Weldon Spring Petition Update

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Update on 3 WS Issues

- Bounding radon model
- Recycled thorium
- Raffinate pit drying

Bounding Radon Model

- January 2011: NIOSH presented a scenario in which all radon released during processing was re-circulated into the facility as bounding
  - The maximum concentration of radon, based on release estimate, to be assigned for intake
- May 2011: discussion and clarification, but no change in proposed direction
- June 2012: WG asked for additional detail to be added to these slides and for presentation of same to full ABRWH

Bounding Radon Model—cont.

- Weldon Spring Historical Dose Estimate (ANL/EES-TM-308, Meshkov et al., 1986) estimates annual radon emissions of 12-34 Ci/yr
- Radon assumed to be released into the work area of the refinery, building 103
- Radon emission rate and very low building ventilation rate were used to calculate equilibrium concentration in building 103

Bounding Radon Model—cont.

- Building 103 volume: 2.6 x 10^4 m^3
- Ventilation rate: 1 air change per hr
- 34 Ci/yr = 3.9 x 10^9 pCi/h
- 1 WL = 100 pCi/L of Ra-222 in full equilib. with short lived alpha emitting progeny
- Hours in a WLM = 170
- Equilibrium factor = 0.5
- Number of occupational work hours = 2,000/yr

Bounding Radon Model—cont.

- Note: At the June Board meeting an equilibrium factor of 0.5 was questioned as perhaps being too low for a building with a low ventilation rate; an increase to a more bounding equilibrium factor would increase the WLM exposure estimate proportionally, and thus is a site profile rather than an SEC issue.

Bounding Radon Model—cont.

- *Ceq* is the radon-222 equilibrium conc. (pCi/L) in a ventilated room

$$C_{eq} = \frac{I}{ach * V}$$

- *I* is the influx of radon-222 in pCi/h = 3.9 x 10^9 pCi/h
- *V* is the volume of the space in L
- *ach* is the number of air changes per hour

$$C_{eq} = \frac{3.9 * 10^9 \ \frac{pCi}{h}}{1 \ ach * 2.6 * 10^7 \ell} = 150 \ pCi/\ell$$

Bounding Radon Model—cont.

$$\frac{WLM}{y} = \frac{C_{eq}\ pCi}{\ell} * \frac{\ell\ WL}{100\ pCi} * \frac{M}{170\ h} * \frac{2000\ h}{y} * \frac{EqF}{}$$

so

$$\frac{WLM}{y} = \frac{150\ pCi}{\ell} * \frac{\ell\ WL}{100\ pCi} * \frac{M}{170\ h} * \frac{2000\ h}{y} * \frac{0.5}{} = 8.8$$

Recycled Thorium

- EPA Environmental Impact Statement from 1989 and other references from that period say raffinate pits 3 and 4 contain “thorium-contaminated raffinate solids from processing thorium recycled products” or other phrases indicating recycled thorium

- EEOICPA program uses “recycled” to describe materials irradiated in a reactor then recovered for re-use, but outside EEOICPA its meaning is not so specific

Recycled Thorium—cont.

- The question is, had the thorium at Weldon Spring previously been irradiated and, if so, to what extent would radiological impurities in recycled thorium affect dose reconstruction

- Inventory records available for Weldon Springs show that thorium was present in significant quantities and processed only during the period 1963-1966

Recycled Thorium—cont.

- DOE thorium irradiations (to produce U-233) occurred at Savannah River starting in the mid-1960s

- Documentation from Savannah River indicates that the first shipment of previously-irradiated and reclaimed thorium (recycled thorium) would be sent to Fernald no earlier than November 1966

Recycled Thorium—cont.

- From this, NIOSH concludes that the thorium processed at Weldon Spring from 1963-1966 was not recycled thorium, as the term is used in EEOICPA

Raffinate Pit Drying

- A number of references from the 1980s and 1990s state raffinate pits were typically covered with water but pits 1 and 2 were not covered during dry weather periods

- This raised the question of whether resuspension from the raffinate pits could have been a source of significant exposure during or after operational period

Raffinate Pit Drying—cont.

- Summary of covered periods
  - 1955 to 1966 - operational period for WS plant and raffinate pits
  - 1967 to Sept 1985 – "inactive" period; during this period WS plant was controlled by Dept. of the Army
  - Oct 1985 to 2002 – remediation period

Raffinate Pit Drying—cont.

- Site perimeter air sampling results are available from:
  - 1959-1965 in Meshkov et al., 1986
  - 1987-2000 in environmental monitoring reports prepared by M.K. Ferguson and Jacobs Engineering
  - 1966-1986 various documents from this period describe air sampling results indistinguishable from background

Raffinate Pit Drying—cont.

- For the period 1967 to roughly 1985, it appears unlikely that there were any covered employees at WS. The Army controlled WS Plant, and the raffinate pits were not being used

- If claimants are identified in this period, it should be possible to use air sampling results from 1987 to estimate exposures from resuspension

Raffinate Pit Drying—cont.

- For the operational period, 1957 to 1966, resuspension from the pits, if they dried, should be reflected in the boundary station air sampling results for that period.

- Environmental dose estimates in the WS Site Profile incorporate boundary station air sampling results and a much larger intake estimate based on being in proximity to airborne-generating activities

Raffinate Pit Drying—cont.

- If it is assumed that the boundary airborne concentrations are comprised of raffinate pit contents (all resuspension is from pits), the corresponding adjustment to reconstructed doses would be nominal because of the much larger presumed intake from being in proximity to airborne-generating activities