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April 26, 2005
GDP 05-0014

Mr. Robert C. Pierson
Director, Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Paducah Gaseous Diffusion Plant (PGDP)
Portsmouth Gaseous Diffusion Plant (PORTS)
Docket Nos. 70-7001/70-7002, Certificate Nos. GDP-1/GDP-2
Commitments Regarding NRC Bulletin 2003-03

Dear Mr. Pierson:

INTRODUCTION AND BACKGROUND

On September 29, 2003, USEC provided a response to NRC Bulletin 2003-03, "Potentially Defective 1-Inch Valves for Uranium Hexafluoride Cylinders" (Reference 1). In a letter dated March 17, 2004 (Reference 2), the NRC approved, with modifications, USEC's response to Bulletin 2003-03. Although USEC's Bulletin response identified that new cylinders with installed Hunt valves were included in USEC's inventory, USEC's response did not explicitly address the activity of filling these new cylinders. The purpose of this letter is to address USEC's inventory of new cylinders with installed Hunt valves and to seek approval to continue filling these cylinders with depleted UF_6 at the Paducah GDP.

Of the approximately 742 new cylinders with Hunt valves installed in USEC inventory at the time of issuance of the NRC Bulletin, approximately 212 of these cylinders have been filled with tails and sent to long term storage. Approximately 192 of these cylinders were sent for use at Portsmouth to receive cleaned feed material from the Technetium-99 cleanup project. All of the 192 cylinders used at PORTS were filled and returned to PGDP prior to the August 29, 2004 Bulletin transition date and have either been fed to the cascade and emptied, have been fed and filled with tails over a feed heel and sent to the tails yard for long term storage, or remain to be fed. The filling of these new cylinders with depleted UF_6 material at PGDP has been performed in accordance with the process controls described in USEC's original Bulletin response (See Reference 1). Approximately 338 new, clean cylinders remain in inventory.

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A recent Region II inspection (Inspection 2005-002) questioned whether filling the cylinders returned from PORTS with depleted UF_6 at PGDP was an activity authorized by the NRC's approval of USEC's response to Bulletin 2003-03. Pending investigation of this question, USEC suspended filling these cylinders used at PORTS with depleted UF_6 at PGDP. USEC performed a review of the USEC and NRC correspondence relating to the Bulletin, and determined that, although USEC's response to Bulletin Requested Action A identified that new cylinders were included in USEC's inventory, the activity of filling the new cylinders containing Hunt valves was not explicitly addressed. USEC also suspended filling clean cylinders (i.e., never used cylinders) with depleted UF_6. From a risk perspective, USEC believes there is no practical difference between filling these new cylinders with depleted UF_6 and the filling of cylinders containing a Hunt valve approved by the NRC in Reference 2 since the testing performed prior to and after cylinder filling confirms the leak integrity of the cylinder valve. USEC believes that filling these new cylinders, which contain a Hunt valve, and were in USEC's inventory prior to issuance of the Bulletin, with depleted UF_6 should be acceptable. Therefore, USEC requests explicit NRC approval 1) to allow USEC to fill new cylinders previously used at PORTS, when emptied of feed material, with depleted UF_6 for long term storage and 2) to continue filling new, clean cylinders currently in USEC's inventory with depleted UF_6 for long term storage.

SAFETY BASIS

USEC provided in its original response (Reference 1) to the Bulletin, a detailed safety justification for continued use of Hunt valves and a description of the processes to which cylinders are subjected. The portions of this original response, which are pertinent to the filling of new cylinders, which contain a Hunt valve, with depleted UF_6 are discussed below.

The safety function of large cylinders containing UF_6 (including the valve and plug) is to provide primary system integrity to minimize the potential for releasing UF_6 to the atmosphere. Cylinders utilized to contain UF_6 are designed, built, and tested to ANSI N14.1, and used as prescribed in the GDP SARs. This ensures safe containment of UF_6 during various cylinder activities, including filling and storage of cylinders containing depleted UF_6. Cylinders (including the valve and plug) are particularly relied upon to prevent a release of liquid UF_6; a release from a cylinder containing solid UF_6 would be small and would impact only the immediate area. In addition, cylinders (including the valve and plug) are relied upon in nuclear criticality safety analyses to prevent the introduction of water from the environment into a cylinder containing enriched uranium; however, this is not a concern for cylinders containing toll normal feed material or depleted uranium.

The SARs for the GDPs identify a number of potential accident scenarios involving the release of UF_6 from cylinders from a variety of initiating events. The SAR analysis for the release from a cylinder containing solid UF_6 is that only workers in the immediate

area of the release would be impacted and that evacuation of the area (see and flee) could be readily accomplished in a manner that would prevent significant exposure to personnel. The primary safety concern is the loss of containment on cylinders containing liquid UF_6. In this regard, three basic types of scenarios are examined in the SAR. The first is loss of containment of a cylinder containing liquid UF_6, from a variety of initiating events, while the cylinder is contained in an autoclave. In these cases, the safety features of the autoclave and the associated operating requirements provide adequate protection to workers and the public from such an event. A second type of event is the rupture of a line (pigtail) connecting a cylinder being filled to the process source of liquid UF_6. For these postulated accidents, reliance is placed on the pigtail design and on safety isolation valves at PORTS or the cylinder valve closer at PGDP to prevent a release that would exceed evaluation guidelines to the public or the workers. The third type of postulated event is the loss of integrity of a cylinder containing liquid UF_6 outside of an autoclave due to a variety of initiating events that mechanically damage the cylinder. This postulated event has an unacceptable consequence to the public and workers and the frequency is maintained at acceptable levels by a combination of design features (cylinders and cylinder handling equipment) and operational requirements. In the events discussed above, the bounding source terms and associated consequences are orders of magnitude larger than the postulated release from any valve leakage seen by USEC in the Hunt valve test program, which USEC performed as a result of NRC's identified concerns with Hunt Valves, and is discussed in Reference 1. Thus, the consequences of any valve leakage of the type experienced in the USEC testing would be within the SAR safety basis and would have no impacts on personnel outside the immediate area or on the public.

Based on the USEC experience with Hunt valves as described in Reference 1, USEC is confident that the Hunt valves installed on these new cylinders are capable of performing their intended safety function under all design conditions. Since 1990, USEC has utilized cylinders equipped with over 25,000 Hunt valves for processing, storage and transport of UF_6. During this time period, USEC has not experienced adverse trends in the performance of these valves. As noted above, the testing performed by USEC in response to information provided by NRC did not identify information that would cause us to conclude that the Hunt valves in use would not meet the performance requirements relied upon for safety. The Hunt valves, with the design as specified in the ANSI N14.1 standard, have a large margin of safety in providing the containment boundary. The valve body and seat are pneumatically tested at 400 psig; this pressure is approximately four times greater than the highest pressure that would be experienced during normal operating and potential accident conditions. The valve body has ultimate strength many times higher than the test pressures. The part of the valves with the lowest margin relative to leakage is the packing and the valve seat. New cylinders, which contain Hunt valves and were in USEC inventory prior to issuance of the Bulletin, have been certified by the cylinder vendors to meet the ANSI testing requirements, i.e., the cylinder testing that includes the post valve installation 100 pound air test that includes the valve packing, valve seat, and valve connection to the cylinder.

In addition to the testing requirements associated with the procurement of UF_6 cylinders and valves, operating procedures require a number of pressure and vacuum checks for the leak tightness of the cylinder, valve, and UF_6 connections prior to a number of processing evolutions, including filling a new cylinder, which contains a Hunt valve, with depleted UF_6. Before a cylinder is filled at a withdrawal station, the connector of the cylinder to the process (pigtail) is checked with the cylinder valve closed to verify the pigtail leak tightness, and thereby the cylinder valve leak tightness, under vacuum and positive pressure representative of the UF_6 process pressure. The cause of any leakage is verified and if a cylinder valve is leaking, except for its packing that may be retightened, the valve would be changed and leak tightness established prior to accepting the cylinder for processing. Following the positive pressure check of the pigtail, the cylinder valve is opened and the cylinder internal vacuum is confirmed. A cylinder with a pressure above established limits is rejected and the cause determined. These checks verify that the cylinder valve is performing its intended safety function. When the UF_6 flow is introduced, the valve and other connections are carefully monitored for signs of leakage, and the flow is secured if any leakage is noted. At the completion of cylinder filling, the UF_6 supply is valved off, the cylinder valve is closed and the pigtail is evacuated. Prior to disconnection of the pigtail, vacuum checks are performed to verify that the cylinder valve is leak tight and that the shutoff valve from the UF_6 supply source is leak tight. These checks performed for the filling of every cylinder provide added assurance that the cylinder valve will perform its safety function. The cylinder is then moved by crane to a cooling location for a period of at least 5 days for a 48-inch diameter cylinder. Any small valve leakage would be detected during that time as the cylinder cools and internal pressure drops from 40-70 psia to subatmospheric. The cylinder is then moved to a storage location. As a result of the above operational requirements, the USEC operating experience with Hunt valves, and the robustness of the design and testing, there is reasonable assurance of the ability of the Hunt valves installed on these new cylinders to perform their safety function while the cylinders are being filled and put in long term storage.

ECONOMIC/RADIOLOGICAL IMPACTS

USEC has filled, approximately 212 new, clean cylinders with depleted UF_6 that have new Hunt valves installed. Additionally there are approximately 338 new, clean cylinders of this type remaining in USEC's inventory for filling. Also, approximately 192 new cylinders with Hunt valves were filled at PORTS with feed material that had been cleaned of Technetium-99 contamination, and returned to Paducah for feeding. The cost to USEC, both from a radiological and financial perspective, to change out the Hunt valves on the 212 cylinders already filled with depleted UF_6, the remaining 338 available for filling, and the 192 cylinders filled at PORTS is significant. To change out the valves on the 212 new cylinders already filled with depleted UF_6 or the 192 used at PORTS entails some minor additional risk including some additional low level radiation exposure compared to leaving the Hunt valves installed. In addition, because cylinder valve changes are an evolution performed by operations and maintenance personnel, increasing the occurrences of this operation inherently increases the potential for human error. This

includes errors associated with the valve change-out itself, where the existing cylinder valve is removed and the new valve is installed in rapid succession with an initial vacuum in the cylinder to prevent any UF_6 release. The additional handling of full cylinders would involve some low added risk of cylinder breach due to the additional handling evolutions. These handling evolutions could also multiply due to removal of cylinders from storage in two tiered long term storage arrays for tails, or three tiered arrays for stored heeled cylinders. Although both of these operations are designed to keep the risk of a UF_6 release caused by human error extremely low, increasing the number of times that valve change outs are performed would necessarily increase the potential for such a release and resulting exposure.

The financial cost to USEC to replace the Hunt valve on the 212 cylinders is approximately $489,000. The cost to replace the Hunt valve on the 192 cylinders is approximately $443,000. If required to replace the Hunt valve on the 338 remaining new clean cylinders, the financial cost would be approximately $780,000. These costs include the price of the new valve, maintenance resources, job planning, movement of the cylinder into position for maintenance, quality control activities, and health physics resources as some of this work can be done only in areas that are controlled to prevent the potential spread of radioactive contamination, and the supervision of these resources. These costs assume the work can be factored into a normal work schedule. However, if any of this work must be done on overtime to preclude impacting normal work schedules, an additional cost of approximately $580 per cylinder performed on overtime would be required. Additional costs associated with multiple cylinder moves which may be necessary to retrieve cylinders in long term storage arrays or the use of more than one valve, should a valve be damaged during installation, are not included here. USEC believes that these radiological and financial costs to change out the Hunt valves on these new cylinders poses an unnecessary burden based on the safety significance of this issue.

USEC would appreciate your approval of this request within thirty days of its receipt. Should you have any questions regarding these requests, please contact Mark Smith at (301) 564-3244.

Sincerely,

S. A. Toelle

Steven A. Toelle
Director, Nuclear Regulatory Affairs

References:

1. USEC letter from Steven A. Toelle to USNRC, "Response to NRC Bulletin 2003-03," USEC letter number GDP 03-0060, dated September 29, 2003.
2. NRC letter from Robert C. Pierson to Steven A. Toelle (USEC) dated March 17, 2004.

cc:
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