October 6, 2006

MEMORANDUM TO: Leonard Wert, Director
Division of Nuclear Materials Safety, Region IV

FROM: Scott C. Flanders, Deputy Director **//RA//**
Environmental and Performance
Assessment Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

SUBJECT: TECHNICAL REVIEW OF TITLE 10 OF THE CODE OF FEDERAL REGULATIONS PART 20.2002 REQUEST BY EXXONMOBIL, REFINING & SUPPLY COMPANY

On July 13, 2006, you requested that my staff review ExxonMobil, Refining & Supply Company's July 6, 2006, Title 10, Code of Federal Regulations (10 CFR) Part 20.2002 request. My staff has reviewed the 10 CFR 20.2002 request and finds it acceptable.

ExxonMobil Refining & Supply Company requested license approval for the free release of its F-551 hydrogen reformer furnace, which was contaminated by a depleted uranium catalyst. Based on the enclosed Safety Evaluation Report (Enclosure 1), the licensee has demonstrated, and the U.S. Nuclear Regulatory Commission (NRC) staff has confirmed, that the proposed 10 CFR Part 20.2002 disposal is expected to result in minimal risk to workers and the public. The licensee evaluated the potential dose to a worker due to continued furnace operation, to an on-site demolition worker who uses a torch-cutter to cut the furnace manifold into pieces for disposal or recycling, to a resident who consumes groundwater contaminated with leachate from a landfill where the contaminated scrap is disposed, and to a worker handling or processing steel slag resulting from the recycling of the furnace. The licensee concluded and the NRC staff confirmed that the potential dose to a worker handling or processing steel slag bounds the potential doses to other individuals. Although the licensee did not consider the inhalation pathway when evaluating the potential dose to a demolition worker, the NRC staff reviewed previous analyses performed to support NUREG-1640 and agrees that the potential dose to a worker handling or processing steel slag bounds the potential dose to an on-site demolition worker.

The licensee calculated a gross activity derived concentration guideline level (DCGL) corresponding to a dose of 0.01 millisievert/year (mSv/yr) (1 millirem (mrem)/yr) total effective dose equivalent (TEDE) to an average member of the critical group of workers handling or processing steel slag. Because most of the area with detectable contamination was measured to have radioactivity below the DCGL, and only one small area was found to have residual contamination that was slightly above the DCGL, the licensee demonstrated and the NRC staff

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confirmed that the residual low-level contamination within the equipment and piping remaining on-site would result in a dose to the public of less than 0.01 mSv/yr (1 mrem/yr) TEDE. Therefore, the NRC staff recommends approval of this modification to the licensee's authority to dispose of waste in accordance with 10 CFR Part 20.2002.

Further, in accordance with the provisions of 10 CFR Part 40.14, "...the Commission may, upon application by an interested person or upon its own initiative, grant such exemptions from the requirements of the regulations...as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." Based on the above analyses, this material, if authorized for possession, recycling, or disposal without further Atomic Energy Act (AEAct) and NRC licensing requirements, poses no danger to public health and safety, does not involve information or activities that could potentially impact the common defense and security of the United States, and it is in the public interest to allow disposal or recycling of this material. Therefore, to the extent that this material is otherwise licensable, the staff concludes that the person possessing, recycling, or disposing of this material is exempt from further AEAct and NRC licensing requirements. Region IV is hereby given the authority to grant the exemption for this licensing action. Language to be used in the cover letter of the amendment, environmental assessment, and safety evaluation report are included as Enclosure 2.

Docket: 040-08769

Enclosures:
1. Safety Evaluation Report
2. Cover Letter

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U.S. NUCLEAR REGULATORY COMMISSION
DOCKET NUMBER 040-08769
October 6, 2006

SAFETY EVALUATION REPORT
Related to Amendment Request to Revise Authority to Possess, Recycle, or Dispose of One F-551 Hydrogen Reformer Furnace Containing Depleted Uranium Material Pursuant to 10 CFR 20.2002
Materials License No. SUB-1382
Issued to ExxonMobil Refining & Supply Company

1.0 BACKGROUND

On July 6, 2006, ExxonMobil Refining & Supply Company requested license approval for the free release of its F-551 hydrogen reformer furnace. Free release of the furnace is requested to support the termination of U.S. Nuclear Regulatory Commission (NRC) license number SUB-1382. The request for approval is submitted pursuant to Section 20.2002 of Title 10 of the Code of Federal Regulations (10 CFR), "Method of Obtaining Approval of Proposed Disposal Procedures."

From 1980 to 1986, the F551 hydrogen reformer furnace contained depleted uranium (DU) catalysts in 84 furnace tubes. In 1986 the catalysts were removed, shipped off-site, and replaced with non-radioactive nickel-molybdenum catalysts. In 1995, all of the furnace tubes were removed and surveyed. Residual radioactivity was detected at the bottoms of some of the furnace tubes that had contained the DU catalyst. These areas were decontaminated and a subsequent survey indicated that the residual radioactivity had been reduced to less than 83 becquerel per square centimeter (Bq/100cm^2) (5,000 disintegrations per minute (dpm)/100cm^2). The tubes were internally sandblasted and returned to service.

In 2005, all of the tubes were replaced during furnace maintenance. During the 2005 maintenance, several pieces of the furnace that were not normally accessible were made accessible. Areas of the furnace that could be contaminated were identified based on process knowledge and were surveyed. The survey included scans and direct static measurements with handheld pancake Geiger-Mueller (GM) detectors as well as swipe samples measured for gross alpha activity. The survey results indicated that residual radioactivity remained on a pipe elbow and product collection manifold that were downstream of where the DU catalysts had been. The pipe elbow has been removed and will be disposed of as radioactive waste. The collection manifold, which is not normally accessible to workers during furnace operation, will remain in place.

2.0 TECHNICAL EVALUATION

The NRC staff evaluated the licensee's analysis of free release of the F551 Hydrogen Reformer Furnace to demonstrate compliance with 10 CFR 20.2002(d) using the general guidance for dose modeling in the NUREG-1757, Volume 2, Section 5, supplemented by the decommissioning specific guidance of the license termination rule. The licensee's approach was to develop a gross activity derived concentration guideline level (DCGL) corresponding to a dose of 0.01 millisievert/year (mSv/yr) (1 millirem (mrem)/yr) total effective dose equivalent (TEDE) to the average member of the critical group and to demonstrate that the residual radioactivity remaining on the furnace was less than the DCGL. The critical group is the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances.

2.1 SOURCE TERM

A radiological survey of areas that could have been contaminated by the metallic DU catalyst was performed in 2005. The survey included points where the furnace tubes attached to other pieces of equipment, the manifold down stream of the furnace tubes, the refractory drum, and four other pieces of downstream equipment. The survey indicated that the residual activity on most of the upstream and downstream attachment points was indistinguishable from background and that the residual radioactivity on a few of the attachment points was slightly elevated above background. The highest readings were found in the manifold that carries product from the furnace tubes to the collection basin refractory drum. No readings that were distinguishable from background were found in the refractory drum or downstream equipment.

In 2005, a pipe elbow was removed from the manifold for metallurgical analysis. Removal of the elbow allowed access to the interior of the manifold piping near the removal point. The accessible areas of the piping upstream and downstream of the elbow were scanned, and static measurements were made in the areas where the highest scan readings were found. The mean of the four measurements made upstream of the elbow was 220 Bq/100 cm^2 (13,200 dpm/100 cm^2). No residual radiation that was distinguishable from background was detected downstream of the elbow. A survey of the elbow itself indicated areas with residual radioactivity comparable to the highest reading found on the upstream side of the elbow. The elbow has been replaced and will be disposed as radioactive waste.

If the concentration of residual radioactivity on the entire manifold were equal to the average concentration detected on the upstream side of the elbow, 220 Bq/100cm^2 (13,200 dpm/100 cm^2), the manifold would contain approximately 0.96 megabecquerel (MBq) (26 microcuries) of DU. This value may be an overestimate because the static survey measurements were made in the areas where the highest concentrations were detected during a scanning survey. However, there is significant uncertainty in the source term because only a relatively small fraction of the interior of the manifold was accessible to the survey (i.e., approximately 1%). If it is assumed that the entire manifold is contaminated at the highest measured concentration of residual activity, the calculated activity on the manifold is 2.8 MBq (75 microcuries) of DU. Based on process knowledge, there is no reason to believe that there would be areas of much higher residual radioactivity in other parts of the manifold. Furthermore, a 100% survey of the attachment points upstream of the manifold (i.e., lower pigtails) and of the pipe elbow downstream of the manifold did not indicate any areas with concentrations exceeding the highest concentration observed in the accessible area of the manifold. Therefore, the staff concludes that the assumption that the entire manifold is contaminated at the highest measured concentration, 645 Bq/100cm^2 (38,700 dpm/100 cm^2), is likely to bound the total activity in the manifold. When averaged over the mass of the manifold (approximately 6 metric tons), 2.8 MBq (75 microcuries) of DU would be far less than one-twentieth of 1 percent (0.05 percent) of the mixture.

The licensee identified the refractory drum downstream of the manifold as an area where uranium was likely to be deposited because the product material slowed in this area, giving entrained material an opportunity to settle. However, the drum is lined with refractory bricks that are replaced at 5-year intervals, and have been replaced at least twice since the DU catalysts were removed. In 2005, the interior of the drum was surveyed and no residual contamination that was distinguishable from background was detected.

2.2 EXPOSURE SCENARIOS

The licensee requested that the furnace be released for continued operation and eventual disposal or recycling. To support the request, the licensee considered two site-specific exposure scenarios and two generic exposure scenarios that were evaluated in NUREG-1640. One site-specific scenario addresses the potential dose to a refinery worker due to continued operation of the furnace. The second site-specific scenario addresses the potential dose to an on-site demolition worker who uses a torch-cutter to cut the manifold piping into shorter lengths for disposal or recycling. The licensee compared the potential doses that could result from these two site-specific exposure scenarios to the potential doses that could result from two generic scenarios evaluated in NUREG-1640. Specifically, the licensee considered the potential dose to a resident who drinks groundwater contaminated with leachate from an industrial landfill where scrap metal is disposed and the potential dose to a worker handling slag at a steel mill or processing slag for road construction. Both generic scenarios are based on the assumption that all of the scrap metal or resulting slag encountered by a hypothetical receptor in a year are contaminated. Thus both generic scenarios are based on the assumption that the hypothetical receptor is exposed to considerably more contaminated metal or slag than would result from the disposal or recycling of the F-551 furnace alone.

The licensee indicated that the potential dose to a refinery worker due to normal furnace operation would be less than the potential dose to a hypothetical receptor in any of the other scenarios considered because there is no detectable contamination on the exterior of the furnace. The potential for worker exposure to the interior of the furnace during normal furnace operation is minimal because the furnace operates continuously, generates high temperatures, and is seldom shut down for regular maintenance. Furthermore, the area of highest measured contamination, which was accessible during the survey only because a pipe elbow had been removed, is no longer physically accessible because the elbow has been replaced. The NRC staff agrees that the possible exposures in the other scenarios considered by the licensee bound the potential exposures to individuals due to normal furnace operation.

The second site-specific scenario considered by the licensee addresses the potential dose to a demolition worker who dismantles the furnace with a torch-cutter. The worker was assumed to spend an hour torch-cutting the contaminated manifold into small lengths of pipe so that it could be sent to a steel recycler or landfill. To estimate external exposure, the licensee calculated the exposure to an individual standing 1 meter (3.3 feet) from a 645 Bq (0.02 microcurie) source for 1 hour and concluded that the dose would be much less than 0.01 mSv (1 mrem). The activity of the source is based on the assumptions that the worker is exposed to radioactivity from the interior of the pipe where the pipe is cut into sections, and that the exposure from the interior of the pipe is equivalent to the exposure to a 100 cm^2 area contaminated at a concentration equal to the concentration of the highest static survey measurement (645 Bq/100 cm^2 [38,700 dpm/100 cm^2]). Only exposure from the inside of the manifold piping was considered because there was no detectable residual radioactivity on the exterior of the manifold. Although the licensee did not provide the radius of the piping, the NRC staff concluded the estimate of external exposure was adequate because independent calculations indicated that the resulting dose is several orders of magnitude less than 0.01 mSv (1 mrem). However, review of the scrap-yard worker scenario used to support NUREG-1640 indicates that the dose to a worker shearing, torch-cutting, crushing, and bailing scrap contaminated with U-234, U-235, and U-238 is expected to be dominated by the inhalation, rather than the direct exposure pathway. The licensee eliminated the inhalation pathway because industrial practice is to wear a respirator while torch-cutting to avoid exposure to volatile heavy metals. However, the NRC staff concluded that it was not appropriate to eliminate the inhalation pathway based on the assumption that the demolition worker would be wearing a respirator because respirators do not provide complete protection.

Although the licensee did not calculate the exposure to an on-site demolition worker due to inhalation, the NRC staff concluded that the potential dose to a to a scrap-yard worker bounds the potential dose to a demolition worker torch-cutting the F-551 furnace. The scrap-yard worker scenario analyzed in NUREG-1640 addresses the potential dose to a worker due to shearing or torch-cutting metal, briquetting or crushing thin and lightweight materials, and baling. The daily duration of external and internal exposure is expected to range from 4 to 6 hours, and the individual is assumed to work 250 days per year. Because the amount of time that a scrap-yard worker would spend torch-cutting material in a year is significantly greater than the 60 minutes that a demolition worker is expected to spend torch-cutting the F-551 furnace manifold, the potential dose to a scrap-yard worker bounds the potential dose to an on-site demolition worker torch-cutting the manifold. As indicated in NUREG-1640, Volume 1, Table 3.22, the potential dose to a scrap-yard worker exposed to scrap contaminated with U-234, U-235, and U-238 is expected to be less than the potential dose to a worker handling the resulting slag at a steel mill or processing slag for road construction. Thus, the potential dose to a worker processing or handling steel slag bounds the potential dose to an on-site demolition worker torch-cutting the manifold into smaller lengths of pipe.

The landfill disposal scenario addresses the potential dose to a resident who lives near an industrial landfill where scrap steel has been disposed. The scenario evaluated to support NUREG-1640 is based on the assumptions that a resident's well is located down gradient from the landfill and that the only exposure pathway is the ingestion of drinking water that is contaminated by landfill leachate. The calculation does not include a contribution from other water-dependent pathways, such as the consumption of crops irrigated with contaminated water, because analyses performed to support NUREG-1640 indicated that consumption of drinking water was expected to dominate the dose due to contaminated groundwater. The licensee calculated a DCGL for each radionuclide based on the normalized effective dose equivalents for the ingestion pathway for U-234, U-235, and U-238 as provided in NUREG-1640. When calculating the gross activity DCGL from the DCGL for each isotope, the licensee used the mass fraction of each isotope instead of the activity fraction of each isotope. However, because the normalized effective dose equivalents from exposure to all pathways are the same for U-234 and U-235 and are similar to the normalized effective dose equivalents from exposure to all pathways for U-238, the gross activity is insensitive to the assumed ratios of isotopes. The NRC staff recalculated the gross activity DGCL based on the activity fractions and determined that the change made a negligible (< 2%) difference to the gross activity DCGL. The licensee determined that the gross activity DCGL that would result in a dose of 0.01 mSv/yr (1 mrem/yr) to a resident ingesting drinking water contaminated with leachate from a landfill in which the scrap steel is disposed is 830 Bq/100 cm^2 (49,900 dpm/100 cm^2).

NUREG-1640 identifies workers who process steel slag for road construction as the critical group for U-234 and U-238, and workers who handle steel slag as the critical group for U-235. Both scenarios include exposure from ingestion, inhalation, and direct exposure. In both cases, inhalation is the dominant exposure pathway. The slag processing scenario addresses the exposure of a worker at a processing facility working near a 20,000 metric ton (22,000 short ton) slag pile. The slag handling scenario addresses the dose to a worker at a steel mill who transfers slag using a front-end loader. In both scenarios, the daily exposure duration is expected to range from 2 to 6 hours and the individual is assumed to work 250 days per year. Both scenarios resulted in the same normalized effective dose equivalents from exposure to all pathways; therefore, it was not necessary to differentiate between the two scenarios when calculating the DCGL that would result in a worker dose of 0.01 mSv/yr (1 mrem/yr). As previously discussed, when calculating the gross activity DGCL for DU, the licensee used the mass fraction of each isotope instead of the activity fractions; however, NRC staff determined this difference had a negligible effect on the gross activity DCGL (< 1%). The DCGL that would result in a dose of 0.01 mSv/yr (1 mrem/yr) to the critical group of a worker handling or processing steel slag was determined to be 400 Bq/100 cm^2 (24,000 dpm/100 cm^2).

Comparison of the four scenarios considered demonstrates that the potential dose to workers who handle steel slag or process the slag for road construction bounds the potential doses due to continued furnace operation, on-site demolition of the furnace, and ingestion of water contaminated with landfill leachate. Therefore, the potential dose to workers who handle or process steel slag was used to determine the gross activity DCGL applicable to the furnace. Surveys performed in 2005 indicated that the concentration of radioactivity in most of the areas with detectable contamination was less than 400 Bq/100 cm^2 (24,000 dpm/100 cm^2), which is the calculated concentration that could cause a dose of 0.01 mSv/yr (1 mrem/yr) to the critical group of workers who handle or process the steel slag. Moreover, the only area with measured residual radioactivity exceeding this activity was small (approximately 100 cm^2) and was contaminated at a concentration only 1.6 times the calculated DCGL (645 Bq/100 cm^2 [38,700 dpm/100cm^2]). Thus, the licensee demonstrated and the NRC staff confirmed that the residual low-level contamination within the equipment and piping remaining on-site would result in a dose to the public of less than 0.01 mSv/yr (1 mrem/yr) TEDE.

3.0 SUMMARY AND CONCLUSIONS

Based on the above analyses, the licensee has demonstrated, and NRC staff has confirmed that the proposed 10 CFR 20.2002 disposal is expected to result in minimal risk to workers and the public. The licensee analyzed the potential dose to a worker due to continued furnace operation, to an on-site demolition worker, to a resident living near an industrial landfill, and to workers handling or processing steel slag, and concluded that the critical group is workers handling or processing steel slag. While the licensee did not evaluate the inhalation risks to an on-site demolition worker, NRC staff concluded that the potential dose to a worker handling or processing steel slag bounds the potential dose to an on-site demolition worker torch-cutting the manifold. Although the licensee used mass fractions of isotopes instead of activity fractions when calculating the gross activity DCGL, NRC staff determined that the use of activity fractions instead of mass fractions made a negligible (< 1%) change in the resulting gross activity DCGL. Because the only area with measured residual radioactivity exceeding the DCGL was small (approximately 100 cm^2) and was contaminated at a concentration only 1.6 times the calculated DCGL (645 Bq/100 cm^2 [38,700 dpm/100cm^2]), the licensee demonstrated and the NRC staff confirmed that the residual low-level contamination within the equipment and piping remaining on-site would result in a dose to the public of less than 0.01 mSv/yr (1 mrem/yr) TEDE.

Further, in accordance with the provisions of 10 CFR 40.14, "the Commission may, upon application by an interested person or upon its own initiative, grant such exemptions from the requirements of the regulations...as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." Based on the above analyses, this material, if authorized for possession, recycling, or disposal without further Atomic Energy Act (AEAct) and NRC licensing requirements, poses no danger to public health and safety, does not involve information or activities that could potentially impact the common defense and security of the United States, and it is in the public interest to allow disposal or recycling of this material. Therefore, to the extent that this material is otherwise licensable, the staff concludes that the person possessing, recycling, or disposing of this material is exempt from further AEAct and NRC licensing requirements.

COVER LETTER

In the cover letter transmitting the license amendment, add the following language:

In accordance with the provisions of 10 CFR 40.14, “the Commission may, upon application by an interested person or on its own initiative, grant such exemptions from the requirements of the regulations...as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest.” The enclosed safety evaluation report concludes that the exemptions are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest. The staff also evaluated the environmental impacts of the exemptions and determined that granting these exemptions would not result in any significant impacts. For this action, the Environmental Assessment and Finding of No Significant Impact were prepared and published in the Federal Register Federal Register, Volume XX, Number XXXX (XX FR XXXX). A copy of the Federal Register notice is enclosed for your information.

Accordingly, pursuant to 10 CFR 40.14, the exemptions are granted and effective immediately.

ENVIRONMENTAL ASSESSMENT

In the Environmental Assessment, add the following language:

For the Introduction, Identification of Proposed action, add “the proposed action would also grant, pursuant to 10 CFR 40.14, an exemption to the disposal or recycling facility from 10 CFR Part 40 licensing requirements.”

For the Environmental Impacts of the Proposed Action, add “the proposed action will not significantly increase the probability or consequences of accidents. No changes are being made in the types of any effluents that may be released off site, and there is no significant increase in occupational or public radiation exposure.”

SAFETY EVALUATION REPORT

In the Safety Evaluation Report, add the following language to the conclusions:

Further, in accordance with the provisions of 10 CFR 40.14, "the Commission may, upon application by an interested person or upon its own initiative, grant such exemptions from the requirements of the regulations...as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." Based on the above analyses, this material, authorized for possession, recycling, or disposal without further Atomic Energy Act (AEAct) and U.S. Nuclear Regulatory Commission (NRC) licensing requirements, poses no danger to public health and safety, does not involve information or activities that could potentially impact the common defense and security of the United States, and it is in the public interest to allow disposal or recycling of this material. Therefore, to the extent that this material is otherwise licensable, the staff concludes that the person possessing, recycling, or disposing of this material is exempt from further AEAct and NRC licensing requirements.