

3. As noted in RAI 1a, an average of four 30B product cylinders is expected to be on an enriched product shipment. The LPES RADTRAN analysis (LPES, 2013) for product cylinders appears to use the external dose rate based on exposure to one cylinder, not four cylinders, thereby underestimating external exposure impacts to the public. Why was an external dose rate based on four cylinders not used? Also, the single cylinder dose rate at two meters was used in the analysis. Since the RADTRAN dose rate input used is for one meter from the vehicle, it would be more appropriate to use the one meter dose rate to be conservative (even though the sides of the cylinders will be back from the side edge of the vehicle) and thus not further underestimate the risks. There is also no discussion in either the Supplement ER or LPES report (LPES, 2013) as to the assumed package configuration on the transport vehicle. The accident risk analysis does consider the contents of four 30B product cylinders.

Response

The evaluation of impacts during transportation was focused on the driver as he/she will have the longest period of exposure to the material as the truck makes its way to the destination. The public along the shipment route will have only short term potential for exposure. The evaluation is based on one cylinder directly behind the cap of the truck. This approach is consistent with the evaluation conducted during the initial facility assessment. For the 30B product cylinder shipments from the UUSA facility there will be an average of four cylinders per truck shipment. The cylinders are oriented perpendicular to the length of the trailer, with the cylinder ends facing out at the side of the trailer. The side wall of the closest cylinder to the driver was used as the basis of the evaluation. While the driver is located in his cab, the distance to the cylinder is approximately 2 meters.

On May 20, 2004, NEF (UUSA) submitted a letter correspondence to the NRC (NEF #04-019) in response to response to NRC "Request for Additional Information Regarding the National Enrichment Facility Environmental Report". The RAI was referenced as follows:

Letter dated April 29, 2004, from M. Wong (NRC) to R. Krich (Louisiana Energy Services) regarding "Request for Additional Information Related to the Preparation Of An Environmental Impact Statement For The Louisiana Energy Services Proposed National Enrichment Facility"

Among the additional information requested was the following RAI:

Verify and provide an example of the calculations used to generate the dose equivalent of 9.47 rem to a driver during normal transport in Section 4.2.7.6. . Sections 2.3 and 4.2.7.6 states that the annual dose equivalent for a truck driver during incident-free transportation is 9.47 rem. Regarding the feed shipments from Ontario, Section 2.3 does not state that the dose per shipment is a collective dose. However, Section 4.2.7.6 appears to indicate that the dose is collective, cumulative over the life of the proposed NEF, and based on 2 drivers per shipment.

The NEF (UUSA) response was as follows:

The basis for computation of the driver exposure time was taken from NUREGICR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station" (June 1978), Section 11.4.1, which states the following transportation assumptions:

Number of drivers: 2

Transportation time: 1,000 miles per 24-hr day

Time outside truck: 2 hrs per 1000-mile trip

Average distance from truck while outside truck: 2 m (6.6 ft)

For dose rates off the truck, the receptor was assumed to be on the side of the container, at mid length (i.e., at the worst-case position). The cab dose drivers were also taken at 2 m (6.6 ft), on the axis for the feed, product, and tails containers, and on the side for the waste drums.

For example, the calculated driver dose rates for a shipment of 48Y feed cylinders from Port Hope, Ontario, to NEF (approximately 1,780 mi) is based on:

Inside cab driver dose rate: 7.247E-02 mrem/hr

Outside cab driver dose rate: 1.403E-01 mrem/hr

The transportation dose to a truck driver per shipped container was calculated by multiplying the cab dose rate times 24 hours (the travel time for a 1,000-mile trip), adding to that an additional 2-hour dose due to standing outside the truck at 2 m (6.6 ft) from the side of the container, and then multiplying the total dose by the truck distance traveled (in 1,000-mile units). The result was then multiplied by 2, the number of truck drivers per shipment.

Dose per 1,000 mile trip, and dose per mile:

= [dose while in cab] + [dose while outside cab]

= [7.247E-02 (mrem/hr) x 24 (hrs)] + [1.403E-01 (mrem/hr) x 2 (hrs)]

= 2.020 (mrem/1,000 miles)

= 2.020E-03 (mrem/mile)

Dose per trip:

= 2.020E-03 (mrem/mile) x 1,780 (miles) x 2 drivers x 1.0E-03 (rem/mrem)

= 7.191 E-03 person-rem/trip

Annual Dose:

= 7.191E-03 person-rem/trip x 690 trips/year

= 4.96 person-rem/year (as given in Table 4.2-2 of the ER).

Total doses were conservatively estimated for any single route by linearly summing the doses from each container being individually transported along that route. This is conservative because no consideration was given to the shielding effect of multiple containers on a single truck, or to differences in the dose point distances due to shipment loading of multiple containers.

The driver dose of 9.49 person-rem (note the correction from 9.47, a typo) reported in Section 4.2.7.6, corresponds to the following hypothetical worst-case transportation routes (from Table 4.2-2):

- Ship 690 feed cylinders (48Y) from Port Hope, Ontario:	4.96 person-rem/yr
- Ship 350 product cylinders (308) to Wilmington, NC:	1.01 person rem/yr
- Ship 160 fifty-five gallon drums to Barnwell, SC:	- 0.015 person-rem/yr
- Ship 625 depleted UF, in 48Y cylinders to Portsmouth, OH	<u>3.50 person-rem/yr</u>
	Total: 9.49 person-rem/yr

The driver dose of 9.49 person-rem (note the correction from 9.47, a typo) reported in ER Sections 2.3 and 4.2.7.6 is a total driver dose for all annual shipments to the two drivers in each truck. The reported dose is not cumulative over the life of the proposed NEF. In the next revision to the ER, Section 2.3 will be revised to reflect "per year" cumulative dose impacts for all categories.