Looking Forward...

Residues Management

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NORM-X
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Multi-Generational....

- Technologies and job skills needed for the CE have yet to be invented!
- It will take generations to address legacy sites
- Long-term funding and bonding need to be established
- Rules of the Road need to be defined

"The picture’s pretty bleak, gentlemen. ... The world’s climates are changing, the mammals are taking over, and we all have a brain about the size of a walnut."
Unintended Consequences

• The Bigger the Decision - the more mischief that may ensue...
• Make small decisions if possible
• Think Globally - Act Locally
  • Transport costs rarely go down...
P-Funk?

• Emerging contaminants: PFOS/PFOA family
• Used widely in a universe of products from Teflon to firefighting foam
  • Oops - its carcinogenic
• Surfactants and slickwater fracking fluids - Your Produced Water may have this stuff in it...
• EPA likely to list as a hazardous substance...
Ra-226 Market is growing...? What market?

- May not be a useless waste after all...
- Radium-223 is a byproduct material, produced by neutron irradiation of $^{226}\text{Ra}$ to create $^{227}\text{Ac}$, which decays to $^{223}\text{Ra}$ through $^{227}\text{Th}$.
- Radium-223 dichloride is intended for therapeutic use for patients with advanced prostate cancer with bone metastases.
- High demand around the world.
- Requires discrete sources of Ra-226 to feed the reactors...
- Maybe separating Ra-226 from your residuals can be profitable after all.
  - Do Not Try This at Home...
- Discrete radium licensed in the US by the NRC