book transfer" to the TVA inventory already in storage at USEC. Therefore, no environmental impact would result from this transfer action. Since a UNH blending process will be utilized both at SRS and NFS, UF<sub>6</sub> must be converted into uranium oxide powder for dissolution into UN solution. TVA evaluated the alternative of converting the UF<sub>6</sub> to uranium oxide at one of its commercial fuel fabricators versus procuring uranium oxide powder directly on the commercial uranium market. The total cost of shipping the UF<sub>6</sub> (either natural or depleted uranium), conversion to uranium oxide powder, and shipping the powder to NFS for dissolution was greater than procuring the powder directly. Furthermore, the environmental impact of the UF<sub>6</sub> conversion to powder would be greater. Approximately 50-70 shipments of depleted or natural UF<sub>6</sub> from the USEC facilities in Paducah, Kentucky, or shipments of depleted UF<sub>6</sub> from Oak Ridge, Tennessee, would be required. The FEIS evaluated shipping UF<sub>6</sub> to the GE (now Global Nuclear Fuel-GNF) plant in Wilmington, North Carolina, from Paducah (a distance of 1,278 km) or from Oak Ridge (a distance of 791 km) for conversion to uranium oxide powder. Once converted the uranium oxide powder would have to be shipped from the GNF plant to NFS (a distance of 860 km) in approximately 40 shipments. To complete these actions, a minimum of 90 total shipments resulting in 73,950 shipment-km of transportation would be required. TVA

proposed procuring uranium oxide powder directly from a commercial supplier such as Cameco in Ontario, Canada. Approximately 40 shipments of uranium powder from the Cameco facility in Blind River, Ontario, Canada (a distance of 1,700 km from NFS) would be required, resulting in 68,000 km of transportation. Although, the route from Cameco to NFS was not specifically analyzed in the FEIS, the expected environmental impact from this transportation is estimated to be less than the UF<sub>6</sub> alternative primarily due to the elimination of the UF<sub>6</sub> shipments. (Note that UF<sub>6</sub> is a more volatile chemical form than uranium oxide). Shipment of uranium oxide powder from other commercial suppliers in the United States would have less impact than shipments from Cameco. The FEIS did evaluate the impact of shipping natural uranium powder from the Hanford site in Richland, Washington, to SRS (a distance of 4,442 km) to bound the maximum intersite transportation effects (FEIS page 2-14 and Appendix G) for all intermediate routes. The FEIS analyses of this route does bound the impact of the TVA proposed action. TVA also evaluated use of surplus depleted uranium solutions at SRS and surplus low-enriched uranium powder at DOE's Fernald site as blendstock.

Both of these alternatives were unacceptable because the chemical contaminants in this material made it unusable as blendstock.

Finally, the incremental effect of TVA's adopted action is less than the TVA alternative action of refueling its reactors using uranium procured in the commercial market. If TVA did not use the surplus HEU as a source of uranium, it would have to procure natural UF<sub>6</sub> from its commercial vendors. Only two vendors exist in North America, ConverDyn in Illinois and Cameco in Canada. TVA normally procures 50 percent of its requirements annually from ConverDyn. If the T-1 derived uranium is not used, TVA would procure approximately 2,500,000 kg of uranium as UF<sub>6</sub> from Cameco. This would require over 300 shipments of natural UF<sub>6</sub> from Cameco to USEC enrichment facilities at Paducah, Kentucky, (a distance of 1,450 km) resulting in 435,000 shipment-km. Therefore, the proposed action, procuring natural uranium oxide powder from Cameco as blendstock has much less significant environmental impacts in regard to transportation than the alternative of not using the HEU derived uranium:

#### **Impact of Blendstock Dissolution (Provision 3)**

The natural uranium oxide powder delivered to NFS will be converted into a uranyl nitrate solution for blending HEU using the UNH blending process (FEIS page 2-20). Approximately, 562,500 liters of uranyl nitrate solution containing 225,000 kg of uranium will be shipped from the NFS site in Erwin, Tennessee, to the SRS in Aiken, South Carolina, (a distance of 620 km). The shipments will be made in DOT certified cargo tank trailers approved for shipping uranyl nitrate solution. Approximately 50 shipments total will be required with a maximum of 15 shipments in a year. The route to be taken will primarily be interstate highways from Johnston City, Tennessee, to Asheville, North Carolina, via I-81 and I-40, Asheville, North Carolina, to Columbia, South Carolina, via I-26, and Columbia, South Carolina, to Aiken, South Carolina, via I-20. The FEIS does not specifically evaluate these shipments in Appendix G. However, the FEIS does evaluate shipment of 4 percent uranyl nitrate solution from SRS to the Westinghouse commercial fuel fabrication plant in Columbia, South Carolina, (FEIS page 4-95) and the shipment of 4 percent uranyl nitrate hexahydrate from NFS to Westinghouse in Columbia, South Carolina, (FEIS page G-7) over the same route. The results of the FEIS transportation analyses bound the expected impacts of the planned natural uranyl nitrate solution shipments from Erwin, TN to Aiken, SC because the total number of shipments evaluated in the FEIS over the same route is greater than 500 shipments and the FEIS analyses were done for 4 percent enriched uranium instead of natural uranium. The total health impact of shipping the natural uranyl nitrate solution (estimated at <6E-03 fatalities total) is significantly less than the total health impact from the FEIS analyses (5.5E-02 fatalities total). Furthermore, the FEIS bounding analyses for shipping natural uranium blendstock (FEIS page 2-14) is from the Hanford site in Richland, Washington, to SRS (a distance of 4,442 km). For 50 shipments of natural uranium blendstock over this route a total health impact of 3.7E-02 fatalities can be calculated from Table G.1-6 of the FEIS.

#### **Impact of Blending 17 Metric Tons of HEU at SRS (Provision 4)**

The FEIS specifically evaluates blending up to 200 metric tons of HEU to a combination of 4 percent UNH and

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0.9 percent UNH at SRS (FEIS pages 264 to 2-77).

### Impact of Shipping Enriched Uranyl Nitrate Solution from SRS to NFS (Provision 5)

TVA's contractor will ship 233 metric tons of low enriched uranium as uranyl nitrate solution from SRS to NFS in Erwin, Tennessee. The route to be used is the same route discussed previously in regard to natural uranium solution shipping. The shipments will be made in 230 gallon Type B shipping containers licensed by the NRC. Each commercial truck shipment will carry 9 shipping containers for a total of 2070 gallons containing 800 kg of uranium. Type B shipping containers are required by federal regulations for these shipments because of the U-234 concentration expected in the uranyl nitrate solution. Type B containers are designed and tested to meet stringent requirements (FEIS page G-14) to ensure that the contents are not released even under hypothetical accident conditions. TVA contracted with Columbiana Boiler to design, test, and license a bulk liquid transport package suitable for shipping low-enriched uranyl nitrate solution.

The uranyl nitrate solution shipping campaign will occur over the period of 2003-2007 and will require approximately 300 shipments. The maximum number of shipments expected per year is 70. The FEIS evaluated shipment of 4 percent uranyl nitrate solution from SRS to the Westinghouse commercial fuel fabrication plant in Columbia, South Carolina, (FEIS page 4-95) using Type A cargo tankers and the shipment of 4 percent uranyl nitrate hexahydrate crystal from NFS to Westinghouse in Columbia, South Carolina (FEIS page G7) using Type A containers.

These shipments are over the same route proposed for the low enriched uranyl nitrate solution. The results of the FEIS transportation analyses cited bound the expected impacts of the planned low enriched uranyl nitrate solution shipments because the total number of Shipments evaluated in the HIS over the same route is greater than 500 shipments as compared to the 300 shipments necessitated by the TVA action. Additionally, the FEIS assumes the shipments are made in Type A containers (FEIS page 4-102) with a 100 percent content release rate during maximum accident conditions (FEIS page G2). The low enriched uranyl nitrate solution shipments will be made in Type B containers with zero content release expected during accident conditions. The total health impact of

shipping the low enriched uranyl nitrate solution is estimated to be less than  $5.8E-02$  fatalities using the conservative assumptions of the FEIS. The smaller number of shipments and the use of Type B containers would result in lesser health impacts from TVA actions. Furthermore, the FEIS bounding analyses for shipping low enriched uranium is from SRS to Siemens in Richland, Washington, (a distance of 4,442 km). For 300 shipments of low enriched uranium over this route a total health impact of  $2.1E-01$  fatalities can be calculated from Table G.1-7. **Impact of Blending 16 Metric Tons of HEU at NFS (Provision 6)**

The FEIS specifically evaluates blending up to 200 metric tons of HEU to a combination of 4 percent UNH and 0.9 percent UNH at NFS (FEIS pages 264 to 2-77).

### Impact of Converting Low Enriched Uranyl Nitrate Solution to UO<sub>2</sub> (Provision 7)

Processing and downblending up to 200 metric tons of HEU at the NFS site is specifically evaluated in the FEIS. The FEIS assumes that the product of the downblending operation would be UNH crystals. The process is illustrated in the FEIS on page 2-21. Further, the FEIS assumes that the UNH crystals will be shipped to commercial fuel fabricators for dissolution to UN liquid, denitration to U308 powder, and reduction to UO<sub>2</sub> powder.

Under TVA's adopted action, the denitration and reduction processes to produce low enriched UO<sub>2</sub> powder would be undertaken at the NFS site. The FEIS evaluated the impacts of downblending 25 percent of the surplus HEU (50 metric tons) to 0.9 percent enriched uranyl nitrate solution (3750 metric tons) and conversion to U308 powder at the NFS site (FEIS pages 220 to 2-22 and 2-41 to 2-44). Thermal denitration of uranyl nitrate solution to U308 will produce essentially equivalent gaseous and liquid effluents as the ammonium diuranate (ADU) process used to produce UO<sub>2</sub>: In the thermal denitration process, the effluents are recovered from the offgas in a liquid process. In the ADU process, the nitrates are also recovered as liquid and the ammonium hydroxide is recycled. Both processes require offgas treatment including filtration for uranium solids by HEPA filtration. Since the effluent from the ADU process will be concentrated and solidified, the impact to the environment will be minimized. Therefore, the FEIS analyses for conversion of 3750 metric tons uranium as uranyl nitrate solution to U308

powder bound the expected impacts of the proposed conversion of 461 metric tons uranium as low enriched uranyl nitrate solution to UO<sub>2</sub> powder at the NFS site. Addition of these processes and the storage tank facility at the NFS site for uranyl nitrate, would require a license amendment from the NRC. The NRC will independently evaluate the potential environmental impacts of a proposed license amendment by NFS. **Impact of Shipping 461 Metric Tons of UO<sub>2</sub> Powder to Framatome ANPRichland (Provision 8)**

After the low enriched uranyl nitrate solution is converted into UO<sub>2</sub> powder at NFS, it will be shipped to the Framatome ANP fuel fabrication facility in Richland, Washington. The shipping campaign will occur over the period of 2004-2008. A total of 154 shipments will be required to transport 461 metric tons of uranium as UO<sub>2</sub> powder. The maximum number of shipments expected in any one year is 40. The UO<sub>2</sub> will be packaged in Type B shipping containers meeting DOT requirements and licensed by the NRC. The FEIS evaluates shipping low enriched uranium as UNH crystals from NFS to Siemens (now Framatome ANP) in Richland, WA. UNH crystals require more volume than UO<sub>2</sub> powder, therefore, 215 shipments would be needed to ship the 461 metric tons of uranium as crystals. Furthermore, UNH crystals are much more soluble than UO<sub>2</sub> powder and accidental releases of UNH crystals would likely have a more significant impact than releases of UO<sub>2</sub> powder. From the HIS Table G.1-7, the total health impact for these shipments is calculated as  $1.44E-01$  fatalities. The FEIS analyses bound the expected impacts of shipping the low enriched uranium as UO<sub>2</sub>.

### Use of Off-Specification HEU

TVA is planning to use the offspecification material described in the HIS that can be economically recovered. The HIS does cover the impact of blending this off-specification uranium to 4 percent enrichment for commercial reactor use 11.1 Allterindati-VE! -0 Maximum Commercial Use Alternatives (Pages 2-9). This alternative evaluated an 85 percent fuel/ 15 percent waste ratio for 200 metric tons of surplus HEU. The 85 percent commercial fuel usage included offspecification uranium that could be economically recovered (approximately 33 metric tons). The 15 percent waste included H-EU material that cannot be economically recovered. The results are summarized in Table 2.4-1 (page 2-64) and discussed in Chapter 4 of the FEIS.

### UG111LLQLI-711 process, nitrates

are recovered from the offgas in a liquid process. In the ADU process, the nitrates are also recovered as liquid and the ammonium hydroxide is recycled. Both processes require offgas treatment including filtration for uranium solids by HEPA filtration. Since the effluent from the ADU process will be concentrated and solidified, the impact to the environment will be minimized. Therefore, the FEIS analyses for conversion of 3750 metric tons uranium as uranyl nitrate solution to U308

#### Socioeconomics

"TVA's staff economist reviewed the DOE FEIS and concluded that the FEIS adequately covers the socioeconomic and environmental justice considerations for TVA's proposed actions. One activity was evaluated in greater detail for socioeconomic effects to corroborate that effects were minimal and did not create additional substantive issues or potential for impacts. Construction of additional facilities at NFS is not explicitly addressed in the DOE FEIS. Construction would require about 4 years, with a maximum employment of about 105 workers. This activity would have a positive socioeconomic impact on the area. At maximum employment, the number of jobs in Unicoi County, where the facility is located, would increase about 1.6 percent. However, the Labor Market Area within which most construction workers would live, also includes Carter, Sullivan and Washington Counties. This Labor Market Area (LMA) has a combined employment level of over 189,000 workers. Therefore the maximum LMA employment increase during construction would be less than one-tenth of one percent and would constitute a minor, insignificant addition to employment in the LMA.

#### Other Considerations

As discussed, the DOE FEIS bounds the expected environmental impacts from the proposed TVA actions. Furthermore, the alternative of obtaining low enriched uranium through conventional mining, milling, conversion, and enrichment has far greater environmental impacts than the proposed action. To produce an equivalent amount of LEU for fuel rod assemblies would require 14 million pounds of U308 which would conservatively require mining about 140,000 tons of ore. Finally, the following should be considered. The Department of Transportation estimates that 3.6 billion tons of regulated hazardous materials are transported each year in the United States with approximately 500,000 shipments of hazardous materials occurring each day (WEIS page 4-101). There are approximately 2 million annual shipments of radioactive materials representing about 2 percent of the annual hazardous material shipments. As discussed, TVA's proposed

actions will replace some of those shipments with other shipments in the form of natural uranium and low enriched uranium. All of the shipments anticipated resulting from the TVA

actions would represent less than a 0.01 percent increase in the number of expected radioactive material shipments over the same time period, and constitute an insignificant addition to the amount of such material shipped.

#### Avoidance and Minimization of Environmental Harm

As discussed, implementation of the decisions in this ROD will result in low environmental and health impacts during normal operations. These impacts were adequately addressed in the DOE FEIS. However, DOE, TVA, and its contractors will take all reasonable steps to avoid or minimize harm, including the following:

- DOE and TVA will use current safety and health programs and practices to reduce impacts by maintaining worker radiation exposure as low as reasonably achievable.
- DOE, TVA and its contractors will meet appropriate waste minimization and pollution prevention objectives consistent with the Pollution Prevention Act of 1990. As discussed in the HEU FEIS, segregation of activities that generate radioactive and hazardous wastes will be employed, where possible to avoid the generation of mixed wastes. Treatment to separate radioactive and non-radioactive components will be employed to reduce the volume of mixed wastes. Where possible, non-hazardous materials will be substituted for those that contribute to the generation of hazardous or mixed waste. Waste streams would be treated to facilitate disposal as nonhazardous wastes, where possible. In addition to following such practices at its own federal facilities, TVA and DOE will seek to include comparable requirements in contracts with commercial facilities.

Dated: November 4, 2001. John Scalice, Chief Nuclear Officer and Executive Vice President. [FR Doc. 01-28844 Filed 11-16-01; 8:45 am]

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