

Subject: Working Group for addressing Soluble Uranium Intake Criteria

Date: October 10, 2007

Participants: NRC: Peter Habighorst,
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Sami Sherbini
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Industry: Felix Killar, NEI
John Nagy, NFS
Richard Burklin, Areva-NP

The subject working group (WG) was formed to explore whether numerical soluble uranium intake criteria can be established for a worker who may be potentially impacted by a high or intermediate consequence accident and an individual located outside a controlled area, such as a member of the public, by an intermediate consequence accident. The WG initially met on 23 August 2007 and identified 11 action items which were addressed in this meeting.

Mr. Habighorst informed the group that the Office of General Counsel (OGC) has determined that our tasks fall under the Federal Advisory Committee Act (FACA) and discussed FACA requirements. These requirements include providing public notice of meetings, retaining copies of any documents considered by the group and retaining copies of meeting minutes.

Mr. Habighorst reviewed the meeting agenda and the minutes and action items from the 23 Aug meeting.

Mr. Nagy presented a review of NUREG-1391, *Chemical Toxicity of Uranium Hexafluoride Compared to Acute Effects of Radiation*. The NUREG reviewed available research on uranium toxicity and determined that the research justifies the NRC limit of 10mg per week as having no "significant acute effects to the exposed individual", but calls into question the validity of 10 mg and 40 mg as threshold doses for transient and permanent injury, respectively. The NUREG does not attempt to identify threshold doses.

Mr. Habighorst provided an overview of the regulatory history 30 mg limit for high consequence exposure to the public. NUREG 1391 and PNL-10065, *Uranium Hexafluoride Public Risk*, were reviewed during the regulatory process. The 1994 10 CFR part 76 rulemaking referenced the PNL report for determining the 30 mg limit. The 1999 10 CFR part 70 rulemaking referenced the part 76 rule as well as the PNL report.

Dr. Sherbini presented a review of PNL-100065. This report reviewed available literature to evaluate potential risks to the public from accidental exposures to uranium in the forms used at gaseous diffusion plants. It finds that general consensus is that chemical toxicity of inhaled or ingested soluble uranium is greater than radiotoxicity in enrichments up to 80%. The threshold for toxicity is approximately 3 µg per gram kidney, which corresponds to an acute intake of about 30 mg soluble uranium for a standard adult. The authors expected that, while children would be expected to have greater sensitivity to toxicity than adults, they would also inhale a smaller volume of air per time and therefore receive smaller intake doses than similarly exposed adults, which the authors believed would offset the higher sensitivity. During discussion, it was mentioned that the 80% enrichment level for transition from chemical to radiological toxicity as producing greater health effects is a rough estimate based on a number of underlying

assumptions. It was also mentioned that for UF₆ releases, the toxicity from HF exposure can not be neglected as its effects will dominate at exposures of less than 50 minutes.

Mr. Burklin made a presentation of his paper coauthored with Ronald L. Kathren, *Acute Toxicity of Uranium: A Brief Review with Special Reference to Man*. The full paper is not yet available to the group for review as it is copywrited but awaiting publication. The paper reviews animal research and documented cases of human accidental and medicinal exposure. There is significant variation in interspecies sensitivity, with humans at the lower end of the scale. There are relatively few cases of human exposures and no human deaths attributable to uranium exposure. The authors recommend conservative provisional LD₅₀ estimates of 5g oral and 1g inhalation intakes.

Mr. Burklin also discussed a second paper which is currently in the draft stage which looks at estimating threshold values for high and intermediate consequence exposure to workers. It is expected this paper will be completed in the next couple weeks, but publication dates are unknown.

Mr. Habighorst provided a review of OSHA, EPA, and international requirements regarding uranium exposure. OSHA limits airborne contamination of soluble uranium to 0.05mg/m³ for 8 hour exposure, except for the construction industry which has a limit of 0.2 mg/m³. The construction industry limit of 0.2 mg/m³ corresponds to the current NRC limit of 10mg/wk. EPA safe drinking water limits are 30g/l. International limits are generally consistent with the PNL report recommendations.

Mr. Habighorst asked what the implications to industry are in regards to soluble uranium exposure; i.e. what percentage of their Integrated Safety Analyses (ISA) are impacted by soluble uranium issues. Industry representatives responded that that would be difficult to ascertain as the ISAs currently evaluate only scenarios which would lead to violations of existing limits. If limits change, the current ISAs would need to be reworked in order to know the impact. The participants agreed that in the current ISAs the majority of the accident sequences are accidental criticality sequences.

The group discussed whether outside toxicology expertise should be sought. It was agreed that this would be more useful later in the process and was put on hold for future action.

The following action items were agreed upon:

- 1) Determine the base population that exposure limits should be designed to protect; i.e. adult, child, weighted population. (NRC staff)
- 2) Determine appropriate vehicle for issuing any guidance resulting from the working group and also insuring that background information used as a basis for making decisions is captured. (NRC staff)
- 3) Determine how and to what extent the working group can use and make public the pending papers by Kathren and Burklin prior to publication without violating copywrite. (Mr. Burklin)
- 4) Summarize the data from the sources discussed at this meeting (papers, OHSA standards, etc). It was suggested that a table summarizing all suggested threshold values could be put together. (NRC staff)

- 5) Discuss with other members of industry to obtain an estimate on impact on ISAs of changing exposure limits. (Industry reps)

It was decided that the next meeting might take place near the beginning of January, with phone conversations to discuss action items in the interim. It is hoped that by the next meeting the first of the Kathren-Burklin papers may be published.

Attachments:

Talking points: PNL Report 10065 – Uranium Hexafluoride Public Risk

Overview of NUREG-1391 As it Relates to Soluble Uranium Limits that Might be Applied Under 10 CFR Part 70

Acute Toxicity of Uranium: A Brief Review with Special Reference to Man

Brief Chronology of Soluble Uranium Requirement

OSHA and EPA standards on Soluble Uranium (ADAMS #: ML072910602)